APPENDIX A: West stratification and survey intensity analysis - flora

Stratum	mean ann.	min. temp.	max. temp	lithology*	, # spp	# sites	probability	forest area	% of forest	# polygons	site density	distribution (geographic units)
No.	precip.	coldest	warmest				next	(ha)	in West		(sites per	
		month	month				species				10,000 ha)	
							new (%)					
82	high	moderate	low	6	589	590	1	71,421	5.92	178	82.61	Otway
63	moderate	high	low	3	912	215	3	43,497	3.61	1526	49.43	Portland, Otway
36	low	moderate	moderate	6	773	434	2	37,817	3.14	616	114.76	Midlands, Horsham
76	moderate	moderate	low	3	385	61	7	14,615	1.21	425	41.74	Otway
80	moderate	high	low	6	395	66	5	13,805	1.14	143	47.81	Otway
84	high	high	low	6	315	44	7	10,861	0.90	135	40.51	Otway
19	moderate	moderate	high	3	429	75	7	9,836	0.82	58	76.25	Horsham
78	moderate	moderate	low	2	423	68	6	8,473	0.70	130	80.25	Otway
39	high	low	low	6	463	148	5	8,349	0.69	102	177.26	Otway, Midlands, Horsham
69	low	high	low	3	401	156	4	7,490	0.62	359	208.29	Midlands, Otway
70	low	high	low	2	802	153	5	6,392	0.53	173	239.38	Midlands, Otway
12	moderate	moderate	high	2	303	30	11	6,243	0.52	56	48.05	Horsham
83	high	moderate	low	2	268	38	7	3,418	0.28	33	111.19	Otway
22	moderate	moderate	high	4	382	20	14	2,695	0.22	13	74.22	Horsham
86	high	high	low	3	312	35	7	2,599	0.22	60	134.67	Otway
25	low	low	high	4	298	12	27	2,494	0.21	155	48.12	Midlands, Horsham
58	low	high	moderate	7	331	18	20	1,052	0.09	212	171.07	Midlands, Portland,
												Dandenong
43	moderate	low	low	2	65	4	*	663	0.05	17	60.37	Horsham
							Total	251,719	20.87			

STRATA WITH HIGH SAMPLING INTENSITY (>40 sites per 10,000ha)

NOTE: Asterisks in "probability next species new" column indicate too few samples (<6 survey sites) for accurate calculation.

* Key to lithology

1 = undescribed

2 = coarsely textured unconsolidated deposits/finely textured unconsolidated deposits: low fertility

- 3 = finely textured unconsolidated deposits: highest fertility, finely textured unconsolidated deposits/coarsely textured unconsolidated deposits: moderate fertility, finely textured unconsolidated deposits/coarsely textured unconsolidated deposits/limestone: ? fertility, finely textured unconsolidated deposits/limestone: ? fertility, finely textured unconsolidated deposits/volcanic rock : ? fertility, saline finely textured deposits/ coarsely textured unconsolidated deposits/ coarsely textured unconsolidated deposits: ? fertility, saline finely textured deposits/ coarsely textured unconsolidated deposits: ? fertility
- 4 = granites and gneisses: moderate to low fertility
- 5 = limestone/coarsely textured unconsolidated deposits: ??? fertility
- 6 = sedimentary rock: low fertility (except where rainfall is high)
- 7 = volcanic rock (acid volcanics): low fertility, volcanic rock/ finely textured unconsolidated deposits : ? fertility, volcanic/sedimentary rock: high fertility, volcanic/sedimentary rock/granites and gneisses/ finely textured unconsolidated deposits: ? fertility

								/					
Stratum	mean ann.	min. temp.	max. temp	Lithology	# spp	# sites	probability	forest area	% of forest	# polygons	site	distribution (geographic units)	
No.	precip	coldest	warmest				next	(ha)	in West		density		
		month	month				species				(sites per		
							new (%)				10,000 ha)		
8	moderate	low	moderate	6	803	172	3	96,470	8.00	1114	17.83	Midlands, Horsham	
14	moderate	low	low	6	602	210	3	95,549	7.92	489	21.98	Midlands, Horsham	
1	low	moderate	high	3	811	136	3	83,687	6.94	3015	16.25	Horsham, Portland	
62	moderate	high	low	2	705	133	6	62,242	5.16	1185	21.37	Portland, Otway	
28	low	moderate	moderate	3	654	69	6	41,325	3.43	1441	16.7	Midlands, Portland, Horsham	
11	low	low	moderate	6	408	41	9	30,009	2.49	750	13.66	Midlands	
35	low	moderate	moderate	2	545	40	13	29,777	2.47	151	13.43	Portland, Horsham	
79	moderate	moderate	low	6	348	44	6	27,457	2.28	121	16.03	Otway	
3	low	moderate	high	6	552	42	13	26,704	2.21	526	15.73	Horsham, Midlands	
37	moderate	moderate	moderate	3	329	42	10	19,621	1.63	701	21.41	Otway, Portland	
26	moderate	moderate	moderate	6	463	22	19	18,658	1.55	211	11.79	Horsham, Midlands, Portland	
6	low	low	high	6	329	22	13	18,430	1.53	1034	11.94	Midlands, Central, Horsham	
32	moderate	moderate	moderate	2	429	32	16	17,745	1.47	188	18.03	Portland, Otway, Horsham	
24	moderate	low	moderate	4	377	19	19	14,044	1.16	303	13.53	Midlands, Horsham, Central	
38	moderate	low	low	4	280	28	8	10,163	0.84	95	27.55	Midlands, Horsham	
10	moderate	moderate	high	6	467	38	9	9,640	0.80	104	39.42	Horsham	

STRATA WITH MODERATE SAMPLING INTENSITY (10 - 40 sites per 10,000 ha)

31	low	high	moderate	3	295	22	16	9,094	0.75	381	24.19	Portland, Midlands
44	low	moderate	moderate	4	198	12	9	5,225	0.43	90	22.97	Horsham, Midlands, Portland
30	low	low	moderate	4	267	14	22	5,153	0.43	145	27.17	Midlands
29	moderate	moderate	moderate	4	353	19	11	4,848	0.40	33	39.19	Horsham
4	low	low	high	3	217	7	32	4,406	0.37	348	15.89	Midlands, Horsham
21	moderate	low	moderate	2	262	14	18	3,965	0.33	36	35.31	Horsham
23	low	moderate	high	4	298	6	41	3,427	0.28	96	17.51	Horsham
81	high	moderate	low	3	127	8	29	2,705	0.22	35	29.58	Otway
17	low	low	moderate	3	111	2	*	1,284	0.11	124	15.57	Midlands
45	high	low	low	7	46	2	*	892	0.07	41	22.42	Midlands
59	low	high	moderate	4	28	2	*	568	0.05	33	35.23	Midlands
							Total	642,088	53.32			

STRATA WITH LOW SAMPLING INTENSITY (>0 - 10 sites per 10,000 ha)

Stratum	mean ann.	min. temp.	max. temp	Lithology	# spp	# sites	probabilit	Forest	% of	#	site	distribution (geographic units)
No.	precip	coldest	warmest				y next	area (ha)	forest in	polygons	density	
		month	month				species		West		(sites per	
							new (%)				10,000	
											ha)	
2	low	moderate	high	2	645	62	8	94,811	7.86	673	6.54	Horsham
66	moderate	high	low	7	277	29	17	63,240	5.24	633	4.59	Portland
64	moderate	high	low	5	359	33	15	45,205	3.75	261	7.3	Portland
41	low	high	moderate	2	104	6	39	32,498	2.69	127	1.85	Portland
50	moderate	high	moderate	2	164	7	48	23,936	1.98	113	2.92	Portland
40	moderate	low	low	7	97	5	*	10,824	0.90	868	4.62	Midlands
61	moderate	moderate	moderate	7	114	9	38	9,936	0.82	466	9.06	Portland, Otway
49	moderate	high	moderate	3	9	2	*	9,559	0.79	395	2.09	Portland
46	low	moderate	moderate	7	16	2	*	4,237	0.35	1082	4.72	Midlands, Otway, Portland
7	moderate	low	high	6	92	1	*	2,151	0.18	167	4.65	Central, Horsham, Midlands
15	low	moderate	high	7	41	1	*	1,384	0.11	356	7.23	Midlands, Horsham, Central
							Total	297,782	24.69			

STRATA (>500 HA) WITHOUT SAMPLE SITES

Stratum	mean ann.	min. temp.	max. temp	Lithology	# spp	# sites	Probability	Forest	% of forest	# polygons	site	distribution (geographic units)
No.	Precip	coldest	warmest				next	area (ha)	in West		density	
		month	month				species				(sites per	
							new (%)				10,000 ha)	
34	moderate	low	moderate	7	0	0	100	3,503	0.00	652	0.00	Midlands, Central
42	low	low	moderate	7	0	0	100	2,043	0.01	268	0.00	Midlands
67	moderate	moderate	low	7	0	0	100	1,579	0.01	31	0.00	Portland
18	moderate	low	moderate	3	0	0	100	989	0.00	94	0.00	Midlands, Horsham
47	low	high	moderate	6	0	0	100	799	0.00	163	0.00	Portland, Midlands
56	moderate	high	moderate	5	0	0	100	609	0.00	9	0.00	Portland
16	low	low	high	7	0	0	100	508	0.00	161	0.00	Midlands, Central
								10,030	0.03			

STRATA OCCUPYING LESS THAN 500 HECTARES

Stratum	mean ann.	min. temp.	max. temp	Lithology	# spp	# sites	Probability	Forest	% of forest	# polygons	site density	distribution (geographic units)
No.	precip	coldest	warmest				next	area (ha)	in West		(sites per	
		month	month				species				10,000 ha)	
							new (%)					
68	low	high	low	7	0	0	100	417	0.03	120	0.00	Midlands
65	moderate	high	moderate	7	0	0	100	373	0.03	83	0.00	Portland
85	high	high	low	2	72	2	*	350	0.03	29	57.20	Otway
5	low	moderate	high	1	0	0	100	344	0.03	88	0.00	Horsham
75	low	moderate	low	3	37	1	*	276	0.02	35	36.20	Otway, Midlands
57	low	low	low	6	0	0	100	266	0.02	5	0.00	Midlands
51	moderate	high	moderate	6	0	0	100	265	0.02	58	0.00	Portland
72	low	high	low	1	122	2	*	225	0.02	45	88.98	Midlands
55	moderate	low	low	3	0	0	100	207	0.02	36	0.00	Midlands
60	low	high	moderate	1	104	11	19	159	0.01	20	690.68	Midlands
33	moderate	low	high	4	39	1	*	136	0.01	15	73.62	Horsham
54	low	low	low	7	0	0	100	96	0.01	40	0.00	Midlands
74	moderate	moderate	low	5	0	0	100	79	0.01	1	0.00	Portland
27	moderate	low	high	7	0	0	100	59	0.00	15	0.00	Central
71	low	high	low	6	23	1	*	51	0.00	19	196.31	Midlands

73	moderate	moderate	moderate	1	0	0	100	32	0.00	13	0.00	Otway
52	low	moderate	moderate	1	0	0	100	31	0.00	25	0.00	Otway, Midlands
20	moderate	low	high	3	0	0	100	19	0.00	5	0.00	Horsham
9	low	low	high	2	0	0	100	18	0.00	2	0.00	Horsham
13	moderate	low	high	2	0	0	100	9	0.00	1	0.00	Horsham
77	low	moderate	low	2	0	0	100	8	0.00	1	0.00	Otway
53	moderate	low	moderate	1	0	0	100	5	0.00	3	0.00	Midlands
48	low	low	moderate	1	0	0	100	3	0.00	3	0.00	Midlands
							Total	3,426	0.28			

APPENDIX B - Fauna Survey Intensity - West

Probability (%) of the next species recorded for a particular fauna group in a particular stratum being new (ie not previously recorded in surveys for that fauna group in that stratum). Also shown are the forested area of each stratum and the % of the total forested area of the West CRA Region. Strata are listed in order of size. Asterisks indicate too few samples (<6 survey sites) for accurate calculation and entries of 100% indicate either no sites surveyed or few species detected.

Strata No.	Area (ha)	% Forest Area	Arboreal Mammal s	Large Mammal s	Small Ground Mammal s	Bats	Diurnal Birds	Nocturn- al Birds	Large Forest Owls	Reptiles	Amphib- ians
1	83,687	6.94	5	12	6	0	2	9	0	5	0
2	94,811	7.86	12	6	3	0	2	33	100	4	0
3	26,704	2.21	5	8	12	9	0	4	0	7	*
4	4,406	0.37	17	6	100	100	0	85	100	3	100
5	344	0.03	*	*	*	100	100	*	100	18	100
6	18,430	1.53	0	27	100	*	11	0	100	0	100
7	2,151	0.18	*	100	100	100	0	*	*	0	100
8	96,470	8.00	4	1	1	1	1	14	0	6	0
9	18	0.00	100	100	100	100	100	100	100	5	100
10	9,640	0.80	15	24	85	10	6	*	*	40	*
11	30,009	2.49	17	20	*	6	0	23	0	14	100
12	6,243	0.52	*	*	*	*	*	*	100	100	100
13	9	0.00	100	100	100	100	100	100	100	0	100
14	95,549	7.92	1	2	1	0	0	0	0	100	100
15	1,384	0.11	100	100	100	100	100	100	100	0	100
16	508	0.04	100	100	100	100	100	100	100	5	100
17	1,284	0.11	100	100	100	100	100	100	100	0	100
18	989	0.08	100	100	100	100	100	100	100	94	100
19	9,836	0.82	6	13	*	*	*	11	*	0	*
20	19	0.00	100	100	100	100	100	100	100	100	100
21	3,965	0.33	*	*	*	*	*	*	100	19	*
22	2,695	0.22	*	*	100	100	*	*	100	100	*
23	3,427	0.28	*	0	55	4	12	*	*	16	0
24	14,044	1.16	0	0	94	8	4	100	100	7	*
25	2,494	0.21	100	100	*	100	100	100	100	0	100
26	18,658	1.55	*	100	38	*	16	*	*	100	100
27	59	0.00	100	100	100	100	100	100	100	0	100
28	41,325	3.43	11	0	18	0	2	12	100	100	*
29	4,848	0.40	*	100	100	16	5	*	100	*	*
30	5,153	0.43	51	100	*	*	100	100	0	19	100
31	9,094	0.75	12	0	100	2	1	15	100	100	100
32	17,745	1.47	0	0	5	5	1	0	0	100	*
33	136	0.01	100	100	100	100	100	100	100	0	100
34	3,503	0.29	100	100	100	100	100	100	100	0	100
35	29,777	2.47	0	66	31	2	3	0	100	*	100
36	37,817	3.14	0	2	4	0	5	8	0	100	*
37	19,621	1.63	14	36	37	0	0	100	*	100	*
38	10,163	0.84	1	2	4	0	2	0	0	59	100
39	8,349	0.69	24	0	6	2	1	92	*	100	*
40	10,824	0.90	0	13	0	0	0	100	0	30	100
41	32,498	2.69	13	100	11	10	0	*	100	0	100
42	2,043	0.17	100	100	*	100	100	100	100	*	*
43	663	0.05	100	100	*	*	100	100	100	*	100

Strata No.	Area (ha)	% Forest Area	Arboreal Mammal s	Large Mammal s	Small Ground Mammal s	Bats	Diurnal Birds	Nocturn- al Birds	Large Forest Owls	Reptiles	Amphib- ians
44	5,225	0.43	*	*	*	100	*	*	100	100	21
45	892	0.07	*	*	*	*	100	*	100	0	100
46	4,237	0.35	100	100	*	*	100	100	100	100	*
47	799	0.07	100	100	100	100	100	100	100	0	100
48	3	0.00	100	100	100	100	100	100	100	*	100
49	9,559	0.79	100	100	100	100	100	100	100	100	100
50	23,936	1.98	0	0	0	0	0	0	0	100	100
51	265	0.02	100	100	100	100	100	100	100	0	100
52	31	0.00	100	100	100	100	100	100	100	*	100
53	5	0.00	100	100	100	100	100	100	100	100	100
54	96	0.01	100	100	100	100	100	100	100	100	100
55	207	0.02	100	100	100	100	100	100	100	100	100
56	609	0.05	100	100	100	100	100	100	100	100	100
57	266	0.02	100	100	100	100	100	100	100	100	100
58	1,052	0.09	*	*	*	*	100	*	100	100	100
59	568	0.05	100	100	100	100	100	100	100	100	100
60	159	0.01	100	100	100	100	100	100	100	100	100
61	9,936	0.82	100	100	*	0	0	100	*	100	100
62	62,242	5.16	0	16	8	3	0	100	100	100	*
63	43,497	3.61	0	4	3	0	1	0	0	100	*
64	45,205	3.75	13	11	0	0	0	98	100	100	*
65	373	0.03	100	100	100	100	100	100	100	100	100
66	63,240	5.24	0	0	3	0	0	0	0	100	100
67	1,579	0.13	100	100	100	100	100	100	100	100	100
68	417	0.03	100	100	100	100	100	100	100	100	100
69	7,490	0.62	28	16	0	21	6	90	100	100	*
70	6,392	0.53	100	100	*	100	8	100	100	100	100
71	51	0.00	100	100	100	100	100	100	100	100	100
72	225	0.02	100	100	100	100	100	100	100	100	100
73	32	0.00	100	100	100	100	100	100	100	100	100
74	79	0.01	100	100	100	100	100	100	100	100	100
75	276	0.02	100	100	100	100	100	100	100	100	100
76	14,615	1.21	*	0	19	7	5	*	*	100	*
77	8	0.00	100	100	100	100	100	100	100	100	100
78	8,473	0.70	0	26	11	0	0	16	100	100	100
79	27,457	2.28	0	16	13	0	1	0	0	100	100
80	13,805	1.14	15	56	5	8	8	20	100	100	*
81	2,705	0.22	*	0	0	0	0	*	*	100	100
82	/1,421	5.92	0	42	2	1	1	0	0	100	100
83	3,418	0.28	*	*	*	100	100	100	0	100	100
84	10,861	0.90	0	96	28	0	0	0	*	100	100
85	350	0.03	100	100	100	100	100	100	100	100	100
86	2,599	0.22	100	*	0	*	100	100	100	100	100

APPENDIX C: Descriptions of Ecological Vegetation Classes (EVCs) occurring in the Victorian West **RFA Region**

Notes:

- EVC mapping for the West region was carried out under four separate projects, each covering part of the region. EVC descriptions are provided separately for each study area and indexed below for convenience.
- A vegetation mosaic consists of discrete floristic entities (EVCs) which were unable to be distinguished in the mapping due to the scale used (i.e. 1:100 000).
- A vegetation complex occurs where floristic entities are unable to be distinguished in an area but are known to exist discretely elsewhere. •
- Mosaics and complexes where all components are individually described in this appendix have not been described separately.
- * denotes alien species
- Categories of rare or threatened plants in Victoria: E Species presumed endangered in Australia
 - Species presumed endangered in Victoria
 - е v Species presumed vulnerable in Australia
 - Species presumed vulnerable in Victoria v
 - R Species presumed rare in Australia
 - Species presumed rare in Victoria r
 - κ Species presumed poorly known in Australia
 - k Species presumed poorly known in Victoria
 - Species that are not rare in Victoria in the wild state, yet are considered threatened as their regeneration is d
 - problematic or less than necessary to replace losses and the populations are continuing to decrease

INDEX

MIDLAND	S AND	OTWAYS	EXTANT	VEGETATION
DESCRIP	TIONS			
EVCID	oastal Dune S	crub Mosaic	and	
	anip Sanus ne		anu	
EVC 8 W	anu neamanu let Heathland			
EVC 10	Estuarine Wetl	and		
EVC 16 1	owland Fores	t		
200.00	Floristic Con	nmunity 16-10	Midlands 1	Lowland Forest
	Floristic Con	nmunity 16-11	Midlands 2	Lowland Forest
EVC 17 F	Riparian Scrub	Complex		
EVC 18	Riparian Fores	t		
EVC 20 H	leathy Dry Fo	rest		
EVC 21 \$	Shrubby Dry Fo	orest		
	Floristic Co	mmunity 21-	05 Midland	ls Escarpments
	Shrubby Dry	Forest	00 11:	- D
	Shrubby Dru	mmunity 21-	06 Midian	as Depauperate
	Eloristic Co	mmunity 21-0	7 Lordordo	ra Shrubby Dry
	Forest		Leideide	rg Shilubby Diy
EVC 22 (Grassy Dry Fo	rest		
EVC 23	Herb-rich Foot	hill Forest		
EVC 29 [Damp Forest			
EVC 30 \	Net Forest			
EVC 31 (Cool Temperat	e Rainforest		
EVC 37	Montane Grass	sy Woodland		
EVC 45 \$	Shrubby Footh	ill Forest		
EVC 47	alley Grassy	Forest		
EVC 48 F	Floriotio Con	inu omunitu 49.00	Sand Llooth	v Woodlond
	Floristic Con	nmunity 48-08	Mostorn G	oldfields Heathy
	Woodland	initiality 40-1	i western e	iolulielus Tieauly
	Floristic Con	nmunity 48-12	Steialitz He	athy Woodland
	Floristic Con	nmunity 48-13	Midlands H	eathy Woodland
EVC 52 (Coastal Saltma	arsh Complex		,
EVC 53 \$	Swamp Scrub	-		
EVC 55 F	Plains Grassy	Woodland		
EVC 61 E	Box Ironbark F	orest		
	Floristic Co	mmunity 61-0	04 Western	Goldfields Box
	Ironbark For	est	Taalamaya	la Caimadai Dav
	FIORSLIC COR	innunity 61-0	s roolerrival	e-Colmadal Box
EVC 64	Pocky Chenon	esi od Woodland		
EVC 67	Alluvial Terrace	es Herb-rich V	/oodland	
EVC 70 H	Hillcrest Herb-r	ich Woodland	oodiana	
EVC 71 H	Hills Herb-rich	Woodland		
	Floristic Co	mmunity 71-	01 Granitic	Hills Herb-rich
	Woodland			
EVC 72 (Granitic Hills W	/oodland		
EVC 73	Rocky Outcrop	Shrubland/ H	erbland Mosa	aic
EVC 74	Netland Forma	ation		
EVC 83	Swampy Ripar	an Woodland		
EVC 127	Valley Heatny	Forest		
EVC 128	Sedge Wetlan	t nd		
EVC 154	Bird Colony S	hrubland		
EVC 161	Coastal Head	land Scrub		
EVC 163	Coastal Tuss	ock Grassland	l	
EVC 164	Creekline Her	b-rich Woodla	nd	
EVC 165	Damp Heath	Scrub		

EVC 177 Valley Slopes Dry Forest Floristic Community 177-01 Brisbane Ranges Valley Slopes Dry
EVC 178 Herb-rich Foothill Forest/Shrubby Foothill Forest Complex
EVC 181 Coast Gully Thicket
EVC 195 Seasonally Inundated Shrubby Woodland
EVC 196 Seugy Ripanan Woodanu EVC 200 Shallow Freshwater Marsh
EVC 201 Shrubby Wet Forest
EVC 203 Stony Rises Woodland
EVC 233 Wet Sands Thicket
EVC 282 Shrubby Woodland
Floristic Community 282-03 Brisbane Ranges Shrubby
Woodland EVC 351 Rocky Outcrop Shrubland/Herbland/Grassy Dry Forest Complex
MIDLANDS & OTWAYS PRE-1750 VEGETATION DESCRIPTIONS
EVC 55 Plains Grassy Woodland
Floristic Community 55-06 <i>Riverina</i> Plains Grassy Woodland
EVC 56 Floodplain Riparian Woodland
EVC 68 Creekline Grassy Woodland
EVC 69 Metamorphic Slopes Shrubby Woodland
EVC 93 Broombush Mallee
EVC 104 Elginant Weitand EVC 125 Plains Grassy Wetland
EVC 132 Plains Grassland
EVC 140 Mangrove Shrubland
EVC 175 Grassy Woodland
Floristic Community 175-04 Low Rises Grassy Woodland Floristic Community 175-10 Lunette Grassy Woodland
Floristic Community 175-11 <i>Granitic</i> Grassy Woodland
EVC 196 Seasonally inundated Sub-saline Herbland
EVC 200 Shallow Freshwaler Marsh EVC 203 Stony Rises Woodland
EVC 283 Plains Sedgy Woodland
EVC 291 Cane Grass Wetland
EVC 300 Reed Swamp
EVC 311 Berm Grassy Shrubland
EVC 851 Stream-bank Shrubland
EVC 863 Floodplain Reedbed
EVC 891 Plains Brackish Sedge Wetland
EVC 895 Escarpment Shrubland
EVC 898 Cane Grass – Lignum Halophytic Herbland
EVC 899 Plains Freshwater Sedge Wetland
GREATER GRAMPIANS VEGETATION DESCRIPTIONS
EVC 3 Damp Sands Herb-rich Woodland
Fioristic Community 3-02 Grampians Damp Sands Herb-rich
Floristic Community 3-03 Rose's Gan Damo Sands Herb-rich
Woodland
EVC 6 Sand Heathland
Floristic Community 6-01 Grampians Dunes Sand Heathland
Floristic Community 6-02 Grampians Sand Heathland/Shallow
Sand Heathland Complex

- EVC 8 Wet Heathland
- EVC 16 Lowland Forest

Floristic Community 16-01 Grampians Lowland Forest Floristic Community 16-02 Feldspar Porphyry Lowland Forest

EVC 18 Riparian Forest

EVC 19 Riparian Shrubland Floristic Community 1901 Grampians Bocky Riparian
Shrubland
EVC 20 Heathy Dry Forest
Forest
EVC 22 Grassy Dry Forest
EVC 23 Herb-rich Foothill Forest
Foothill Forest
Floristic Community 23-11 Grampians Montane Herb-
rich Foothill Forest
Floristic Community 28-01 Grampians Rocky Outcrop
Shrubland
EVC 29 Damp Forest Floristic Community 29-02 Grampians Damp Forest
EVC 30 Wet Forest
Floristic Community 30-03 Grampians Wet Forest
EVC 37 Montane Grassy Woodland Eloristic Community 37-03 Grampians Montane Grassy
Woodland
EVC 45 Shrubby Foothill Forest
Floristic Community 45-02 Grampians Shrubby Foothill
EVC 47 Valley Grassy Forest
Florsitic Community 47-03 Grampians Valley Grassy
Forest EVC 48 Heathy Woodland
Floristic Community 48-01 <i>Plains Lateritic</i> Heathy
Woodland
Woodland
Floristic Community 48-03 Grampians Desert Heathy
Woodland Eloristic Community 48-05 Slopes Lateritic Heathy
Woodland
Florsitic Community 48-08 Sandy Outwash Heathy
Woodland Eloristic Community 48-09 Sand Heathy Woodland
EVC 55 Plains Grassy Woodland
Floristic Community 55-02 Greater Grampians Plains
Floristic Community 55-04 Western Basalt Plains
Grassy Woodland
EVC 67 Alluvial Terraces Herb-rich Woodland
Terraces Herb-rich Woodland
EVC 71 Hills Herb-rich Woodland
Floristic Community 71-01 Granitic Hills Herb-rich Woodland
Floristic Community 71-02 Fertile Hills Herb-rich
Woodland EVC 134 Sand Ecrest
Floristic Community 134-02 Grampians Sand Forest
EVC 136 Sedge Wetland
EVC 184 Montane Wet Heathland Eloristic Community 184-01 Grampians Montane Wet
Heathland
EVC 191 Riparian Scrub
Floristic Community 192-01 <i>Mt. William</i> Montane
Rocky Shrubland
Floristic Community 192-02 Grampians Montane
Floristic Community 192-03 Gully Montane Rocky
Shrubland
Floristic Community 192-04 Escarpment Montane Rocky Shrubland
EVC 193 Rocky Outcrop Herbland
Floristic Community 193-01 Grampians Rocky Outcrop
EVC 195 Seasonally Inundated Shrubby Woodland
Floristic Community 195-01 Valley Seasonally
Inundated Shrubby Woodland Floristic Community 195-02 Plains Seasonally
Inundated Shrubby Woodland
Floristic Community 195-03 Rocklands Seasonally
Inundated Shrubby Woodland EVC 198 Seday Riparian Woodland
EVC 200 Shallow Freshwater Marsh
EVC 278 Herb-rich Heathy Forest
Heathy Forest
EVC 279 Heathland Thicket
Floristic Community 279-01 <i>Grampians</i> Heathland
THICKEL
EVC 280 Floodplain Thicket
EVC 280 Floodplain Thicket Floristic Community 280-01 <i>Grampians</i> Floodplain

EVC 281	Sedge-rich	Wetland
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- Floristic Community 281-01 Grampians Sedge-rich Wetland EVC 282 Shrubby Woodland
- Floristic Community 282-01 Grampians Shrubby Woodland Floristic Community 282-02 Sand Shrubby Woodland EVC 283 Plains Sedgy Woodland
- EVC 284 Claypan Ephemeral Wetland
- EVC 285 Dry Creekline Woodland
 - Floristic Community 285-01 Grampians Dry Creekline Woodland
- EVC 292 Red Gum Wetland
 - EVC 300 Reed Swamp EVC 710 Damp Heathland

PORTLAND - WIMMERA VEGETATION DESCRIPTIONS EVC 3 Damp Sands Herb-rich Woodland Glenelg Plain Damp Sands Herb-rich Woodland Goldfields Damp Sands Herb-rich Woodland Grampians Damp Sands Herb-rich Woodland

- Victorian Volcanic Plain Damp Sands Herb-rich Woodland Warrnambool Plain Damp Sands Herb-rich Woodland Wimmera Damp Sands Herb-rich Woodland EVC 6 Sand Heathland
- Glenelg Plain Sand Heathland Goldfields Sand Heathland
 - Grampians Sand Heathland
 - *Wimmera 1* Sand Heathland *Wimmera 2* Sand Heathland
- EVC 8 Wet Heathland
- EVC 10 Estuarine Wetland
 - Lower Estuary Estuarine Wetland Upper Estuary Estuarine Wetland
- EVC 13 Brackish Sedgeland
- EVC 16 Lowland Forest
 - Glenelg Plain Lowland Forest Victorian Volcanic Plain Lowland Forest Warrnambool Plain Lowland Forest
- EVC 18 Riparian Forest Glenelg Plain Riparian Forest Victorian Volcanic Plain Riparian Forest Warrnambool Plain Riparian Forest
- EVC 19 Riparian Shrubland EVC 20 Heathy Dry Forest
- - Goldfields Heathy Dry Forest Wimmera Heathy Dry Forest
- Grassy Dry Forest **EVC 22**
- EVC 23 Herb-rich Foothill Forest Glenelg Plain Herb-rich Foothill Forest Victorian Volcanic Plain 1 Herb-rich Foothill Forest Victorian Volcanic Plain 2 Herb-rich Foothill Forest Warrnambool Plain Herb-rich Foothill Forest
- EVC 28 Rocky Outcrop Shrubland EVC 30 Wet Forest
- Glenelg Plain Wet Forest
- EVC 47 Valley Grassy Forest
- Grampians Valley Grassy Forest EVC 48 Heathy Woodland *Glenelg Plain* Heathy Woodland *Goldfields* Heathy Woodland *Grampians 1* Heathy Woodland *Grampians 2* Heathy Woodland *Grampians 3 (Mount Arapiles)* Heathy Woodland

 - Victorian Volcanic Plain Heathy Woodland
 - Wimmera Sand Sheet Heathy Woodland Wimmera Western Goldfields Heathy Woodland
- EVC 50 Coastal Heathland
- EVC 53 Swamp Scrub
 - Dundas Tablelands 1 Swamp Scrub Dundas Tablelands 2 Swamp Scrub
 - Glenelg Plain Swamp Scrub
 - Victorian Volcanic Plain Swamp Scrub Warrnambool Plain Swamp Scrub
 - EVC 55 Plains Grassy Woodland Dundas Tablelands Plains Grassy Woodland Glenelg Plain Plains Grassy Woodland Goldfields 1 Plains Grassy Woodland Goldfields 2 Plains Grassy Woodland
 - Grampians Plains Grassy Woodland Victorian Volcanic Plain Plains Grassy Woodland
- EVC 56 Floodplain Riparian Woodland
- EVC 61 Box Ironbark Forest Goldfields Box Ironbark Forest Wimmera Box Ironbark Forest
- Wimmera Box Ironbark Forest EVC 67 Alluvial Terraces Herb-rich Woodland Goldfields Alluvial Terraces Herb-rich Woodland Grampians Alluvial Terraces Herb-rich Woodland
- EVC 68 Creekline Grassy Woodland EVC 71 Hills Herb-rich Woodland
 - Dundas Tablelands Hills Herb-rich Woodland Goldfields Hills Herb-rich Woodland

		Grampians Hills Herb-rich Woodland
EVC	83	Swampy Riparian Woodland
EVC	93	Broombush Mallee
		Wimmera Broombush Mallee
EVC	103	Riverine Grassy Chenopod Woodland
EVC	124	Wimmera Riverine Grassy Chenopod Woodland Grev Clay Drainage Line Herbland/Sedgeland
EVC	125	Plains Grassy Wetland
		Victorian Volcanic Plain 1 Plains Grassy Wetland
		Victorian Volcanic Plain 2 Plains Grassy Wetland
		Wimmera 1 Plains Grassy Wetland
EVC.	132	Plains Grassland
210	102	Victorian Volcanic Plain 1 Plains Grassland
		Victorian Volcanic Plain 2 Plains Grassland
		Victorian Volcanic Plain 3 Plains Grassland
EVIC	100	Wimmera Plains Grassland
EVC	155	Glenela Plain Limestone Pomaderris Shrubland
EVC	136	Sedge Wetland
		Group 1 Sedge Wetland
-		Group 2 Sedge Wetland
EVC	155	Bird Colony Succulent Herbland
FVC	161	Coastal Headland Scrub
210	101	Glenelg Plain Coastal Headland Scrub
		Glenelg Plain Coastal Headland Scrub
EVC	163	Coastal Tussock Grassland
		Headland Coastal Tussock Grassland
EVC	164	Creekline Herb-rich Woodland
		Goldfields Creekline Herb-rich Woodland
EVC	175	Grassy Woodland
		Goldfields Low Rises Grassy Woodland
EVC	170	Wimmera Low Rises Grassy Woodland
LVC	173	Glenelg Plain Heathy Herb-rich Woodland
		Wimmera Heathy Herb-rich Woodland
EVC	191	Riparian Scrub
EVC	193	Rocky Outcrop Herbland
EVC	195	Glenela Plain Seasonally Inundated Shrubby Woodland
		Grampians Seasonally Inundated Shrubby Woodland
		Wimmera 1 Seasonally Inundated Shrubby Woodland
		Wimmera 2 Seasonally Inundated Shrubby Woodland
EVC	198	Sedgy Riparian Woodland
		Victorian Volcanic Plain Sedgy Riparian Woodland
		Warrnambool Plain Sedgy Riparian Woodland
EVC	200	Shallow Freshwater Marsh
EVC	203	Stony Rises Woodland
EVC	264	Vimmera Sand Ridge Woodland
EVC	279	Heathland Thicket
		Grampians Heathland Thicket
EVC	280	Floodplain Thicket
	202	Grampians and Dundas Tablelands Floodplain Thicket
EVC	282	Grampians Shrubby Woodland
EVC	283	Plains Sedgy Woodland
		Grampians Plains Sedgy Woodland
		Wimmera 1 Plains Sedgy Woodland
		Wimmera 2 Plains Sedgy Woodland
EVC	285	Dry Creekline Woodland
210	200	Grampians Dry Creekline Woodland
EVC	291	Cane Grass Wetland
EVC	292	Red Gum Wetland
		Grampians Red Gum Wetland
		Wimmera 2 Red Gum Wetland
		Wimmera 3 Red Gum Wetland
EVC	295	Riverine Grassy Woodland
-	~~~	Wimmera Riverine Grassy Woodland
EVC	298	Kiverine Sedgy Forest
EVC	636	Brackish Lake Mosaic
		Brackish Lake Mosaic (Brackish Aquatic Herbland
		component)
EVC	640	Creekline Sedgy Woodland
EVC	641	Kiparian Woodland Gleneld Plain and Dundas Tablelands Piparian
		Woodland
		Victorian Volcanic Plain Riparian Woodland
_	_	Wimmera Riparian Woodland
EVC	642	Basalt Shrubby Woodland
EVC	043	Drackish Drainage Line Herbland/Sedgeland

EVC 644 Cinder Con	ie Woodland
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EVC 647	Plains Sedgy Wetland
	Dundas Tablelands Plains Seday Wetland
	Victorian Volcanic Plain Plains Sedgy Wetland
EVC 648	Saline Lake Verge Herbland/Sedgeland
EVC 649	Stony Knoll Shrubland
EVC 651	Plains Swampy Woodland
EVC 652	Lunette Woodland
EVC 653	Aquatic Herbland
EVC 654	Creekline Tussock Grassland
EVC 655	Lignum Cane Grass Swamp
EVC 656	Brackish Wetland
	Victorian Volcanic Plains Brackish Wetland
	Wimmera Brackish Wetland
EVC 657	Freshwater Lignum Shrubland
EVC 659	Plains Riparian Shrubby Woodland
EVC 663	Black Box Lignum Woodland
EVC 003	Limestone Weedland
EVC 0/0	Glenela Plain 1 Limestone Woodland
	Glenela Plain 2 Limestone Woodland
	Glenela Plain 2 Limestone Woodland
	Glenelg Plain Limestone Rise Grassland
EVC 673	Dune Soak Woodland
EVC 674	Sandy Stream Woodland
EVC 676	Salt Paperbark Woodland
	Wimmera Salt Paperbark Woodland
EVC 677	Inland Salt Marsh
	Wimmera Inland Salt Marsh
EVC 679	Drainage Line Woodland
EVC 680	Freshwater Meadow
EVC 681	Deep Freshwater Marsh
EVC 682	Permanent Open Freshwater
EVC 683	Semi-permanent Saline
EVC 684	Permanent Saline
EVC 704	Lateritic Woodland
	Dundas Tablelands Lateritic Woodland
	Goldheids Latentic Woodland
	Grampians Lateritic Woodland
EV/C 705	Resalt Creekline Shrubby Woodland
EVC 705	Limestone Rise Woodland
200700	Glenela Plain Limestone Rise Woodland
EVC 707	Seday Swamp Woodland
EVC 708	Hypersaline Inland Saltmarsh
2.0.00	Wimmera Hypersaline Inland Saltmarsh
EVC 709	Scree Slope Woodland/Grassland
EVC 710	Damp Heathland
	Group 1 Damp Heathland
	Group 1 Damp Heathland
EVC 717	Saline Lake Mosaic
EVC 718	Freshwater Lake Mosaic
EVC 783	Grassy Dry Forest / Heathy Woodland Complex
	Grampians Grassy Dry Forest / Heathy Woodland Complex
EVC 789	Hills Herb-rich Woodland/Grassy Dry Forest Complex
	Grampians Hills Herb-rich Woodland / Grassy Dry Forest
	Complex
EVC 792	Stony Rises Woodland/Stony Knoll Shrubland Complex
EVC 793	Clanela Blain Domp Hoothy Woodland
	Gleneig Plain Damp Heathy Woodland
EV/C 801	Basalt Shrubby Woodland/Plains Swampy Woodland Complex
EVC 803	Plains Woodland
EVC 858	Calcarenite Dune Woodland
EVC 876	Spray-zone Coastal Shrubland
	Glenelg Plain Spray-zone Coastal Shrubland
EVC 882	Shallow Sands Woodland
	Dundas Tablelands Shallow Sands Woodland
	Glenelg Plain Shallow Sands Woodland
	Goldfields Shallow Sands Woodland
	Grampians Shallow Sands Woodland
	Wimmera Shallow Sands Woodland
EVC 885	Damp Sands Herb-rich Woodland/Plains Grassy Woodland
	Complex
EVC 894	Scoria Cone Woodland
EVC 895	Escarpment Shrubland
	Gieneig Plain Escarpment Shrubland
	victorian voicanic Plains Grassy Woodland Complex
LVC 09/	i ianis Grassianu/Fianis Grassy WUUUIdhu GUMplex

MIDLANDS AND OTWAYS EXTANT VEGETATION DESCRIPTIONS

EVC 1 Coastal Dune Scrub Mosaic

This EVC was often mapped in mosaic with Coastal Tussock Grassland. Due to limitations of scale (i.e. 100 000) it was often not possible to separate these two EVCs in the floristic vegetation mapping exercie so they were mapped as a mosaic. They also have floristic affinities with each other.

Coastal Dune Scrub/Coastal Tussock Grassland Mosaic occurs on exposed foredunes or on more protected secondary dunes extending from west of Port Campbell to the Bellarine Peninsula. Wind-blown calcareous sands form the dune system behind the rocky headland. The average altitude is 10-30m asl and average annual rainfall is 900mm.

There are two forms of this mosaic. The first is predominantly treeless, with the occasional Swamp Gum Eucalyptus ovata or Messmate E. obliqua. The shrub layer may be dense or patchy and is characterised by Coast Beard-heath Leucopogon parviflorus with Coast Daisy-bush Olearia axillaris, Seaberry Saltbush Rhagodia candolleana ssp. Candolleana, the rare Exocarpus syrticola, the rare Velvet Correa Correa backhousiana and the scrambling Bower Spinach Tetragonia implexa.

The dominant lifeforms are tussock forming graminoids and forbs. Blue Tussock-grass Poa poiformis and Knobby Club-sedge Isolepis nodosa dominate this layer, with Coast Sword-sedge Lepidosperma gladiatum and Black-anther Flax-lily Dianella brevicaulis/revoluta s.l. often interspersed. On the fore dune the tussock-dominated grassland is often dominated by the introduced Marram Grass *Ammophila arenaria which replaces the native sand-binding grass Hairy Spinifex Spinifex sericeus. Forbs are common and include Yellow Wood-sorrel Oxalis corniculata ssp. agg., Branched Centaury *Centaurium tenuiflorum, Pimpernel *Anagalis arvensis, Bidgee-widgee Acaena novae-zelandiae, Coast Groundsel Senecio spathulatus, Ivy-leaf Violet Viola hederacea and Cat's Ear "Hypochoeris radicata. Both floristic alliances are easily disturbed due to the proximity to beaches and subsequently a large proportion of species present are weeds.

The second form of this mosaic grows on exposed fore dunes of the Bellarine Peninsula at Breamlea Spit. It less diverse than the previous form.

Coast Tea-tree Leptospermum laevigatum is the dominant shrub with Coast Beard-heath Leucopogon parviflorus, Coast Wattle Acacia sophorae, Cushion Bush Leucophyta brownii, Seaberry Saltbush Rhagodia candolleana ssp. candolleana comprising the remaining shrub layer. The dominance of Coast Tea-tree Leptospermum laevigatum is one of the main differences between the two forms. Forbs and grasses comprise a large percentage of the ground layer and include Coast Sow-thistle Actites megalocarpa, Beach Rocket *Cakile maritima ssp. maritima, Hairy Spinifex Spinifex sericeus, Marram Grass *Ammophila arenaria, Sea Celery Apium prostratum ssp. prostratum, Bidgee-widgee Acaena novae-zelandiae, Pimpernel *Anagallis arvensis, Angled Pigface *Carpobrotus aequilaterus and Knobby Club-sedge Isolepis nodosa. This form also carries a diverse array of weeds.

EVC 3 Damp Sands Herb-rich Woodland Within the Midlands and Otways region Damp Sands Herb-rich Woodland occurs on deep sandy loams, uaually associated with adjacent creeks or seasonal lakes and swamps. In the Midlands region it is only mapped in the Langi Ghiran State Park and in small patches around the Upper Stony Creek Reservoirs (near the Brisbane Ranges) at altitudes ranging from 350-600m above sea level (asl). In the Otways region it occurs on public land only near the coast with an average altitude of 70m asl. It does occur further inland in this area however, but mostly on private land. It grows in areas of average to high annual rainfall ranging from 650-700mm in the Midlands to 1000mm in the Otway Ranges. Effective rainfall is increased by the shallow water-tables associated with the creeks which provide adequate moisture to support a rich ground layer of forbs and grasses, including many weed species.

Due to a long history of and continuing land clearance and disturbance Damp Sands Herb-rich Woodland carries a high proportion of weed species. In addition, density of the overstorey has been significantly reduced in many areas. The high proportion of weed species is exacerbated by continued disturbance, proximity to farmland and good site quality.

The overstorey is dominated by Manna Gum Eucalyptus viminalis. In the drier Midlands region this grows in association with Scentbark *E. aromaphloia* or Candelbark *E. rubida* and with scattered Black Wattle Acacia mearnsii and Blackwood A. melanoxylon. In the higher rainfall areas of the Otways region it

grows in association with Messmate E. obliqua and Swamp Gum E. ovata.

A few scattered shrubs may be present including Coast Beard-heath Leucopogon parviflorus, Prickly Moses Acacia verticillata, Sweet Bursaria Bursaria spinosa, Prickly Tea-tree Leptospermum continentale, Tree Everlasting Ozothamnus ferugineu, Small-leaf Bramble Rubus parvifolius, Matted Rice-flower Pimelia biflora and Coast Pomaderris Pomaderris oraria ssp. oraria and Large-leaf Bush-pea Pultenaea daphnoides.

The ground is dominated by a dense layer of Austral Bracken Pteridium esculentum over a diverse layer of forbs, grasses and other graminoids. Common forbs include Bidgee-widgee Acaena novae-zelandiae, Cat's Ears *Hypochoeris radicata, , Austral Cranesbill Geranium solanderi, Common Raspwort Gonocarpus tetragynus, Common Centaury *Centaurium erythraea, Kidney-weed Dichondra repens, Yellow Wood-sorrel Oxalis corniculata spp. agg., Pimpernel *Anagallis arvensis, Grassland Wood-sorrel Oxalis perennans, Prickly Starwort Stellaria pungens and Grass Triggerplant Stylidium graminifolium, Common Lagenifera Lagenifera stipitata, Hairy Pennywort Hydrocotyle hirta, Ivy-leaf Violet Viola hederacea, Hairy Speedwell Veronica calycina, and Greenhoods Pterostylis spp.. Common grminoids include Weeping Grass Microlaena stipoidesl, Common Tussock-grass Poa labillardieri, Hare's Tail *Lagurus ovatus, Spiny headed Mat-rush and Black-anther Flax-lily Lomandra longifolia s.l. Dianella brevicaulis/revoluta

EVC 6 Sand Heathland

Within the Midlands Sand Heath is restricted to very small areas surrounded by Lowland Forest in the Brisbane Ranges National Park. It grows on flat to gently undulating topography, at altitudes of 290-340m asl and has an average annual rainfall of approximately 700mm. Soils are Tertiary sands over an impervious clay layer which are periodically very dry or waterlogged. on flat to gently undulating country.. Due to these conditions, the tree layer is often absent.

When present, the overstorey carries sparse and spindly Messmate Eucalyptus obliqua. The shrub layer is very dense to 2m high and is dominated by Heath Tea-tree Leptospermum myrsinoides Prickly Tea- tree L. continentale, Silver Banksia Banksia marginata Common Aotus Aotus ericoides and Red-fruit Saw-sedge Gahnia sieberiana. The ground layer is sparse and includes Blue Squill *Chamaescilla corymbosa*, Milk-maids Burchardia umbellata and Sundew Drosera spp.

EVC 8 Wet Heathland

Wet Heathland, occurs within the Otways region, predominantly on flats and depressions with impeded drainage within Carlisle State Park, on Hanson Plain and on the coastal plains of the Otways National Park. The soils have varying depths of tertiary sandy loams, layered over clay loams. The clay layer impedes further drainage, creating an organic soil of low fertility. Such drainage lines are frequent in Carlisle State Park and Hanson Plain, north of the Otway Range.

Wet Heathland is most often treeless but Brown Stringybark Eucalyptus baxteri, Shining Peppermint E. willisii and Swamp Gum E. ovata, may occur as sparse, short (less than 20m tall) and scattered individuals.

The shrub layer is characterised by two shorter layers. The taller one is 1-2m tall and consists of a sometimes patchy and relatively dense thicket of shrubsincluding Prickly Tea-tree Leptospermum continentale, Scrub Sheoke Allocasuarina paludosa, Scented Paperbark Melaleuca squarrosa, Smooth Parrot-pea Dillwynia glaberrima and Silver Banksia Banksia marginata (shrub form). The lower shrub stratum is characterised by epacrids including Pink Swamp-heath Sprengelia incarnata, Woolly-style Heath Epacris lanuginosa and Common Heath Epacris impressa. The climbers and scramblers Slender Dodder-laurel Cassytha glabella and Spreading Roperush Empodisma minus are usually present below and within this stratum. Wiry Bauera Bauera rubioides and Pouched Coral-fern Gleichenia dicarpa

are also present. Dense Button Grass Gymnoschoenus sphaerocephalus dominates and is characteristic of this EVC. Other tussock forming species include Tall Yellow-eye Xyris operculata, Austral Grass-tree Xanthorrhoea australis and Red-fruit Saw-sedge Gahnia sieberiana. Due to the low fertility of the soil and dense understorey, the ground cover is virtually non-existent, with the exception of Swamp Selaginella Selaginella uliginosa and Screw Fern Lindsea linearis which may form in patches. Weeds are uncommon due to a lack of disturbance and the infertile, wet soils.

EVC 10 Estuarine Wetland

Estuarine Wetland is limited in occurrence within the Otways region being confined to lower reaches of streams near the coast. This EVC recieves saline water from tidal movements and fresh water flows from inland. The inundating waters are usually salty, sometimes brackish and occasionally fresh over the period of a year depending upon river flooding regimes. Soils are anaerobic peat-rich muds. Rainfall is between 800-1000 mm per annum. Elevation is 0-2 m asl.

Estuarine Wetland is dominated by the Common Reed Phragmites australis, Creeping Monkey-flower Mimulus repens, Water Buttons *Cotula coronopifolia, Streaked Arrow grass Triglochin striatum, Club Sedge

Bolboschoenus spp. and Shiny Swamp-mat Selliera radicans. An example of Estuarine Wetland can be found adjacent to Lake Craven and Lake Hordern around the lower reaches of the Aire River.

EVC 16 Lowland Forest

Lowland Forest is mapped in both the Midlands and Otways study areas and will be described separately (below).

Midlands study area:

Lowland Forest is a very restricted EVC in the Midlands study area. It occurs in two very small, disjunct localities, each represesnting a different floristic community

Floristic Community 16-10 Midlands 1 Lowland Forest Midlands 1 Lowland Forest occurs in the Brisbane Ranges National Park and the nearby Bamganie State Forest. Despite its narrow distributional range, it is floristically and structurally variable

This floristic community grows Tertiary sands/clays and the floristic and structural variation is possibly due to differing proportions of sand and clay in the soil. The land is flat and soils are often seasonally wet despite the low annual rainfall of less than 650mm. Altitude ranges from 300-380m asl.

The overstorey is a dense canopy of Messmate *Eucalyptus obliqua* to 15m tall. The shrub layer is highly variable in height, species diversity and types of shrubs present (either narrow-leaved mesic The most common species include Myrtle Wattle or ericoid). Acacia myrtifolia, Dusty Miller Spyridium parvifolium Common Flatpea Platylobium obtusangulum, Honey-pots Acrotriche serrulata, Erect Guinea-flower Hibbertia riparia, Silver Banksia Banksia marginata, Rusty Pomaderris Pomaderris ferruginea Heath Teatree Leptospermum myrsinoides and Furze Hakea Hakea ulicina.

The ground layer may be sparse but diverse in sedges, lillies, forbs and grasses. Species include Thatch Saw-sedge Gahnia radula, Tortuous Rapier-sedge Lepidosperma semiteres, Blue Squill Chamaescilla corymbosa, Reed Bent-grass Deyeuxia quadriseta, Button Everlasting Helichrysum scorpioides, Trailing Goodenia Goodenia lanata and Wallaby-grasses Austrodanthonia spp.

Austral Grass-tree Xanthorrhoea australis was once common in this EVC, however it has declined due to the infestation of the Cinnamon fungus *Phytophthora cinnamoni*. It is still common in the adjacent better-drained soils which support Heathy Dry Forest.

Floristic Community 16-11 Midlands 2 Lowland Forest

Midlands 2 Lowland Forest is found in the Mt Charlie Flora Reserve (north of Riddells Creek) and in the nearby Mt Teneriffe and T Hill Flora Reserves. It occurs on soils derived from sandstones and shales, on mainly sheltered aspects of both steep and gentle slopes. Annual rainfall is 700-800 mm, altitude is 450-700m asl which is generally higher than Lowland Forest elsewhere in the State

The overstorey is dominated by medium height Messmate Eucalyptus obliqua with Manna Gum E. viminalis and Narrow-leaf Peppermint E. radiata. The shrub stratum is very open and diverse with no defined layers. Common species include Silver Wattle Acacia dealbata, Blackwood A. melanoxylon, Prickly Moses A. verticillata, Cluster Pomaderris Pomaderris racemosa, Austal Grass-tree Xanthorrhoea australis, Bushy Hakea, Hakea sericea, Handsome Flat-pea Platylobium formosum and Silver Banksia Banksia marginata.

The ground layer is diverse though often visually dominated by Silvertop Wallaby-grass Joycea pallida. Other species include Bracken Pteridium esculentum, Stinking Pennywort Hydrocotyle laxiflora, Tall Sword-sedge Lepidosperma elatius, Forest Wiregrass Tetrarrhena juncea, Ivy-leaf Violet Viola hedereaca, Runninig Postman Kennedia prostrata, Creeping Bossiaea Bossiaea prostrata and Grey Tussock-grass Poa sieberiana.

Otways study area:

Within the Otways study area there are two forms of Lowland Forest. The first occurs on sandy loam to sandy orange clay loam soils in high rainfall areas, averaging 1100mm per annum and at moderate altitudes, averaging 150m asl. These areas are mostly concentrated in the vicinity of Cape Otway on duplex soils (sand/clay) and Carlisle State Park. Prior to European settlement Lowland Forest is presumed to have occurred extensively on the undulating tarrain overlying the Gellibrand Marl geology. Limited examples of this remain.

The characteristic feature of Lowland Forest is a diversity of species and lifeforms. The overstorey is usually dominated by Brown Stringybark Eucalyptus baxteri but occasionally Messmate E. obliqua, Narrow-leaf Peppermint E. radiata and the rare Bog Gum Eucalyptus kitsoniana may co-occur.

The understorey is includes a combination of drier, ericoid species due to the sandier soils. Characteristic species are Prickly Tea-tree Leptospermum continentale, Silver Banksia Banksia marginata, Prickly Moses Acacia verticillata, Common Heath Epacris impressa, Honey-pots Acrotriche Common Correa Correa reflexa, Broom Sedge serrulata, Amperea xiphoclada, Large-leaf Bush-pea Pultenaea daphnoides and Austral Grasstree Xanthorrhoea australis. On sites with a higher proportion of clay in the soil, species such as Narrow-leaf Wattle Acacia mucronata, Dusty Miller Spyridium parvifolium Hop Goodenia Goodenia ovata, Pink-bells Tetratheca ciliata, Red-fruit Saw-sedge Gahnia sieberiana and Tall Sword-sedge Lepidosperma elatius occur.

The ground layer consists of Spreading Rope-rush Empodisma minus, Common Raspwort Gonocarpus tetragynus, Ivy-leaf Violet Viola hederacea, Trailing Goodenia Goodenia lanata, Screw Fern Lindsea linearis and climbers such as Common Apple-berry Billardiera scandens and Downy Dodder-laurel Cassytha pubescens. Austral Bracken Pteridium esculentum and Forest Wire-grass Tetrarrhena juncea are also quite common. Weed species are not common

The second form of Lowland Forest differs in the dominance of species normally associated with EVC 48 Heathy Woodland and the higher diversity of tussock-forming plants. This form occurs on gentle to moderate slopes of the Otway Plain Natural Region. Here soils are early to late Tertiary sediments of sandy loams and sitly clay loams. Rainfall is lower at around 900mm per annum.

The overstorey includes Narrow-leaf Peppermint Eucalyptus radiata ssp. radiata, Messmate E. obliqua and Scentbark E. aromaphloia. The shrub layer includes Common Heath Epacris impressa, Honey-pots Acrotriche serulata, Prickly Geebung Persoonia juniperia, Pink-bells Tetratheca ciliata and Common Aotus Aotus ericoides. The ground strata include Common Raspwort Gonocarpus tetragynus, Trailing Goodenia Goodenia lanata, Reed Bent-grass Deyeuxía quadriseta, Black-anther Flax-lily Dianella revoluta and Spreading Rope-rush Empodisma minus. Sedges are also common and include Wattle Mat-rush Lomandra filiformis, Many-flowered Mat-rush L. multiflora and Spiny-headed Mat-rush L. longifolia.

EVC 17 Riparian Scrub Complex

Riparian Scrub is restricted to parts of the Otways study area with an underlying Tertiary sands geology. The most well developed examples occur in drainage lines where stream alluvium is present. This EVC typically forms in broad, gently sloping drainage lines and is commonly surrounded by EVC 48 Heathy Woodland or EVC 8 Wet Heathland. The altitude range is between 20 and 170 m asl and average annual rainfall varies from approximately 650mm in the Anglesea area to 900-1300mm in the Carlisle River area. During the pre-1750 vegetation mapping exercise extensive areas of Riparian Scrub Complex were modelled on alluvial flood-plain deposits. It was modelled extensively along the Gellibrand River, at and near the junction with Carlise River and futher downstream on the floodplain sections of the Gellibrand River.

Structurally, Riparian Scrub is a closed scrub 2.5 to 6 metres tall. Species diversity is low due to the dense cover of Scented Paperbark Melaleuca squarrosa and less commonly Prickly Tea-tree Leptospermum continentale. Scattered overstorey trees are often present, usually Manna Gum Eucalyptus viminalis and Messmate E. obliqua. Common species in the understorey include Red-fruit Saw-sedge Gahnia sieberiana, Spreading Rope-rush Empodisma minus and Variable Sword-sedge Lepidosperma laterale var. majuswhich may be locally common.

EVC 18 Riparian Forest

Riparian Forest is mapped in both the Midlands and Otways study areas and will be described separately (below).

Midlands study area:

Riparian Forest is scattered throughout the study area as narrow bands along the banks and alluvial terraces of (usually) perennial sreams. Soils are well-drained and alluvial and a constant supply of moisture supports a tall, high biomass, multi-layered, species-rich forest.

The overstorey is usually patchy in cover. It is dominated by Manna Gum *Eucalyptus viminalis* with Blue Gum *E.globulus* ssp.*biscosta*, Narrow-leaf Peppermint E.radiata s.I., Messmate E.obliqua and Swamp Gum E.ovata also occurring. The small tree layer includes Blackwood Acacia melanoxylon, Silver Wattle Acacia dealbat and Hazel Pomaderris Pomaderris aspera.

The tall shrub stratum includes Prickly Currant-bush Coprosma quadrifida, Hop Goodenia Goodenia ovata and Austral Mulberry Hedvcaria angustifolia.

The field layer is diverse in water-dependent species inlcuding sedges, forbs and ferns. Species present include Fishbone Water-fern Blechnum nudum, Water-ribbons Triglochin procerum, Austral Brooklime Gratiola peruviana, Tall Sedge Carex appressa, Swamp Club-sedge Isolepis inundata and Rushes Juncus spp.

Due to a history of disturbance in many of these areas and the moist, fertile nature of the soils weeds such as Blackberry *Rubus fruticosus and Yorkshire Fog-grass *Holcus lanatus are common and may dominate the field layer.

Otways study area: Within the Otways study area Riparian Forest occurs along rivers and creeks, on alluvial terraces and occasionally in the heads of gullies leading into creeks and rivers. The rainfall of is high, averaging 1250mm per annum and average altitude is 200m asl. Soils are alluvial, fine grey sand at the surface, gradually changing to a mottled orange clay loam at depth.

The overstorey is dominated by Blackwood Acacia melanoxylon, Mana Gun Eucalyptus vinnaka bilakukou Acada melalosyloi, Mana Gun Eucalyptus vinnaki occurring in less than half of the sites surveyed. The rare Brooker's Gun Eucalyptus brookeriana may also be present.

The understorey includes a variety of tall shrubs including Austral Mulberry Hedycarya angustifolia, Prickly Currant-bush Coprosma quadrifida, Musk Daisy-bush Olearia argophylla, Hazel Pomaderris Pomaderris aspera, Banyalla Pittosporum bicolor and Privet Mockolive Notelaea ligustrina.

The ground layer is dominated by a high diversity of moisturedependent ferns. Taller ferns and epiphytes include Kangaroo Fern Microsorum pustulatum, Soft tree-fern Dicksonia antarctica, the rare Skirted Tree-fern Cyathea X marcescens, the rare Slender Tree-fern Cyathea cunninghamii, and Rough Tree-fern Cyathea australis. Ground ferns include Mother Shield-fern Polystichum proliferum, Bat's Wing Fern Histiopteris incisa, Fishbone water-fern Blechnum nudum, Lance Water-fern B. chambersii, Hard Waterfern B. wattsii, the rare Bristly Shield-fern Lastreopsis hispida and the rare Ground Spleenwort Asplenium terrestre ssp. terrestre. Other species in the ground layer include Scrub Nettle Urtica incisa, Shade Nettle Australina pusilla ssp. muelleri, the rare Tufted Club-sedge Isolepis wakefieldiana, the rare Snowdrop Wood-sorrel Oxalis magellanica, Forest Starwort Stellaria flaccida, Tall Sedge Carex appressa and Blackberry Rubus fruticosus spp. agg.

EVC 20 Heathy Dry Forest

Heathy Dry Forest is widespread across the Midlands study area, particularly at lower elevations in the lower rainfall areas, where it grows on gentle slopes and on all aspects. In higher rainfall areas it is restricted to exposed slopes and ridgetops. It occurs on Ordovician shales and sandstones which produce skeletal soils with low fertility and water-holding capacities.

The largest areas of Heathy Dry Forest in the study area are on the broad flat ridges of the Brisbane Ranges National Park and the Lerderderg and Enfield State Parks, the more exposed slopes and ridges in the southern part of the Wombat State Forest, the areas immediately north of Daylesford and the gentle lower slopes of the Pyrenee State Forest and Ararat Hills State Forest.

Heathy Dry forest has a similar structure thoughout the Midlands though floristics and diversity of the understorey vary greatly. The overstorey is a low open forest though it may often tend toward a woodland in tree density and tree form. Messmate Eucalyptus oblique and Brown Stringybark *E. baxteri* dominate in the Brisbane Ranges while Broad-leaf Peppermint *E. dives*, Red Stringybark *E* macrorhyncha and Red Box E. polyanthemos are common in other areas.

The shrub layer is extremely variable floristically and structurally , depending on site characteristics and management history. Many sites have been subject to a long history of disturbance by burning, clearing and mining. Generally this stratum is dominated by low ericoid shrubs dominated by the Fabaceae, Proteaceae and Species present may include Daphne Heath Epacridaceae. Brachyloma daphnoides and Common Beard-heath Leucopogon virgatus in the northern areas, Common Heath Epacris impressa, Bushy Hakea Hakea sericea and Bushy Parrot-pea Dillwynia ramosissima in Lerderderg State Park, Golden Bush-pea Pultenaea gunni and Small Grass-tree Xanthorrhoea australis and Matted Bush-pea Pultenaea pedunculata in the Brisbane Ranges National Park.

The ground layer is generally sparse with a low diversity of scattered forbs and grasses. The most common species are Common Raspwort Gonocarpus tetragynus, Mat-rushes Lomandra spp. Variable Stinkweed Opercularia varia, Black-anther Flax-lily Dianella revoluta, Common Hovea Hovea linearis, Grey Tussockgrass Poa sieberiana and Silvertop Wallaby-grass, Joycea pallida.

Within the Midlands region many areas identified as Heathy Dry Forest are floristically depauperate. These tend to be areas with a long history of disturbance by frequent fires and clearing and massive soil disturbance for mining which have resulted in a severe

reduction in species diversity. The shrub layer is sparse to non-existent and the ground layer is often dominated by Silvertop Wallaby-grass Joycea pallida with few other species present. Although the species which are present all commonly occur in Heathy Dry Forest, most characteristic species are absent, particlularly in the shrub layer which is the characteristic feature of Heathy Dry Forest.

EVC 21 Shrubby Dry Forest

Shrubby Dry Forest is mapped in both the Midlands and Otways study areas and will be described separately (below).

<u>Midlands study area</u>: Within the Midlands region three floristic communities of Shubby Dry Forest are currently recognised. In general, Shrubby Dry Forest is a low, open forest with a diverse though sometimes sparse shrub layer and sparse and species-poor ground layer.

Floristic Community 21-05 Midlands Escarpments Shrubby Dry Forest Midlands Escarpments Shrubby Dry Forest occurs on very steep, exposed, rocky slopes in the Brisbane Ranges National Park, Lerderderg State Park and Werribee Gorge State Park. The soils are infertile and skeletal (to virtually non existent), derived from Ordovician shale and sandstones. The steepness and lack of soil combined with an annual rainfall of less than 600mm create an extremely low effective rainfall and harsh site quality. In its most extreme habitats this floristic community may structurally resemble a Rocky Outcrop Shrubland.

The overstorey may contain any combination of Brown Stringybark Eucalyptus baxteri, Red Ironbark E. tricarpa, Long-leaf Box E. goniocaylx and Red Box E. polyanthemos. These are low, often less than five metres tall and spreading in form.

The shrubby stratum is diverse and sparse though Golden Wattle Acacia pycnantha may occasionally form a dense layer. Other species include Shiny Cassinia Cassinia longifolia, Large-leaf Bush-pea Pultenaea daphnoides, Prunus Pomaderris Pomaderris prunifolia, Shrubby Platysace Platysace lanceolata, Digger's Speedwell Derwentia perfoliata and Fragrant Saltbush Rhagodia parabolica.

The ground layer is sparse and low in diversity, most species restricted to crevices and rocky shelves. Spciese present include Black-anther Flax-lily Dianella revoluta, Many-flowered Mat-rush Lomandra multiflora, Fireweed Groundsel Senecio linearis, Australian Stonecrop Crassula sieberiana, Karkalla Carprotus rossii, and Pink Purslane Calandrinia calyptrata.

Floristic Community 21-06 Midlands Depauperate Shrubby Dry Forest Midlands Depauperate Shrubby Dry Forest occurs on dry ridges on the northern and western edges of the Wombat State Forest. Soils are infertile, derived from Ordivician shales and sandstones. Rainfall is higher than the other two floristic communities of Shrubby Dry Forest at around 750mm per annum. Topography is gently sloping to flat.

The overstorey is dominated by Messmate Eucalyptus obliqua to 20m tall.

The understorey is very low and sparse or totally bare. Narrow-leaf Hopbush Daviesia leptophylla, Narrow-leaf Wattle Acacia mucronata, Thin-leaf Wattle A. aculeatissima, Common Hovea Hovea linearis, Black-anther Flaxlily Dianella revoluta, Common Heath Epacris impressa and Trailing Groundberry Acrotriche serrulata are common. Silvertop Wallaby-grass Joycea pallida may dominate.

Floristic Community 21-07 Lerderderg Shrubby Dry Forest

Lerderderg Shrubby Dry Forest occurs in the Lerderderg State Park on steep slopes and narrow, exposed ridgetops. Soils are similar to Midlands *Escarpments* Shrubby Dry Forest but slopes are less steep producing a slightly better site quality. Vegetation is more dense but generslly more species poor.

The overstorey is dominated by low Red Stringybark Eucalyptus macrorhyncha, 4-10m tall with Broad-leaf Peppermint E. dives, Red Ironbark E. tricarpa and Long-leaf Box E. goniocalyx.

The shrub stratum is often dominated by dense stands of Narrow-leaf Hopbush Davesia leptophylla. Other shrubs include Golden Wattle Acacia pycnantha, Large-leaf Bush-pea Pultenaea daphnoides, Common Heath Epacris impressa and Daphne Heath Brachloma daphnoides.

The ground layer is sparse and rarely includes more than Common Raspwort Gonocarpus tetragynus, Silvertop Wallaby-grass Joycea pallida and Black-anther Flax-lily Dianella revoluta.

<u>Otways study area</u>: Within the Otways study area Shrubby Dry Forest has a limited distribution sediments near the boundary of the lower Cretaceous and late Tertiary sediments near Aireys Inlet. The most well developed examples occur on exposed western and northern aspects on moderate slopes. The soils are orange-brown silty loams to silty clay loams. The average annual rainfall is 650-800mm and altitude is approximately 10-200 m asl.

The overstorey is an open forest dominated by Messmate *Eucalyptus obliqua*, Blue Gum *E. globulus*, Scentbark *E. aromaphloia* and Red Ironbark *E. tricarpa*.

The shrub stratum is diverse and dense and includes Large-leaf Bush-pea *Pultenaea daphnoides* Common Heath *Epacris impressa*, Prickly Moses *Acacia verticillata*, Narrow-leaf Wattle *A. mucronata* and Netted Daisy-bush *Olearia speciosa*.

The ground stratum may vary in density and includes a number of grasses, the more common being Grey-tussock Grass *Poa sieberiana*, Silver-top Wallaby-grass *Joycea pallida* and Short-hair Plume-grass *Dichelachne micrantha*. Sedges are strongly represented by Wattle Mat-rush *Lomandra filiformis*, Many-flowered Mat-rush *L. multiflora*, Spiny-headed Mat-rush *L. longifolia* and Thatch Saw-sedge *Gahnia radula*. Other common species include Trailing Goodenia *Goodenia lanata*, Honey-pots *Acrotriche serrulata* and Love Creeper *Comesperma volubile*.

EVC 22 Grassy Dry Forest

Grassy Dry Forest is mapped in both the Midlands and Otways study areas and will be described separately (below).

Midlands study area:

Grassy Dry Forest occurs across the drier sections of the Midlands study area. Further sampling is required to define the variation of this EVC within the study area.

In general, Grassy Dry Forest occurs on moderately fertile soils derived from Ordivician shales and sandstones. It is more common on sheltered aspects, slopes may be steep or gentle. Rainfall is less than 700mm per annum.

The overstorey is a low forest 6-15m tall and trees may grow in a spreading 'woodland' form. Long-leaf Box *Eucalyptus goniocalyx*, Red Box, *E. polyanthemos*,

Long-leaf Box *Eucalyptus goniocalyx*, Red Box, *E. polyanthemos*, Red Stringybark *E. macrorhyncha*, Yellow Box *E. melliodora* and Candelbark *E. rubida* are common in the north and west of the study area with Messmate *E. obliqua* and Yellow gum *E. leucoxylon* more common in the south.

There is little or no shrub layer, though disturbance by fire may encourage dense stands of Narrow-leaf Bitter-pea Daviesia leptophylla.

The ground layer is dominated by a diversity of grasses and forbs though in dry periods many species retreat to rootstock or soilstored seed. Common grasses include Grey Tussock-grass *Poa sieberiana*, Plume-grasses *Dichelachne* spp. Wallaby grasses *Austrodanthonia* spp., Hair grasses **Aira* spp. and Quaking-grass **Briza maxima*. A few areas, such as Mt Toowong near Macedon and Napoleons Ridge at Ararat are dominated by Kangaroo Grass *Themeda triandra*. Common associated species include Wattle Mat-rush *Lomandra filiformis*, Rock-fern *Cheilanthes* spp., Variable Plantain *Plantago varia*, Blue Pincushion *Brunonia australis*, Yam Daisy *Microseris lanceolata*, Cotton fireweed *Senecio quadridentatus* and Magenta Stork's-bill *Pelargonium rodneyanum*. Many species are area-specific such as Clustered Everlasting *Chrysocephalum semipapposum* which dominates many Grassy Dry Forest sites in the Pyrenee Ranges but was not present in Grassy Dry Foreste elsewhere in the Midlands.

Langi Ghiran State Park carries a variant of Grassy Dry Forest. Here it occurs on potentially more fertile soils derived from granodiorite. The ground cover is more dense and there is significant shrub component where the EVC abutts Rocky Outcrop Shrubland. Common shrubs are Sticky Hop-Bush *Dodonea viscosa*, Grey Everlasting *Ozothamnus obcordatus* and Myrtle Wattle *Acacia myrtifolia*.

Grassy Dry Forest often occurs in association with Heathy Dry Forest and in frequently burnt or disturbed areas where diagnostic species may be missing the two EVCs can be difficult to distinguish as only the hardy species common to both EVCs remain. In such areas (eg.in Waterloo State Forest near Beaufort) the vegetation is mapped as EVC 320 Heathy Dry Forest/Grassy Dry Forest Complex.

Otways study area:

Within the Otways study area Grassy Dry Forest was only identified in an area just west of Lorne. Average annual rainfall is 800-950mm and elevation is 80-250m asl. Soils are shallow and rocky and are less weathered and have a higher iron content than soils of the adjacent EVC 21 Shrubby Foothill Forest. Grassy Dry Forest is confined to northern and western aspects on gentle to moderately steep slopes and ridges.

The overstorey is a low forest 15-20m tall dominated by Scentbark *Eucalyptus aromaphloia*, Blue Gum *E. globulus* and Mountain Grey Gum *E. cypellocarpa*.

The shrub stratum is low in diversity and sparse, except in areas affected by 1983 wildfires, which are dominated by dense stands of Hop Wattle *Acacia stricta* and Hop Goodenia *Goodenia ovata*. These are behaving as post-fire regenerators, which take advantage of conditions during and immediately following a wildfire to dominate for a short period and are now senescing.

The diversity of grasses in the ground stratum characterises this EVC. Common species are Wallaby grasses *Austrodanthonia* spp, Plume-grasses *Dichelachne* spp, Silvertop Wallaby-grass *Joycea pallida*, Soft tussock-grass *Poa morrisii*, Grey Tussock-grass *P. sieberiana* and Weeping grass *Microlaena stipiodes*. Sweet Vernal-grass **Anthoxanthum odoratum* and Common Tussock-grass *P. labillardieri* occur in sites with increased moisture availability. Common herbaceous species include Variable Stinkweed *Opercularia varia*, *Laginifera* spp., Common Centaury *Centaurium erythraea, Blue Pincushion *Brunonia australis*, Milkmaids *Burchardia umbellata* and Small St. John's Wort *Hypericum gramineum*

EVC 23 Herb-rich Foothill Forest

Herb-rich Foothill Forest is mapped in both the Midlands and Otways study areas and will be described separately (below). Further sampling is required to define the variation of this EVC within both the Midlands and Otways study areas.

Within the Midlands region many areas identified as Herb-rich Foothill Forest are floristically depauperate. These areas lack the species rich herb layer that characterises this EVC.

Midlands study area:

Herb-rich Foothill Forest is widespread across the Midlands though most is on or north of Great Dividing Range. It occurs in areas with high rainfall and fertile soils, though it also occurs on some moderately fertile soils. The main occurrences within the study area are Mt Cole and Cobaw State Forests and Mt Buangor State Park on fertile loams and sandy loams derived from granodiorite, at Mt Macedon Regional Park on rhyodacite, in the Wombat State Forest on both fertile soils derived from basalt and much less fertile soils derived from Odovician shales and sandstone and in the Pyrenee State Forest on less fertile soils similar to the Wombat State Forest. Altitude is usually 600-900m asl and the annual rainfall is 800-1000mm.

In general, Herb-rich Foothill Forest is a medium to tall open forest with a sparse to non-existent shrub layer and a diverse ground layer of forbs and grasses. In the east of the study area the overstorey is dominatey by Messmate *Eucalyptus obliqua* with some Manna Gum *E. viminalis* and Narrow-leaf Peppermint *E. radiata* while in the west, Eurabbie *E. globulus* ssp.*biscosta* dominates. Silver Wattle *Acacia dealbata* is often the only shrub presnt though Narrow-leaf Wattle *A. mucronata* and Prickly Currant bush *Coprosma quadrifida* may be present.

The most common forbs and grasses are lvy-leaf Violet Viola hederacea, Bidgee-widgee Acaena novae-zelandiae, Kidney-weed Dichondra repens, Hairy Pennywort Hydrocotyle hirta, Prickly Starwort Stellaria pungens, Small Poranthera Poranthera microphylla, Mountain Clematis Clematis aristata, Spiny-headed Mat-rush Lomandra longifolia ssp. longifoilia Common Tussock-grass Poa labillardieri (Sword Tussock-grass P. ensiformis in the west) Weeping Grass Microlaena stipoides, and Forest Wire-grass Tetrarrhena juncea. Austral Bracken Pteridium esculetum is also very common and often dominates the understorey.

Otways study area:

Within the Otways study area Herb-rich Foothill Forest occurs inland from the coast, in the Angahook Lorne State Park, Lorne State Forest and east of Carlisle State Park. The soils are gradational clay loams over mottled clays. This EVC occurs at an average altitude of 290m asl and mean annual rainfall of is 1100mm.

The overstorey is dominated by Messmate *Eucalyptus obliqua* tree with Mountain Grey Gum *E. cypellocarpa* often co-dominant. Other species may include Narrow-leaf Peppermint *E. radiata,* Blue Gum *E. globulus,* Scentbark *E. aromaphloia* and Swamp Gum *E. ovata.* Blackwood *Acacia melanoxylon* is occasional as an understorey tree.

The shrub layer is unusually diverse and this may be in response to disturbance from frequent burning or high visitor pressure in recreational areas. Species present may include Tree Everlasting *Ozothamnus ferrugineus*, Narrow-leaf Wattle Acacia mucronata, Prickly Moses A. verticillata, Snow Daisy-bush Olearia lirata, Prickly Currant-bush Coprosma quadrifida and Hop Goodenia Goodenia ovata. Austral Bracken Pteridium esculentumis nearly always found beneath the shrubs.

The ground stratum is diverse in forbs and grasses, many of them weeds. Species present include the vulnerable Wrinkled Buttons *Leptorhynchos gatesii*, Austral Cranesbill *Geranium solanderi*, Ivy-leaf Violet Viola hederacea, Cat's Ears *Hypochoeris radicata*, Yellow Wood-sorrel Oxalis corniculata spp. agg., Bidgee-widgee Acaena novae-zelandiae, Prickly Starwort Stellaria pungens, Common Raspwort Gonocarpus tetragynus, Matted Pratia Pratia pedunculata, Grasses Slender Tussock-grass Poa tenera, Common Tussock-grass P. labillardieri and Weeping Grass Microlaena stipoides var stipoides. Wire Grass Tetrarrhena juncea is common and may intertwine through the shrubs and along the ground.

EVC 29 Damp Forest

Damp Forest is restricted within the study area, occurring on moderate to steep slopes within the highest rainfall areas of the Midlands region. It is mostly found in the Wombat State Forest in sheltered gullies on alluvial deposits at altitudes of 650-800m asl and an annual rainfall of 950-1150mm. Damp Forest also occurs at Mt Macedon on well-developed soils derived from rhyodacite soils at altitudes of 600-950m asl. At lower elevations it is only found in sheltered gullies, but over 900m asl it is found on all aspects.

The tall overstorey (to 35m) is cominated by Messmate *Eucalyptus* obiqua with a lower tree layer of Blackwood *Acacia melanoxylon* to 20m.

This EVC is characterised by the dense shrublayer in the understorey dominated by Musk Daisy-bush *Olearia argophylla* with Prickly Moses *Acacia verticillata* Prickly Currant-bush *Coprosma quadrifida* and Hazel Pomaderris *Pomaderris aspera*.

The groundcover carries a diversity of ferns, forbs and grasses including Mother Shield-fern *Polystichum proliferum*, Fishbone Water-fern *Blechnum nudum*, Black-anther Flax-Illy *Dianella revoluta*, Bidgee-widgee *Acaena novae-zelandiae*, Turquoise Berry *Drymophila cyanocarpa* and Forest Wire-grass *Tetratheca juncea*. Within the Midlands region Damp Forest differs from Wet Forest by the absence of tree-ferns and the higher proportion of moisture dependent species.

In the Wombat State Forest, Damp Forest occurs in association with Shrubby Foothill Forest while at Macedon it is to Herbrich Foothill Forest and Wet Forest.

EVC 30 Wet Forest

Wet Forest is mapped in both the Midlands and Otways study areas and will be described separately (below).

Midlands study area:

Wet Forest has a very limited distribution in the Midlands Study area. It is confined to sheltered south-facing gullies on fertile, deep alluvial soils in the higher rainfall and higher altitude areas of the Mt Buangor State Park, Mt Cole State Forest and the Macedon Regional Park. Altitude is above 700m asl and annual rainfall exceeds 1000mm. The effective rainfall is further enhanced by cloud cover and fog drip.

The overstorey is a tall forest dominated byMountain Ash *Eucalyptus regnans* in the Macedon area with Messmate *E. obliqua* and Manna Gum *E. viminalis* ssp. *viminalis* while Eurabbie *Eucalyptus globulus* ssp. *bicostata* dominates in the Mt. Cole and Mt Buangor areas. Under this is a layer of understorey trees/tall shrubs shrubs including Blackwood *Acacia melanoxylon*, Silver Wattle *A. dealbata*, Austral Mulberry *Hedycarya angustifolia* and Musk Daisy-bush *Olearia argophylla*.

The ground is characteristically rich in ferns including Rough Treefern *Cyathea australis*, Soft Tree-fern *Dicksonia antarctica*, Austral King-fern *Todea barbara*, Fishbone Water-fern *Blechnum nudum* Hard Water-fern *B. wattsii* and often dense Mother Shield-fern *Polystichum proliferum* The non-vascular bryophytes (mosses and liverworts) are also an important component of the ground cover and , among which are found forbs such as Forest Starwort *Stellaria flaccida*, Prickly Starwort *S. pungens* and the climber Mountain Clematis *Clematis aristata*.

Otways study area:

Within the Otways study area there are two forms of Wet Forest. The first is distributed along the Otway range from the northern section of the Otway National Park and north of the Great Ocean Road to the Beech Forest Water Catchment. It has an extremly high annual rainfall or 1550mm and occurs in gullies or on protected south and south east-facing slopes of the Otway Range. In addition, it may extend out of more sheltered situations and on to ridges due to the protected nature of the topography and high rainfall and low cloud cover. Geology is mostly non-marine, early cretaceous sediments and soils are fertile loams, where slumping and erosion is common.

The overstorey is a tall forest dominated by pure stands of Mountain Ash *Eucalyptus regnans* on wetter sites and mixed stands of Mountain Ash with Mountain Grey Gum *Eucalyptus cypellocarpa* and Messmate *Eucalyptus obliqua*, the latter more frequent at lower altitudes. Blackwood *Acacia melanoxylon* forms a tall secondary tree layer.

The shrub layer is well established and is dominated by mesic shrubs including Musk Daisy-bush Olearia argophylla, Prickly Currant-bush Coprosma qudrifida, Austral Mulberry Hedycarya angustifolia and Blanket-leaf Bedfordia arborescens. Sclerophyllous, non-ericoid species, such as Bootlace Bush

Pimelea axiflora, Hazel Pomaderris Pomaderris aspera, Banyalla Pittosporum bicolor, Satinwood Phebalium squameum and Privet Mock-olive Notolea ligustrina are also common.

There is an abundance and diversity of ferns in all strata as ground ferns, tree ferns or epiphytes. Epiphytic ferns, fern allies and filmy ferns include the vulnerable Beech Finger-fern *Grammitis magellanica* ssp. nothofageti, Kangaroo Fern *Microsorum pustulatum*, Common Finger-fern *Grammitis billiardieri*, Gipsy Fern *Ctenopteris heterophylla*, Austral Filmy Fern *Hymenophyllum cupressiforme* Leathery Shield-fern *Ruhmora adiantiformis*. Ground ferns include Mother Shield-fern *Polystichum proliferum*, Hard Water-fern *Blechnum wattsii* and Bat's Wing Fern *Histiopteris incisa*. Soft Tree-fern *Dicksonia antarctica* is nearly always present, with the rare Slender Tree-fern *Cyathea cunninghamii* andRough Tree-fern *Cyathea*

The ground stratum is usually sparse with a high cover of leaf litter. Common forbs include the vulnerable Tall Astelia *Astelia australiana*, Forest Starwort *Stellaria flaccida*, Tall Sword-sedge *Lepidosperma elatius* and Shade Nettle *Australina pusilla ssp. muelleri*.

The second form of Wet Forest in the Otways study area is more wide spread and is located in the northern section of Otway National Park both south and north of the Great Ocean Road. This form occurs on more exposed northerly slopes and ridges at lower altitudes, averaging 330m asl and average annual rainfall is 1450mm. Geology is of cretaceous sediments and soils are moderate to high in fertility and less moist than the previous form of this EVC.

The overstorey is dominated by Mountain Ash *Eucalyptus regnans* overstorey over 40m tall. On drier sites this co-dominates with Messmate *E. obliqua*, Mountain Grey Gum *E. cypellocarpa* and Victorian Blue Gum *E. globulus* ssp. *bicostata.* Blackwood *Acacia melanoxylon* often forms a tall secondary tree layer.

The understorey is more open and species-rich in shrubs than the previous form and includes Musk Daisy-bush *Olearia argophylla*, Snow Daisy-bush *Olearia lirata*, Hazel Pomaderris *Pomaderris aspera*, Prickly Currant-bush *Coprosma quadrifida*, Satinwood *Phebalium squameum*, Privet Mock-olive *Notolaea ligustrina*, Austral Mulberry *Hedycarya angustifolia* and Victorian Christmas-bush *Prostanthera lasianthos*.

Ferns are neither common or abundant. Those that are present include Soft Tree-fern Dicksonia antarctica, Kangaroo Fern Microsorum pustulatum Austral Bracken Pteridium esculentum Hard Water-fern Blechnum wattsii, Bat's Wing Fern Histiopteris incisa and Mother Shield-fern Polystichum proliferum Other species in the ground stratum are more common and include Forest Starwort Stellaria flaccida, Hop Goodenia Goodenia ovata, Tall Sword-sedge Lepidosperma elatius and Mountain Clematis Clematis aristata. Forest Wire-grass Tetrarrhena juncea has a high cover and often dominates in response to disturbance.

EVC 31 Cool Temperate Rainforest

The following description is from Peel (1999).

On the southern fall of the Otway Ranges Cool Temperate Rainforest occurs in steeply dissected gullies and valleys which represent the wettest and most sheltered niches available. I occupy extensive riverine terraces. On the northern fall of the Ranges this EVC is restricted to the headwaters of streams near the main divide where rainfall is highest and cloud cover most persistent. Altitudes are low, averaging 250-350m asl and average annual rainfall is high at around 1000-1500mm. Generally soils are deep, well structured, reddish clays and sandy clay loams high in organic content but on alluvial terraces they are chocolate brown to grey silts and silty clay loams.

The overstorey is usually well developed Myrtle Beech Nothofagus cunninghamii to 30m tall.

The understorey is dominated by a dense canopy of Soft Tree-fern *Dicksonia antarctica* along with a diversity of understorey trees and tall, mesic shrubs including Prickly Currant-bush *Coprosma quadrifida*, Austral Mulberry *Hedycarya angustifolia*, Banyalla *Pittosporum bicolor*, Musk Daisybush *Olearia argophylla* and Blackwood *Acacia melanoxylon*. The rare Slender Tree-fern *Cyathea cunninghamii* is also commonly present. Other treeferns commonly present include the rare Skirted Tree-fern Cyathea X marcescens and Slender Tree-fern Cyathea cunninghamii which has a National threatened status of rare and a Statewide status of vulnerable.

This EVC is characterised by the diversity and abundance of obligate epiphytes or species that are epiphytic at crucial stages in their life cycle. This includes vascular species (predominantly ferns) and non-vascular species (mosses, liverworts and lichens). The usual epiphytic substrates are the caudexes ('trunk' or stem) of Soft tree-fern *Dicksonia antarctica* and the trunks of Myrtle Beech. Epiphytic ferns are particularly prominent and include Leathery Shield-fern *Rumohra adiantiformis*, Kangaroo Fern *Microsorum pustulatum*, Austral Filmy Fern *H. cupressiforme*, Narrow Filmy Fern *H. rarum*, Common Finger-fern *Grammitis billiardieri*, Weeping Spleenwort *Asplenium flaccidum* ssp. *flaccidum*, Mother Spleenwort *A*.

bulbiferum ssp. gracillimum, the rare Ground Spleenwort Asplenium terrestre ssp. terrestre and Veined Bristle-fern Polyphlebium venosum

The ground stratum is dominated by ground ferns with the occasional forb. Ferns include Mother Shield-fern *Polystichum* proliferum Ray Water-fern Blechnum fluviatile, Lance Water-fern B. chambersii, Austral Lady-fern Allantodia australis and the rare Bristly Shield-fern Lastreopsis hispida. Shade Nettle Australina pusilla ssp. muelleri is commonly present.

Cool Temperate Rainforest in the Otway Ranges contains a number of Nationally and Statewide listed rare and vulnerable species. See Peel (1999.

EVC 37 Montane Grassy Woodland

Montane Grassy Woodland has a very limited distribution in the Midlands study. It is confined to small exposed, rocky areas of the Macedon Range where the harsh environment excentuates altitudinal effects. The altitude is 900-1000m asl with a mean annual rainfall over 1000mm.

The overstorey is dominated by short and stunted Snow Gum Eucalyptus pauciflora and Dwarf Silver Wattle Acacia nanodealbalta. The rocky surface is dominated by Sword Tussock Grass Poa ensiformis and Slender Tussock Grass P. tenera. Common herbs include Hairy Pennywort Hydrocotyle hirta, Bidgee-widgee Acaena novae-zelandiae, Grass Trigger-plant Stylidium graminifolium, Prickly Starwort Stellaria pungens and Groundsels Senecio spp. with clumps of Tasman Flax-lily Dianella tasmanica, Spiny-headed Mat-rush Lomandra longifolia ssp. longifolia scattered in sheltered rock crevices.

EVC 45 Shrubby Foothill Forest

Shrubby Foothill Forest is mapped in both the Midlands and Otways study areas and will be described separately (below).

<u>Midlands study area</u>: Within the Midlands study area Shrubby Foothill Forest has been identified in the Wombat State Forest and adjacent areas where it is common and widespread. It is a drier form of the EVC than that in the Otways region. It occurs on moderately fertile soils derived from Ordovician shale and sandstones at elevations of 500-900m asl. In higher elevations it may occur on all slopes and aspects, while in drier areas it is restricted to sheltered slopes and gullies. Annual rainfall varies from 750-1150mm. This EVC has a long history of intense and repeated logging.

The overstorey is a medium forest usually dominated by Messmate E.obliqua, though Broad-leaved Peppermint E. dives, Narrow-leaf Peppermint E. radiata, Candlebark E. rubida and Mountain Grey Gum E. cypellocarpa may also be present.

The mid stratum is diverse in narrow-leaved or ericoid shrubs, low and often structurally open. Species include Narrow-leaf Wattle Acacia mucronata, Common Heath Epacris impressa, Moth Daisybush Olearia erubescens, Mueller's Bush-pea Pultenaea muelleri var. reflexifolia, Golden Bush-pea P. gunnii and Gorse Bitter-pea Davesia ulicifolia.

The ground layer is sparse and species poor and includes lvy-leaf Violet Viola hederacea and Common Raspwort Gonocarpus tetragynus. Forest Wire-grass Tetrarrhena juncea and Austral Bracken Pteridium esculentum are common and may dominate the understorey in response to disturbance.

Otways study area:

Shrubby Foothill Forest occurs widely across the study area, on exposed aspects and slight to moderate slopes. It has been identified close to and remote from the coast, with an average annual rainfall greater than 1100mm. The soils are clay loams over medium to heavy clays. Closer to the coast the clay loams become more shallow over rock. Average altitude is 180m asl.

The overstorey is a medium forest dominated by Messmate *Eucalyptus obliqua* to 30m tall. Mountain Grey Gum *E cypellocarpa* is also common. Occasional other species include Scentbark E. aromaphloia, Brown Stringybark E. baxteri, the rare Brooker's Gum *E. brookeriana*, Blue Gum *E. globulus*, Swamp Gum *E. ovata*, Narrow-leaf Peppermint *E. radiata* s.l., Mountain Ash E. regnans and Manna Gum E. viminalis s.l. There is no understorey tree layer.

A diverse shrub layer characterises this EVC. The most common species include Hop Goodenia Goodenia ovata, Prickly Moses Acacia verticillata, Snow Daisy-bush Olearia lirata, Prickly Currantbush Coprosma quadrifida, Narrow-leaf Wattle Acacia mucronata, Privet Mock-olive Notelaea ligustrina, Tree everlasting Ozothamnus ferrugineus, Prickly Tea-tree Leptospermum continentale, Hazel Pomaderris Pomaderris aspera and Large-leaf Bush-pea Pultenea danhnoides

The ground stratum lacks diversity and is often dominated by Austral Bracken Pteridium esculentum and Forest Wire-grass Tertrarrhena juncea which may dominate in response to disturbance. Other species include Tall Sword-sedge Lepidosperma elatiu, the rare Cluster-headed Mat-rush Lomandra longifolia ssp. exilis, the vulnerable Swamp Flax-lily Dianella calicarpa and lvy-leaf Violet Viola hederacea. Mountain Clematis Clematis aristata is the only climber.

EVC 47 Valley Grassy Forest

Valley Grassy Forest generally occurs in small pockets scattered across the drier sections of the Midlands region. It usually grows on quaternary alluvium deposited on valley floors which may be totally dry or carry intermittent streams. Altitude is usually less than 600m asl and mean annual rainfall is below 700mm.

Within the study area there are two isolated basalt caps (surrounded by Odovician Shales and sandstones supporting Heathy Dry Forest) which have been mapped as Valley Grassy Forest. Though they are not in the typical Valley Grassy Forest landform, they are floristically similar, have fertile soils and occur in the same altitude and rainfall range.

The overstorey may carry a variety of eucalypts, usually species which which prefer more moist or more fertile conditions as compared to the species in surrounding habitats. Most common are Yellow Box Eucalyptus melliodora, Red Box E. polyanthemos, Messmate E. obliqua, Narrow-leaf Peppermint E. radiata and Candelbark E. rubida. Apart from scattered Black Wattle Acacia mearnsii and Silver Wattle A. dealbata the shrub layer is virtually non-existent.

The ground is usually covered in a dense grassy sward with a high diversity of both grasses and forbs. Dominant species vary depending on moisture levels. The most common dominant species are Weeping Grass Microlaena stipoides, Common Tussock-grass Poa labillardieri, and Grey Tussock-grass P. sieberiana. P. sieberiana. Other grasses usually present are Sweet Vernal-grass *Anthoxanthum odoratum Silvertop Wallaby-grass Joycea pallida, Fiveawned Spear-grass Pentapogon quadrifidus, Common Wheat-grass Elymus scabrus, Plume grasses Dichelachne spp. and Wallaby grasses Austrodanthonia spp... Forbs include Blue Pincushion Brunonia australis, Ivy-leaf Violet Viola hederacea, Kidney-weed Dichondra repens, Common Lagenifera Lagenifera stipitata, Austral Bugle Ajuga australis, Chocolate-lily Arthropodium strictum and Austral Bracken Pteridium esculentum.

Valley Grassy Forest usually occurs adajacent to dry forests such as Grassy Drv Forest and Heathy Dry Forest though in the Macedon/Cobaw area it is adjacent to Herb-rich Foothill Forest.

EVC 48 Heathy Woodland Heathy Woodland is mapped in both the Midlands and Otways study areas and will be described separately (below).

Midlands study area: Heathy Woodland in the Midlands occurs in small patches scattered across the study area. Several floristic communities have been identified.

Floristic Community 48-09 Sand Heathy Woodland

Sand Heathy Woodland has been identified adjacent to the northwest corner of the Langi Ghiran State Park. Soils are granitic-outwash sands. Altitude is 360-420m asl and average annual rainfall is around 650mm.

The overstorey is is very sparse and dominated by Long-leaf Box Eucalyptus goniocalyx with tree form Silver Banksia, Banksia marginata and Black Sheoke Allocasuarina littoralis.

The understorey is dense and dominated by Small Grass-tree Xanthorrhoea minor and Heath Tea-tree Leptospermum myrsinoides with Daphane Heath Brachyloma daphnoides, Fringed Brachyloma B. ciliatum, Horny Cone-bush lsopogon ceratophyllus and Wire Rapier-sedge Lepidosperma semiteres.

The groundlayer is sparse with scattered herbs and several tiny sedges including Pointed Centrolepis Centrolepis aristata, Hairy Centrolepis C. strigosa, Common Bog-sedge Schoenus apogon and Tiny Bog-sedge S. nanus

Floristic Community 48-11 Western Goldfields Heathy Woodland Western Goldfields Heathy Woodland has been identified in three tiny blocks of public land near Stawell and Amphitheatre. It is equilavlent to the Heathy Woodland (Western Goldfields) as described by Muir et al. (199. Soils are Tertiary sands/clays which have been locally altered to form quartzite gravel. Altitudes are 300-340m asl and average annual rainfall is between 500-600mm.

The overstorey is dominated by small, spreading Long-leaf Box Eucalyptus goniocaylx with some Red Stringy bark E. macrorrhyncha. The lower strata include a shrub layer dominated by a dense cover of low heathy shrubs over scattered herb and grasses in the ground stratum. Common species include Flame Heath Astroloma conostephioides, Cranberry Heath Astroloma humifusum, Daphane Heath Brachyloma daphnoides, Black-anther Flax-lily Dianella revoluta, Cat's Claws Grevillea Grevillea alpina, Heath Tea-tree Leptospermum myrsinoides, Common Bog-sedge Schoenus apogon,

Pointed Centrolepis Centrolepis aristata and Wallaby-grasses Austrodanthonia spp.

Floristic Community 48-12 Steiglitz Heathy Woodland Steiglitz Heathy Woodland occurs on a tiny patch of Tertiary clays in the Steiglitz Historic Park. Altitude is 340m asl and average annual rainfall is 650mm.

The overstorey consists of Red Stringybark Eucalyptus macrorhyncha over an open understorey of Austral Grass-tree Xanthorrhoea australis, Dusty Miller Spyridium parvifolium, Heath Tea-tree Leptospermum myrsinoides, Dwarf Geebung Persoonia chamaepeuce and Golden Grevillea Grevillea chrysophaea. The groundlayer is sparse and includes Sundew Drosera peltata, Button Everlasting Helichyrsum scorpioides and Wallaby-grass Austrodanthonia spp.

Floristic Community 48-13 Midlands Heathy Woodland

Midlands Heathy Woodland occurs on narrow Tertiary cappings on ridgetops in the Wombat and Pyrete State Forests. Soils are a very fine white clay. Altitudes in the Wombat State Forest are 600-830m asl and averrage annual rainfall is 900-1100mm. In the Pyrete State Forest altitude is 400-500m asl and average annual rainfall is 700mm.

The overstorey is dominated by Broad-leaf Peppermint Eucalyptus dives, which, in the Pyrete State Forest may be only two or three metres tall. The understorey may be dense or sparse and includes Dagger Wattle Acacia oxycedrus, Bushy Hakea Hakea sericea, Prickly Tea-tree Leptospermum continentale, Rosy Baeckea Baeckea ramosissima, Silver Banksia, Banksia marginata, Bundled Guinea-flower, Hibbertia prostrata, Common Rapier-sedge, Lepidosperma filiforme and Curly-wig Caustis flexuosa.

Otways study area:

Two forms of Heathy Woodland have been identified within the Otways study area. The first is the most widespread, occurring from sites near Port Campbell and Lower Gellibrand along the tertiary sand belt and in the Eastern View to Anglesea area.

The overstorey is dominated by Brown Stringybark Eucalyptus baxteri, Narrow-leaf Peppermint E. radiata s.l., Messmate E. obliqua and Shining Peppermint E. willisii s.l.

The shrub stratum is diverse and includes Prickly Tea-tree Leptospermum continentale, Common Heath Epacris impressa, Narrow-leaf Wattle Acacia mucronata, Prickly Geebung Persoonia juniperina, Common Beard-heath Leucopogon virgatus, Silver Banksia Banksia marginata, Pink Bells Tetratheca ciliata, Smooth Parrot-pea Dillwynia glaberrima, Western Furze Hakea Hakea repullan.s Common Aotus Aotus ericoides and Slender Rice-flower Pimelea linifolia. Species in the ground stratum include Austral Grass-tree Xanthorrhoea australis, Tassel Rope-rush Hypolaena fastigiata, Spreading Rope-rush Empodisma minus. Spiny-headed Mat-rush Lomandra longifolia and Swamp Selaginella Selaginella uliainosa.

The second form of Heathy Woodland in the Otways study area occurs on late Tertiary sediments between Eastern View and Point Addis of Anglesea. Average annual rainfall is 550-700mm. Distinguishing features of this form of Heathy Woodland are its relatively high species richness and the frequency of tussock forming species compared with the previous form.

Common overstorey species are Messmate Eucalyptus obliqua, Brown Stringybark E. baxteri and Scentbark E. aromaphloia. The diverse shrub layer includes Silver Banksia Banksia marginata, Common Flat-pea Platylobium obtusangulum, Common Heath Epacris impressa, Honey-pots Acrotriche serrulata, Prickly Tea-tree Leptospermum continentale, Heath Tea-tree L. myrsinoides, Erect Guinea Flower Hibbertia riparia, Prickly Geebung Persoonia juniperina, Pink-bells Tetratheca ciliata, Common Beard-heath Leucopogon virgatus, Dwarf Wedge-pea Gompholobium ecostatum, Myrtle Wattle Acacia myrtifolia, Common Rice-flower Pimelea humilis, Smooth Parrot-pea Dillwynia glaberrima and Leafless Globe-pea Sphaerolobium vimineum.

Common species in the ground stratum include Thatch Saw-sedge Gahnia radula, Bent Goodenia Goodenia geniculata, Wattle Matrush Lomandra filiformis, Blue Squill Chamaescilla corymbosa var. corymbosa, Wire Rapier-sedge, Lepidosperma semiteres, Variable Stinkweed Opercularia varia, Heath Xanthosia Xanthosia pusilla, Screw fern Lindsea linearis, Button Everlasting Helichrysum scorpiodes and Hidden Violet Viola cleistogamoides. Other common species include Austral Grass-tree Xanthorrhoea australis, Tassel Rope-rush Hypolaena fastigiata, Common Rapiersedge Lepidosperma filiforme, Tall Sundew Droscera peltata ssp auriculata and Milkmaids Burchardia umbellata.

EVC 52 Coastal Saltmarsh Complex

Coastal Saltmarsh Complex occurs on the Bellarine Peninsula, south-west of Anglesea along the Painkalac Creek and at Queenscliff in the Breamlea estuary, and within the Port Campbell National Park. This EVC occurs at or just above sea level and has an average annual rainfall range of 600 780mm. Fertile clay loam soils and disturbance from recteation activities combine to encourage a high proportion of weeds. Species diversity is low, reflecting the saline nature of the estuarine environment.

There are two forms of Coastal Saltmarsh Complex mapped within the study area. Both are treeless with rushes, sedges, forbs and aquatic plants dominating. Within the Bramlea estuary dominant species include Beaded Glasswort Sarcocornia quinqueflora, Austral Seablite Suaeda australis and Shrubby Glasswort Sclerostegia arbuscula whilst elswehere Creeping Brookweed Samolus repens is most common, co-occurring with Sea Rush Juncus kraussii. Grasses such as Australian Salt-grass Distichlis distichophylla, Blue Tussock-grass Poa poiformis, Annual Beard-grass Polypogon monspeliensis grow on the fringes of the estuary. Buck's-horn Plantain * Plantago coronopus, Shiny Swamp-mat Selliera radicans, Beaded Glasswort Sarcocornia quinqueflora, Aster-weed *Aster subulatus, Water Buttons **Cotula coronopifolia* and Smooth Willow-herb *Epilobium billardierianum* ssp. *billardierianum* also occur on the margins of this complex. Nodding Club-sedge *Isolepis cernua* and Knobby Club-sedge Isolepis nodosa are the most common sedges.

Examples of this EVC can be found at Painkalac Creek at Aireys Inlet, the estuarine flat of the Erskine River at Lorne and the wetland area south of the Old Great Ocean Road at Princetown, approximately 1km from its intersection with the Great Ocean Road.

EVC 53 Swamp Scrub

Swamp Scrub occurs close to the coast in the study area and has affinities with Shallow Freshwater Marsh. Both occupy similar swamp habitats, however the Swamp Scrub occurs on slight rises where the soil is deeper and better drained.

This EVC lacks an overstorey and is dominated by tall Woolly Tea-tree Leptospermun lanigerum which forms dense impenetrable thickets, outcompeting other species. Coast Saw-sedge Gahnia trifida and Common Reed Phragmites australis are also common

EVC 55 Plains Grassy Woodland

Plains Grassy Woodland was once widespread across the study area in the vicinity of the volcanic plains, in some areas growing in association with Plains Grassland. Due to a long history of grazing and clearing for agriculture the majority of this EVC has disappeared and that which is left is often severely degraded. Of the areas remaining on public land the largest is around the Upper Stoney Creek Reservoirs, mainly on land managed by Barwon Water though some occurs in the adjacent Brisbane Ranges National Park. Other areas include the Dolly Creek State Forest, Bannockburn and Inverleigh Commons and a very small patch in the Langi Ghiran State Park

There is great variation within these areas and it is likely that several different floristic communities exist. However, due to the paucity of sampling of intact remnants, distinctions at the floristic community level have not been made here. All sites are virtually flat, altitudes range from 350 to 380m asl except in the Bannockburn and Inverleigh areas which are 90 to 100m asl and annual rainfall is approximately 650mm. Soils are generally fertile, most sites occuring on Tertiary sands and clays though soils of the Inverleigh Common are aeolian sands and the Langi Ghiran State Park example is on granitic-outwash soils.

Tree density within the areas mapped varies from almost forest to very open woodland. Dominance within the overstorey varies with soil moisture which is related to the proportions of sand and clay within the soil. Fire and management history may also influence overstorey structure and species composition.

Dominant species within this EVC may include Yellow Gum Eucalyptus leucoxylon, Swamp Gum E. ovata, Yellow Box E. melliodora or Manna Gum E. viminalis with Silver Banksia Banksia marginata (tree form), Black Sheoke Allocasuarina littoralis Blackwood Acacia melanoxylon and Black Wattle A. mearnsii. There is no shrub layer apart from localised thickets of Hedge Wattle A. paradoxa in the Bannockburn and Inverleigh areas.

The ground layer is very species rich with a mixture of low ericoid shrubs, such as Peach Heath Lissanthe stigosa, Cranberry Heath Astroloma humifusum and Honey-pots Acrotriche serrulata, and a diversity of lilies, forbs and grasses. Common species include Yellow Rush-lily Tricoryne elatior, Milkmaids Burchardia umbellata, Running Postman Kennedia prostrata, Common Rice-flower Pimelea humifusum Creeping Bossia Bossia prostrata, Wiry Buttons Leptorhynchos tenuifolius, Scaly Buttons L. squamatus, Kidneyweed Dichondra repens, Sundew Drosera peltata, Spear-grasses Austrostipa spp., Wallaby-grasses Danthonia spp., Reed Bent-grass Deyeuxia quadriseta, Weeping Grass Microleanea stipoides and Kangaroo Grass Themeda triandra. In some areas there are dense patches of Black-anther Flax-lily Dianella revoluta and Variable Sword-sedge Lepidosperma laterale.

EVC 61 Box Ironbark Forest

Box-Ironbark Forest covers large areas across north central Victoria, however it is very limited in the Midland study area. Two floristic communities have been indentified. Generally, this EVC is an open forest over sparse but often diverse lower strata. It occurs on low, gently undulating hills or the lower slopes of larger hills and ranges. Altitude is less than 350m as and annual average rainfall is low at 500-600mm. Soils are derived from Ordivocian shale and sandstones and are infertile with a low waterholding capacity.

Floristic Community 61-04 Western Goldfields Box Ironbark Forest

Western Goldfields Box Ironbark Forest occurs in the far northwest of the study area in the Dunneworthy and Joel Joel State Forests and the northern tip of the Pyrenee State Forest.

The overstorey is dominated by Yellow Gum Eucalyptus leucoxylon, Grey Box E. microcarpa, Red Ironbark E. tricarpa, and Red Box E. polyanthemos. Common shrubs include Golden Wattle Acacia pycnantha, Grey Everlasting Ozothamnus obcordatus, Twiggy Bush-pea Pultenaea largiflorens and Peach Heath Lissanthe strigosa. The groundlayer consists of Rough Spear-grass Austrostipa scabra, Bristly Wallaby-grass Austrodanthonia setacea, Hair-grass *Aira elegans, Small Mat-rush Lomandra sororia and Narrow Groundsel Senecio tenuiflorus in addition to a number of tiny annuals such as Rayless Daisy Bracyscome perpusilla, Soft Millotia Millotia tenuifolis, Spoon Cudweed Stuatina muelleri, Yellow Pennywort Hydrocotyle foveolata, Small Pennywort H. callicarpa and Annual Bluebell Wahlenbergia gracilenta

Floristic Community 61-06 Toolernvale-Coimadai Box Ironbark Forest

Toolernvale-Coimadai Box Ironbark Forest occurs on the gentle lower slopes of the hills in the Toolernvale and Coimadai areas, mostly on private land. Areas of public land with this floristic community are the southern edge of the Pyrete State Forest, the southeast corner of the Lerderderg State Park and parts of the Long Forest Flora Reserve and Werribee Gorge Sate Park.

The overstorey is similar to Western Goldfields Box Ironbark Forest with the addition of Red Stringybark Eucalyptus macorrhyncha. Shrubs include Golden Wattle Acacia pycnantha, Gold-dust Wattle Acacia acinacea, Saloop Saltbush Einadia hastata, and Shiny Cassinia Cassinia longifolia with Drooping Cassinia Cassinia arcuata in disturbed areas. The ground layer includes Wattle Matrush Lomandra filiformis, Silvertop Wallaby-grass Joycea pallida, Bristly Wallaby-grass Austrodanthonia setacea, Grey Tussockgrass Poa sieberiana, Cotton Fireweed Senecio quadridentatus and Small-leaf Clematis Clematis microphylla. The tiny annuals characteristic of the previous floristic community are not present.

EVC 64 Rocky Chenopod Woodland

Within the Midlandsregion Rocky Chenopod Wooland only occurs in the Werribee Gorge State Park and the Long Forest Flora Reserve. Altitudes range from 100-250m asl and annual rainfall is low at 450- 550mm. Soils are infertile, have a high salt content and are fairly impermeable to water, thereby reducing effective rainfall. Prior to European settlement this EVC extended onto Permian glacial mudstones to an altitude of 360m asl.

In this EVC the overstorey is a low (6-10m tall) forest to woodland dominated by Bull Mallee Eucalyptus behriana, Yellow Gum E. leucoxylon or Grey Box E. microcarpa. In some areas, particularly those dominated by Bull Mallee in Long Forest and Yellow Gum in Werribee Gorge, the trees are mallee-form though this has been accentuated by timber cutting methods in the past which encouraged coppice regrowth.

The understorey and ground layers are characertised by a diversity of chenopods (saltbushes) and succulents including. Fragrant Saltbush Rhagodia parabolica, Saloop Saltbush Einadia hastata, Nodding saltbush E. nutans, Ruby Saltbush Enchylaena tomentosa, Wingless Saltbush Maireana enchylaenoides, Frosted Goosefoot Chenopodium desertorum ssp. microphyllum, Inland Pigface Carpobrotus modestus, Pink Purslane Calandrinia calytrata and Australian Stonecrop Crassula sieberiana. Projected foliage cover of these species varies and at times is minimal. Areas dominated by Grey Box tend to have the lowest number of chenopod species, which may reflect a slightly better site quality. Other shrubs present include Golden Wattle Acacia pycnantha, Moonah Melaleuca lanceolata, Turkeybush Eremophila dersiti and Drooping Cassinia Cassinia arcuata.

The groundlayer is always sparse and may sometimes be virtually bare. Species diversity varies. Usual species include Wallabygrasses Austrodanthonia spp., Spear-grasses Austrotipa spp., Annual Veldt-grass *Ehrhartia longiflora, Austral Tobacco Nicotiana suaveolens and Small-leaved Clematis Clematis microphylla.

EVC 67 Alluvial Terraces Herb-rich Woodland

Alluvial Terraces Herb-rich Woodland occurs in the north-west of the study area, in the Pyrenee Ranges, Waterloo and Dunneworthy State Forests and the Langi Ghiran State Park. It grows on low-lying alluvial terraces and plains and has been extensively cleared across its range, now only occurring in small pockets around the edges of public land. Soils are relatively fertile and have a higher water-holding capacity than the surrounding low hills. Altitudes are generally below 350m asl and the annual rainfall is below 650mm.

Within this EVC the overstorey is of tall woodland trees, mainly Yellow Box Eucalyptus melliodora with Candlebark E.rubida, River Red Gum E.camaldulensis, Red Box E. polyanthemos and Blue Gum E.globulus also occurring occasionally. There is no shrub layer, and the ground layer is diverse in forbs, lilies and grasses including many annuals. In dry seasons the ground may appear very bare, many species retreating to rootstocks or existing as soil-stored weed. Common species include Scaly Buttons Leptorhynchos squamatus, Solenogyne Solenogyne dominii, Yellow Rushlily Tricoryne elatior, Chocolate Lily Arthropodium strictum, Yam-daisy Microseris lanceolata, Common Bog-sedge Schoenus apogon, Common Wheat-grass Elymus scabrus and Wallaby-grasses Austrodanthonia spp.

Most areas of Allivial Terraces Herb-rich Woodland have suffered a severe history of disturbanc, from mining, grazing and timber cutting. As a consequence weeds are common, particularly annual grasses.

EVC 70 Hillcrest Herb-rich Woodland

Hillcrest Herb-rich Woodland is restricted to broad, flat hilltops and ridgelines in the far north-west of the Midlands study area, in and around the Pyrenee Ranges It has been mapped in isolated locations through the Box-Ironbark Region to the north and east but has not been recorded further south. Altitude is 400-450m asl and mean annual rainfall is approximately 550-650mm. All sites occur on Ordovician sediments. The flatness of the ridgetops allows the formation of deeper soils and thus better growing conditions than on the surrounding slopes which are steeper and generally support Grassy Dry Forest and Heathy Dry Forests.

The is sparse and consists of low spreading eucalypts, mainly Yellow Box Eucalyptus melliodora and Long-leaf Box E. goniocalyx. The shrub layer is usually absent while the ground layer has a diverse array of grasses and forbs. Common species include Clustered Everlasting *Chrysocephalum* semipapposum Tall Raspwort *Gonocarpus elatus*, the Wallaby-grasses Austrodanthonia pilosa and A. racemosa, Narrow Rock-fern *Cheilanthes* sieberi, Cotton Fireweed Senecio quadridentatus, Sieber Crassula Crassula sieberiana, Common Wheat-grass Elymus scaber, Chocolate Lily Arthopodium strictum, Magenta Stork's-bill Pelargonium rodneyanum and the Spear-grasses Austrostipa mollis and A. scabra ssp. falcata.

EVC 71 Hills Herb-rich Woodland

Floristic Community 71-01 *Granitic* Hills Herb-rich Woodland Within the Midlands region, *Granitic Hills* Herb-rich Woodland is uncommon and is typically found at the boundaries of blocks of public land such as Mt Buangor State Park, Langi Ghiran State Park, Mt Cole State Forest, Mt Lonarch State Forest and Ben Major Forest Reserve on fertile granodiorite and granodiorite-derived soils. The most extensive intact example within the study area is in Mt Beckworth State Forest where it occupies most of the park. Altitudes range from 350 to 700m asl and annual rainfall is less than 700mm

The overstorey is a woodland of large eucalypts, usually Yellow Box Eucayptus melliodora. Shrubs and understorey trees are sparse with Black Wattle Acacia mearnsii and less commonly Cherry Ballart Exocarpus cupressiformis most usual.

On the outwash slopes to the west of Mount Langi Ghiran this floristic community grows on soils which appear less fertile and are more often waterlogged than those of steeper slopes elsewhere. Here the low tree layer is missing, and tall shrubs such as Hedge Wattle Acacia paradoxa and Varnish Wattle A. verniciflua may be present, rarely forming dense stands.

The ground layer is rich in grasses and forbs such as Wallaby-grasses Austrodanthonia spp., Kidney-weed Dichondra repens, Austral Bugle Ajuga australis, Austral Bear's-ears Cymbonotus preissianus and Green Rock Fern Cheilanthes austrotenuifolia. Low ericoid shrubs such as Cranberry Heath Astroloma humifusum and Peach Heath Lissanthe strigosa are also common.

Due to the fertile nature of the soils and disturbance by grazing (rabbits and marsupials) weeds are common, paticularly annual grasses.

EVC 72 Granitic Hills Woodland Granitic Hills Woodland is restricted in the Midlands to the YouYangs Regional Park where is occurs on steep granite hills and rocky outcrops. Average annual rainfall is low at approximately 550mm and effective rainfall even lower due to the steep slopes and shallow free-draining soils. Altitude ranges from 200-350m asl.

The overstorev varies from sparse to almost forest-like depending soil depth and the availablitly of deep cracks for root growth. Red Stringbark Eucalytus

macrorhyncha dominates although Yellow Gum E. leucoxylon, Red Ironbark E. tricarpa and Yellow Box E. melliodora may also occur. The shrub layer is usually demse where there is enough soil for unless there are large slabs of exposed rock which lacks enough soil for establishment of root systems. Common shrubs include Snowy Mint-bush Prostanthera nivea, Hegde Wattle Acacia paradoxa, Lightwood A. implexa, Sticky Hop-bush Dodonaea viscosa, Shiny Cassinia Cassinia longifolia and the weed Boneseed *Chrysanthemum monilifera. Among the rocks are grasses and forbs such as Kangaroo Grass Themeda triandra, Fibrous Spear-grass Austrostipa semibarbarta, Weeping Grass Microleana stipoides, Black-anther Flax-lily Dianella revoluta, Small-leaved Clematis Clematis microphylla, Yellow Rush-lily Tricoryne elatior and Narrow Rock-fern Cheilanthes tenuifolia.

EVC 73 Rocky Outcrop Shrubland/ Herbland Mosaic

midlands study area, Rocky the Outcrop Shrubland/Herbland Mosaic is most common on granodiorites in the Mt Buangor State Park, Mt Cole State Forest and Langi Ghiran State Park, on exposed, westerly-facing rocky outcrops at altitudes greater than 700m asl.

These two EVCs grow in tight association with eachother, interspersed by areas of bare rock and were unable to be distinguished in the mapping due to the scale used (i.e. 1:100 000). Rocky Outcrop Shrubland grows in localised areas of deeper soils, usually between rocks and Rocky Outcrop Herbland grows on localised areas of shallow soils in mossbeds and in shallow depressions in the rock. Bryophytes (mosses and liverworts) and lichens are common and may cover rock surfaces.

The overstorey may be sparse to absent, depending on soil depth. Where they do occur, trees are usually stunted and spreading in form. In drier sites such as within Langi Ghiran State Park and lower altitude sites to the north of Mt Buangor the most common eucalypts are Long-leaf Box *Eucalyptus goniocalyx* and Red Stringybark E. macrorhyncha while in wetter sites, such as atop Ben Nevis, stunted Eurabbie E. globulus ssp. bicostata is found. Narrow-leaf Peppermint E. radiata or Broad-leaf Peppermint E. dives are less common.

The most common shrubs in this mosaic include Violet Kunzea Kunzea parvifolia, Spike Wattle Acacia oxycedrus and Sticky Hopbush Dodonea viscosa while at higher altitudes, for example on the top of Ben Nevis, Shiny Tea-tree Leptospermum turbinatum dominates.

Among the rocks species such as Nodding Blue-lily Stypandra glauca, Velvet Wallaby-grass Austrodanthonia pilosa, Matted Tussock-grass Poa clelandii, Prickly Starwort Stellaria pungens and Austral Carrot Daucus glochidiatus are common. In moss beds and on rocky outcrops Spreading Crassula Crassula decumbens and a diversity of stunted grasses and annual forbs are found.

EVC 74 Wetland Formation Wetland Formation is a broad, undersampled group occurring throughout the study area. Wetland vegetation is often severely degraded and weed-invaded having suffered a history of disturbance including alteration of drainage patterns such as up-stream damming for water storage or draining and clearing for agriculture or grazing. This formation includes generally herbaceous wetland vegetation in ephemeral and permanent water bodies. On the volcanic plain EVCs present may include EVC 125 Plains Grassy Wetland, EVC 136 Sedge Wetland, EVC 647 Plains Sedgy Wetland, EVC 653 Aquatic Herbland, EVC 647 Plains Sedgy Wetland and areas of open fresh or saline water. In areas of lower rainfall EVCs present may include EVC 104 Lignum Wetland, EVC 291 Cane-grass Wetland and EVC 292 Red Gum Wetland. These EVCs are individually described in other sections of this text.

EVC 83 Swampy Riparian Woodland

Swampy Riparian Woodland has been mapped in only one location in the Midlands study area, in the Wombat State Forest where it occurs on Recent alluvial flats adjacent to the Werribee River in association with Herb-rich Foothill Forest and Shrubby Foothill Forest. The area is flooded regularly and is nearly always wet even when the river is not flowing. The altitude is 600m als and average annual rainfall is approximately 850mm.

Swampy Riparian Woodland consists of a very open to virtually absent canopy of Swamp Gum Eucalyptus ovata and Manna Gum E. viminalis. The shrub layer is also very sparse with scattered Blackwood Acacia melanoxylon, Silver Wattle A. dealbata, Hazel Pomaderris Pomaderris aspera, Prickly Currant-bush Coprosma quadrifida and the occasional Rough Tree-fern Cyathea australis and Soft Tree-fern Dicksonia antartica. The ground layer is dense, dominated by Fishbone Water-fern Blechnum nudum. Other common species include Mother Shield-fern Polystichum proliferum Leafy Flat-sedge Cyperus lucidus, Tall Sedge Carex appressa and Hard Water-fern Blechum watsii. Patches between the ferns support herbs such as Bidgee-widgee Acaena novae-zelandiae, Kidney-weed Dichondra repens, Hairy Pennywort, Hydrocotyle hirta and Austral Brooklime Gratiola peruviana.

EVC 127 Valley Heathy Forest Within the Midlands and Otways region Valley Heathy Forest was only recorded in two tiny patches in the far north-eastern corner of the Midlands study area. It is grows on flats and gentle slopes at the base of small granite hills and outcrops. Altitude is 540m asl and mean annual rainfall approximately 700mm.

Valley Heathy Forest is characterised by a diverse range of species. Dry forest species dominate on the free-draining sandy soils but underlying impeded drainage and/or seepage from adjacent hills also allows species which prefer wetter environments to thrive.

The overstorey consists of Messmate Stringybark Eucalyptus obliqua and Swamp Gum E. ovata with a sparse tall shrub layer of Black Wattle Acacia mearnsii. Prickly Tea-tree Leptospermum continentale and Spreading Wattle Acacia genistifolia. The ground stratum is dense and diverse in low shrubs, grasses and forbs. Common species include Small Grass-tree Xanthorrhoea minor, Cranberry Heath Astroloma humifusum, Honey-pots Acrotriche serrulata, Common Rice-flower Pimelea humilus, Silvertop Wallaby-grass Joycea pallida, Reed Bent-grass Deyeuxia quadriseta, Weeping Grass Microlenea stipoides, Grey Tussock-grass Poa sieberiana, Yam Daisy Microseris scapigera, Variable Sword-sedge Lepidosperma laterale, Ivy-leaf Violet Viola hederacea and Variable Stinkweed Opercularia varia

EVC 128 Grassy Forest

Within the Midlands region remnants of Grassy Forest were only mapped in a small area in the valley between the Macedon Regional Park and the Wombat State Forest. Prior to European settlement, as identified in the modelling of pre-1750 vegetation types, it occurred extensively in the Gisborne-Woodend area. The best quality remnants of this EVC are on roadsides rather than on broad-scale public land blocks. Grassy Forest occurs on relatively infertile soils derived from Ordovician sediments with moderate average annual rainfall of 700-850mm and an altitude range of 400-600m asl.

The overstorey is a low forest (20m tall) of Messmate Stringybark Eucalyptus obliqua, Narrow-leaf Peppermint *E. radiata* and Manna Gum *E.* Acacia melanoxylon, Black Wattle A. mearnsii and Chery Ballart Exocarpos cupressiformis. If present, the shrub layer is low and sparse and includes Narrow-leaf Wattle A. mucronata, Matted Bossiaea Bossiaea buxifolia and Parrot-peas Dillwvnia spp.

The ground-layer is dominated by grasses, particularly Grey Tussock-grass Poa sieberiana, Silver-top Wallaby-grass Joycea pallida, Weeping Grass Microleana stipoides and Plume Grasses Dichelachne spp. Other common species include Purple Coral-pea Hardenbergia violacea, Black-anther Flaxlily Dianella revoluta, Handsome Flat-pea Platylobium formosum, and Common Hovea Hovea linearis.

EVC 136 Sedge Wetland

Due to the small scale of mapping (1:100 000) Sedge Wetland was only mapped within the Midlands region in the vicinity of the Upper Stony Creek Reservoirs. However, it also occurs near the Brisbane Ranges National Park and some areas were mapped within EVC 74 Wetland Formation. Sedge Wetland occurs in minor depressions on otherwise flat areas of Tertiary sands and clays. Altitude is 340m asl and average annual rainfall is approximately 680mm.

This EVC rarely has a eucalypt overstorey. Swamp Gum *Eucalyptus ovata* is often found scattered around the fringes of the wetland, along with shrubs such as Blackwood Acacia melanoxylon and Prickly Tea-tree Leptospermum continentale. The ground layer is dominated by dense swards of Pithy Sword-sedge Lepidosperma longitudinale in addition to Spiny-headed Matrush Lomandra longifolia ssp. longifolia, Soft Twig-rush Baumea rubiginosa, Scale Rush *Lepyrodia* spp. and Common Bog-sedge *Schoenus apogon*. Herbs present include Running Marsh-flower *Villarsia reniformis* and Centella *Centella cordifolia*.

EVC 154 Bird Colony Shrubland

Bird Colony Shrubland has only been mapped on Mutton Bird Island, a tiny island of the coast, near Lochard Gorge.

Mutton Bird Island is derived from limestone with poorly structured duplex soils which are skeletal and calcareous. This EVC occurs within Mutton Bird breeding rookeries and is subject to intense seasonal trampling and tunnelling by the Mutton Birds, Penguins and other sea-birds. Soil fertility is enhanced by bird droppings.

Within the study area this EVC was unsampled but it has also been identified (and sampled and mapped) on islands off the coast of Wilsons Promontory. These islands have a different geology of granite with large outcropping granite slabs. Species common to both areas are Seaberry

Saltbush Rhagodia candolleana, White Elderberry Sambucus gaudichaudiana, Four-leaved Allseed *Polycarpon tetraphyllum and Drooping Sheoke Allocasuarina verticillata. Other species likely to be present are Blue Tussock-grass Poa poiformis, Cushion Bush Leucophyta brownii, Coast Daisy-bush Olearia axillaris, Ridged Ground-berry Acrotriche affinis and Coast Beard-heath Leucopogon parviflorus.

EVC 161 Coastal Headland Scrub

Coastal Headland Shrubland occurs in exposed situations on the limestone plains of coastal cliffs at Port Campbell and arkose sandstone cliffs at Cape Otway. The vegetation is often wind and salt-pruned due to exposure to prevailing south-west winds and salt spray. Fertile soils and high average annual rainfall of 950mm combine to maintain a diversity of species. Coastal Headland Shrubland occurs on the more protected south-west slopes and east-facing gullies.

Coastal Headland Shrubland is treeless, except for the occasional stunted Messmate Eucalyptus obliqua. It is dominated by a closed heath of Manuka Leptospermum scoparium with Silver Banksia Banksia marginata, Prickly Moses Acacia verticillata Prickly Tea-tree Leptospermum continentale and Dusty Miller Spyridium parvifolium often occurring in lower densities. Honey-pots Acrotriche serrulata, Coast Beard-heath Leucopogon parviflorus, Ridged ground-berry Acrotriche affinis, Cranberry Heath Astroloma humifusum, Common Correa Correa reflexa, Common Heath Epacris impressa and Rough Guinea-flower Hibbertia aspera form a lower, ericoid shrub laver.

Sedges such as Common Bog-sedge Schoenus apogon. Bare Twig-sedge Baumea juncea, Short-stem Sedge Carex breviculmis and Coast Saw-sedge Gahnia trifida are often present. Blue Tussock-grass Poa poiformis is the most common grass species, with occasional Grey Tussock-grass Poa sieberiana. A few scattered herbs are present including Branched Centaury *Centaurium tenuifolium Ivy-leaf Violet Viola hederacea, Common Raspwort Gonocarpus tetragynus, Kidney-weed Dichondra repens and Shiny Swamp-mat Selliera radicans.

Coastal Headland Shrubland near Port Campbell can also occur as a mosaic with Coastal Tussock Grassland.

EVC 163 Coastal Tussock Grassland

Coastal Tussock Grassland occurs on cliff-top plateaus affected by seaspray. The soils are poorly structured with sands over bedrock that can only support shallow-rooted plants. Water availability at depth is often good due to the proximity of bedrock. Harsh site quality encourages stunted and poorly-formed plants. Rainfall for this EVC is 950mm and the average altitude is 36m asl.

This EVC is treeless and is dominated by Blue Tussock-grass Poa poiformis. Other grasses include Bristly Wallaby-grass Austrodanthonia setacea, Common Blown Grass Agrostis avenacea and Mat Grass Hemarthria uncinata var. uncinata. A few shrub species often occur, including Coast Beard-heath Leucopogon parviflorus, Manuka Leptospermum scoparium, Silver Banksia Banksia marginata and Coast Daisy-bush Olearia axillaris. The ground layer may carry sedges such as Bare Twig-sedge Baumea juncea, Common Bog-sedge Schoenus apogon, Shortstem sedge Carex breviculmis, Coast Saw-sedge Gahina trifida and Coast Sword-sedge Lepidosperma gladiatum. Coastal Tussock Grassland supports a diversity of forbs in low densities. These include the endangered Metallic Sun-orchid Thelymitra epipactoides, Common Centaury 'Centaurium erythraea, Hairy Hawkbit *Leontodon taraxacoides, Coast Daisy Brachyschome parvula, Kidney-weed Dichondra repens, Pimpernel *Anagallis arvensis, Cat's Ear *Hypochoeris radicata, Sow-thistle *Sonchus oleraceus, Angled Lobelia Lobelia alata, Shiny Swamp-mat Sellaria radicans, Ivy-leaf Violet Viola hederacea, Common Woodruff Asperula conferta, Grassland Wood-sorrel Oxalis perennans, Buck's-horn Plantain *Plantago coronopus, Bidgee-widgee Acaena novae-zelandiae, Spear Thistle * Cirsium vulgare and Rough Fireweed Senecio hispidulus. A diversity of weed species may occur within this Coastal Tussock Grassland.

Shallow ephemeral swamp depressions occur within this EVC. The zone where the water recedes allows herbs to establish, which links these ephemeral sites to the Coastal Tussock Grassland. For mapping purposes, these sites will be incorporated in Coastal Tussock Grassland. In addition, Coastal Tussock Grassland near Port Campbell may occur as a mosaic with Coastal Headland Shrubland

EVC 164 Creekline Herb-rich Woodland

Creekline Herb-rich Woodland is limited in extent and is found scattered across the drier sections of the Midlands region, often growing in association with Heathy Dry Forest, Grassy Dry Forest or Valley Grassy Forest.

It occurs on creek terraces of ephemeral streams. Altitudes vary from 250-600m asl and annual is rainfall generally less than 700mm. Major occurrences are in the Brisbane Ranges National Park, Enfield State Park and the north eastern section of Wombat State Forest.

Creekline Herb-rich Woodland is an open woodland of Swamp Gum Eucalyptus ovata, or the rare Yarra Gum E. yarraensis, with ocassional Manna Gum E. viminalis and Narrow-leaf Peppermint E. radiata. Scattered shrubs such Blackwood Acacia melanoxylon, Silver Wattle A. dealbata, Large-leaf Bush-pea Pultenaea daphnoides or Sweet Bursaria Bursaria spinosa may be present along with clumps of Austral Bracken Pteridium esculentum The ground has a dense covering of Common Tussock-grass Poa labillardieri with scattered herbs such as Cinquefoil Cranesbill Geranium potentilloides, Bidgee-widgee Acaena novae-zelandiae, Prickly Starwort Stellaria pungens, Fireweed Groundsel Senecio linearifolius, Kidney-weed Dichondra repens and Common Maidenhair Adiantum aethiopicum. The weeds Spear Thistle *Cirsium vulgare, Sweet Vernal Grass *Anthoxanthum odoratumand Yorkshire Fog *Holcus lanatus are also common.

EVC 165 Damp Heath Scrub

Damp Heath Scrub occurs on flat to gently sloping terrain, on or near coastal sites near Port Campbell and in a number of widely distributed locations including Cooriemungle and Jancourt Forest/Hanson Plain public land blocks. During the pre-1750 vegetation mapping exercise, this EVC was modelled on an extensive flat near the coast between the Port Campbell National Park and the Cooriemungle public land block. This extends its distribution from the valley-type environments it commonly occupies in the extant examples on public land. High rainfall and lack of drainage of the tableland-like area combine to retain high levels of moisture throughoutf the vear.

Floristically this EVC carries influences of Wet Heath The overstorev is generally sparse and includes Swamp Gum Eucalyptus ovata and less commonly Brown Sringbark E. baxteri. The shrub layer is very dense and includes Prickly Tea-tree Leptospermum continentale, Silver Banksia Banksia marginata, Prickly Moses Acacia verticillata Scrub Sheoke Allocasuarina paludosa, Common Heath Epacris impressa, Scented Paperbark Melaleuca squarrosa, Dusty Miller Spyridium parvifolium and Honey-pots Acrotriche serrulata

Other common species are Austral Grass-tree Xanthorrhoea australis, Spreading Rope-rush Empodisma minus, Slender Dodder-laurel Cassytha glabella, Common Rapier-sedge Lepidosperma filiforme, Screw-fern Lindsea linearis and Honey Cone-bush Isopogon ceratophyllus.

EVC 177 Valley Slopes Dry Forest

Floristic Community 177-01 Brisbane Ranges Valley Slopes Dry Forest Within the Midlands region Valley Slopes Dry Forest was only mapped in one tiny patch in the Brisbane Ranges National Park. It occurs on a steep east to southeast aspects on soils derived from Ordovician shales and sandstone. Soils are well-developed brown earths in contrast to skeletal soils on nearby steep slopes. Annual rainfall is 600mm, altitude is 300 to 400m asl

The overstorey consists of Yellow Gum Eucalyptus leucoxylon, Red Stringybark E. macrorhyncha, Long-leaf Box E. goniocalyx and Red Box E polyanthemos. There is no shrub layer, only scattered Golden Wattle Acacia pycnantha and Black Wattle A. mearnsii.

This EVC is characterized by a herb-rich ground stratum of species generally associated with extremely dry or rocky conditions such as Pigface Carpobrotus spp., Saloop Saltbush Einadia hastata, Nodding Saltbush, E. nutans and Austral Stonecrop Crassula sieberiana mixed with species usually associaed with wetter or more fertile forests such as Kidneyweed Dichondra rerepens, Weeping Grass Microleana stipoides, Austral Bear'sears Cymbonotus preissianus. Scented Groundsel Senecio odoratus. Cotton Fireweed S. quadridentatus and Spear Thistle *Cirsium vulgare.

EVC 178 Herb-rich Foothill Forest/Shrubby Foothill Forest Complex Along the western edge of the Wombat State Forest near Barkstead a large

area has been mapped as Shrubby Foothill forest/Herb-rich Foothill Forest Complex. This contains the diverse herb layer of EVC 23 Herb-rich Foothill forest while retaining the diverse shrub layer of EVC 45 Shrubby Foothill Forest. It is usually dominated by species which occur at the drier end of both EVCs.

EVC 181 Coast Gully Thicket Coast Gully Thicket occurs along drainage lines and small creeks close to the coast. The soils are shallow sands grading to clay over limestone. Closed coastal scrub is a wind stressed environment as the prevailing southwest winds prune plants greater than three metres in height.

Swamp Gum Eucalyptus ovata and Messmate Stringybark E. obliqua are the dominant eucalypts and are short, wind pruned individuals. Some of the sites lack a eucalypt overstorey. This EVC is dominated by a dense cover of Rough Guinea-flower Hibbertia aspera and Austral Bracken Pteridium esculentum Manuka Leptospermum scoparium also adds to the dense thicket, making it difficult for other plants to establish at ground level. Prickly Tea-tree Leptospermum continentale and Coast Beard-heath Leucopogon parviflorus occasionally contribute to the shrub layer. Easterly sites that offer some protection provide suitable conditions for tufted graminoids to establish such as Spinv-headed Mat-rush Lomandra longifolia. Black-anther

Flax-lily (s.l.) Dianella brevicaulis/revoluta, Coast Saw-sedge Gahnia trifida, Tall Sword-sedge Lepidosperma elatius and Variable Sword-sedge Lepidosperma laterale and Common Tussock-grass Poa labillardieri. Downy Dodder-laurel Cassytha pubescens s.s. takes advantage of the shrub structure and Mountain Clematis Clematis aristata is the other climber.

EVC 195 Seasonally Inundated Shrubby Woodland

Within the Midlands region Seasonally Inundated Shrubby Woodland was mapped only in a small area within Langi Ghiran State Park. It occurs on fine sandy clay loams in very shallow drainage depressions in conjunction with EVC 67 Alluvial Terraces Herb-rich Woodland. Altitude is 350m asl and average annual rainfall is 650mm. ...This EVC occurs more extensively to the west within the Grampians National Park

The overstorey is dominated by a woodland of Red Gum Eucalyptus camaldulensis and Yellow Box E. melliodora under which is a mosaic of relatively dense stands of Totem Poles Melaleuca decussata. Between these stands, much of the ground is bare, the fine sandy clay loams becoming hard baked over summer months

Most prominent species in the ground stratum include Sedges such as Common Bog-sedge Schoenus apogon, Tiny Flat-sedge Cyperus tenellus and Dwarf Rush Juncus capitatus. Numerous forbs and grasses also occur within this EVC. The most common forbs are Pointed Centrolepis Centrolepis aristata Hairy Centrolepis C. strigosa ssp. strigosa, Sheep's Burr Acaena echinata, Black's Goodenia Goodenia blackiana and Wiry Mitrewort Mitrasacme paradoxa. The most common grasses are Bristly Wallaby-grass Austrodanthonia setacea, Kneed Wallaby-grass A. geniculata, Common Blown-grass Agrostis avenaceae, Lesser Quaking-grass *Briza minor and Five-awned Spear-grass Pentapogon quadrifidus.

EVC 198 Sedgy Riparian Woodland Sedgy Riparian Woodland is mapped in both the Midlands and Otways study areas and will be described separately (below).

Midlands study area:

Sedgy Riparian Woodland is limited has a limited distribution within the Midlands area. It occurs in broad flat drainage lines which may be seasonally inundated. Soils are generally recent Quaternary alluvial of varing depths. This EVC occurs in a wide range of altitudes and rainfall

Sedgy Riparian Woodland usually has an overstorey of Swamp Gum Eucalyptus ovata or the rare Yarra Gum E. yarraensis over an open shrub layer of Blackwood Acacia melanoxylon, Prickly Moses A. verticillata, Prickly Tea- tree Leptospermum continentale and Wirv Bossiaea Bossiaea cordigera.

The groundlayer is often dominated by a very dense sward of Redfruit Saw-sedge Gahnia sieberiana and/or Tall Sword-sedge Lepidoperma elatius. Sometimes it is more open with scattered clumps of Spiny-headed Mat-rush Lomandra longifolia ssp. longifolia among a layer of small sedges, rushes and herbs including Spreading Rope-rush Empodisma minus, Club-sedges Isolepis spp Rushes Juncus spp. Slender Tussock-grass Poa tenera, Weeping grass Microleanea stipoides, Kidney-weed Dichondra repens and Prickfoot Eryngium vesiculosum

Weed species are often present due to high soil fertility and ready availability of moisture. These include Yorkshire Fog-grass *Holcus lanatus, Cat's ear *Hypochoeris radicata, Sweet Vernal-grass *Anthoxanthum odoratum and Perennial Thistle *Cirsium vulgare are often present.

Otways study area:

Within the Otways study area Sedgy Riparian Forest occurs on riparian flats of creeks that are frequently inundated by flooding or along drainage lines carrying ephemeral streams. The soils are alluvial grey silty loams to silty clay loams. These soils are typically deep but occasionally shallow over a layer of clay. Average altitude is 110m asl and an average annual rainfall is 800mm. Some sites mapped as Sedgy Riparian Forest are not directly associated with creeks or drainage lines but occur upslope from these areas. These tend to have more herbs and grasses dominating the ground layer and less sedges, thereby expressing an affinity with EVC 23 Herb-rich Foothill Forest.

Generally this EVC is dominated by a Swamp Gum *Eucalyptus* ovata overstorey, 25 to 30m tall and is often associated with Messmate Eucalyptus obliqua. Prickly Tea-tree Leptospermum continentale, Prickly Moses Acacia verticillata Scented Paperbark squarrosa and Prickly Currant-bush Coprosma Melaleuca quadrifida often form dense stands in the shrub layer.

A dense layer of sedges in the ground stratum is characteristic of this EVC. This layer is commonly comprised of Variable Swordsedge Lepidosperma laterale var. majus though Red-fruit Saw-sedge Gahnia sieberiana and Thatch Saw-sedge Gahnia radula can also form dense stands.

More open sites allow herbs to establish such as Common Raspwort Gonocarpus tetragynus, Cat's ear Hypochoeris radicata, Shady Wood-sorrel Oxalis exilis, Bidgee-widgee Acaena novae-zelandiae, Ivy-leaf Violet Viola hederacea, Matted Pratia Pratia pedunculata, Kidney-weed Dichondra repens and Hairy Pennywort Hydrocotyle hirta. Austral Brooklime Gratiola peruviana is present at creek sites. Slender Tussock-grass Poa tenera and Forest Wire-grass Tetrarhena juncea are the dominant grasses, with the occasional Yorkshire Fog "Holcus lanatus and Weeping Grass Microlaena stipoides var. stipoides. Often Sedgy Riparian Woodland borders fertile farmlands and subsequently weedy herbs and grass species such as Cat's Ear Hypochoeris radicata and Yorkshire Fog *Holcus lanatus are present

EVC 200 Shallow Freshwater Marsh

Shallow Freshwater Marsh occupies open sheets of water which are usually perennial although contract in size during the drier months. The degree of inundation, water depth and water availability at the periphery of the swamps changes seasonally. Shallow Freshwater Marsh also occurs on deep brown (anaerobic) silts where creeks and rivers broaden and flow slows as the water enters floodplains.

This EVC is a species poor and species grow in zones dependent on water depth and seasonality. Water-ribbons Triglochin procerum spp. agg. and Myriophyllum spp. dominate the deeper water and Tall Rush Juncus procerus, Fine/Soft Twig-sedge Baumea arthrophyllar/tubiginosa, Pithy Sword-sedge Lepidosperma longitudinale and Running Marsh-flower Wilarsia reniformis occupy more shallow water. A round the periphery of the swamp, Swamp Gum *Eucalyptus ovata* is the only eucalypt. Prickly Teatree Leptospermum continentale, Red-fruit Saw-sedge Gahnia sieberi, Soft Bog-sedge Schoenus tesquorum, Amphibromus spp., Creeping Raspwort Gonocarpus micranthus ssp. micranthus and Swamp Club-sedge Isolepis inundata also occur on the fringes of the swamp where water levels vary seasonally.

EVC 201 Shrubby Wet Forest

Within the Otways study area Shrubby Wet Forest is widely distributed. It occupies western and northern aspects and ridgelines and grows in asociation with EVC 30 Wet Forest where the elevation and rainfall within the study area decreases. Average annual rainfall is high at 1200mm, soils are fertile clay loams over medium to heavy clay and average altitude is 200m asl

Shrubby Wet Forest differs from Wet Forest in generally having no epiphyte cover, a lower diversity of ground ferns, and Rough Treefern Cyathea australis is the common treefern, Soft Treefern Dicksonia antarctica occuring only rarely. In addition it has a higher diversity and cover of herbs due to increased light reaching the forest floor.

The overstorey is a tall forest dominated by Messmate Eucalyptus obliqua, Mountain Grey Gum E. cypellocarpa and Manna Gum E. viminalis. Blackwood Acacia melanoxylon and Hazel Pomaderris Pomaderris aspera form a lower tree laver.

The tall-shrub layer is dominated by mesic shrubs including Prickly Currantbush Coprosma quadrifida, Musk Daisy-bush Olearia argophylla, Snow daisy-bush O. lirata, Hazel Pomaderris Pomaderris aspera, Tree everlasting Ozothamus ferrugineus and Austral Mulberry Hedycarya angustifolia. Prickly Moses Acacia verticillata and Hop Goodenia Goodenia ovata form a mid shrub layer. Tree-form Varnish Wattle Acacia verniciflua andDwarf Silver Wattle A. nano-dealbata and the shrubs Prostanthera melissifolia and Spyridium parvifoliumalso commonly occur, their density varying, possibly in response to timber harvesting.

Rough Treefern Cyathea australis and Mother Shield-fern Polystichum proliferum are common ferns with Austral Bracken Pteridium esculentum . dominating.

The ground layer may be sparse and includes the herbs Bidgee-widgee Acaena novae-zelandiae, Cinquefoil Cranesbill Geranium potentilloides, Ivyleaf Violet Viola hederacea, Creeping Wood-sorrel Oxalis corniculata, Galium sp. and Forest Starwort Stellaria flaccida. Mountain Clematis Clematis aristata is the only climber and Tall Sword-sedge Lepidosperma elatius the only sedge. Forest Wire-grass Tetrarrhena juncea is commonly present and may dominate, often in response to disturbance.

EVC 203 Stony Rises Woodland

Stony Rises Woodland was only located at the Floating Islands Reserve along the Princes Highway west of Colac. The reserve has a history of grazing and much of it is in extremely poor condition and weed-invaded. Soils are derived from quaternary basalts and in some places may be absent where bedrock protudes from the surface.

Structurally the vegetation is an open grassy woodland to 15m tall. The overstorey is dominated by Manna Gum Eucalyptus viminalis and Swamp Gum E. ovata. The shrub layer is scattered and includes Shiny Cassinia Cassinia longifolia, Blackwood Acacia melanoxylon, Tree Violet Hymenanthera dentata, Cherry Ballart Exocarpus cupressiformis ane the

occasional Musk Daisy-bush Olearia argophylla surviving on rocky rises. The ground layer is dominated by Common Tussock-grass *Poa labillarideri, Senecio* spp, Sickle Fern *Pelleaea* falcata, Yorkshire Fog * *Holcus lanatus, Geranium* spp, Spiny-headed Matrush Lomandra longifolia ssp. longifolia, Cat's Ear **Hypochoeris* radiata, *Aira spp, Cleavers *Galium alparine, Pterostylis* spp and *Pelagonium* spp.

EVC 233 Wet Sands Thicket

Wet Sands Thicket has a limited distribution within the Otways study area and is restricted to areas that combine high rainfall with sandy Tertiary outwash geology. The average elevation is 200m asl and average annual rainfall is high at 1300mm where this EVC is best developed, dropping to 1000–1200mm in more marginal sites. The soils are characteristically deep, coarse grey sands.

The overstorey is a tall open forest dominated by Messmate *Eucalyptus obliqua*, Brown Stringybark *E. baxteri* and Blue Gum *E. globulus*, ranging in height from 30-50m. In the Cape Otway the rare Bog Gum *Eucalyptus kitsoniana* dominates. The shrub layer is characteristically dense to impenetrable and is strongly represented by Showy Bossiaea *Bossiaea cinerea*, Bushy Broomheath *Monotoca glauca* and to a lesser extent by Forest Boronia *Boronia muelleri*, Victorian Christmas-bush *Prostanthera lasianthos*, Musk Daisy-bush *Olearia argophylla* and Scented Paperbark *Melaleuca squarrosa*. The ground layer is sparse to absent due to competition from the dense shrub stratum. Other characteristic species include Red-fruit Saw-sedge *Gahnia sieberiana*, Prickly Tea-tree *Leptospermum* continentale, Stinkwood *Ziera arborescens*, Handsome Flat-pea *Platylobium formosum* Wiry Bauera *Bauera rubiodes* and Austral Bracken *Pteridium esculentum*

EVC 282 Shrubby Woodland

Floristic Community 282-03 Brisbane Ranges Shrubby Woodland Brisbane Ranges Shrubby Woodland occurs in a small area of the

Brisbane Ranges Shrubby Woodland occurs in a small area of the Brisbane Ranges National Park on Tertiary sands and clays. It grows on the boundary between EVC 55 Plains Grassy Woodland and EVC 16 Lowland Forest. The area is flat, altitude 350m asl and average annual rainfall is 650mm.

The overstorey is dominated by Messmate *Eucalyptus obliqua* over a low, sparse, heathy shrub layer including Prickly Tea-tree *Leptospermum continentale*, Heath Tea-tree *L. myrsinoides*, Honey-pots *Acrotriche serrulata* and Common Beard-heath *Leucopogon virgatus*. The ground stratum is diverse and includes Hidden Violet *Viola cleistogamoides*, Trailing Goodenia *Goodenia lanata*, Creeping Bossiaea *Bossiaea prostrata*, Common Bogsedge *Schoenus apogon*, Weeping Grass *Microlaena stipoides* and Yellow Rush-lily *Tricoryne elatior*.

Shrubby Woodland is similar to an area described as Herb-rich Heathy Woodland in Dergholm State Park (Rankin 1997).

EVC 351 Rocky Outcrop Shrubland/Herbland/Grassy Dry Forest Complex

Rocky Outcrop Shrubland/Herbland/Grassy Dry Forest Complex occurs on the steep north-western and western slopes of the Mt. Buangor State Park and the Mt. Cole State Forest. Soils are derived from granodiorite, are free draining, fertility limited by soil porosity. Altitude is 400-600m asl and mean annual rainfall around 700mm.

A variety of eucalypts form the overstorey including Messmate *Eucalyptus obliqua*, Eurabbie *E. globulus* ssp. *bicostata*, Long-leaf Box *E. goniocalyx* and Red Stringybark *E. macrorhyncha*.

The shrub layer is sparse and usually includes Sticky Hop-bush Dodonaea viscosa associated with other species such as Prickly Moses Acacia verticillata, Silver Wattle A. dealbata, Grey Everlasting Ozothamnus obcordatus, Sweet Bursaria Bursaria spinosa and Sticky Cassinia Cassinia uncata.

The ground layer is diverse in grasses and shrubs due to the combination of adequate moisture and fertile soils. Common include Hair-grass *Aira spp., Quaking-grass *Briza spp., Wallaby-grasses Austrodanthonia spp., Pimpernel *Anagallis arvensis, Grassland Wood-sorrel Oxalis perrenans and Hairy Pennywort Hydrocotyle hirta.

MIDLANDS & OTWAYS PRE-1750 VEGETATION DESCRIPTIONS

EVC 19 Riparian Shrubland

Riparian Shrubland occurs along streams with exposed bedrock, which may be granitic, metamorphic or basaltic in origin. These streams receive periods of seasonal flooding. In the pre-1750 mapping exercise this EVC was difficult to predict so modelling of its prior extent is based solely on remnants.

This EVC is a medium to tall shrubland that occupy the banks and the channel of the rocky creek. Species may include Silver Wattle Acacia dealbata, Blackwood A. melanoxylon, Woolly Tea-tree Leptospermum lanigerum Burgan Kunzea ericoides and Sweet Bursaria Bursaria spinosa. Common Reed Phragmites australis and Reeds Juncus spp. are an important component of the ground layer. Herbs of wet environments may appear seasonally. Species that may occupy the stream bank include Varnish Wattle A vernicifiua, Lightwood A. implexa, Rough Fireweed Senecio hispidulus, Grey Tussock-grass Poa sieberiana and Austral Bracken Pteridium esculentum. Trees may be irregularly scattered throughout but tend to be restricted to the banks. Trees may be irregularly scattered through, but tend to be restricted to the banks these include River Red Gum Eucalyptus camaldulensis at most sites and ocassionally Swamp Gum E. ovata.

EVC 55 Plains Grassy Woodland

Plains Grassy Woodland has been largely cleared for agriculture or residential or commercial development or disturbed by grazing, as a result there are very few intact remnants on public land.

Within Midlands and Otways study area extant examples of Plains Grassy Woodland are small and fragmented and restricted to tiny areas, mainly on Tertiary sands/clays and Aeolian sands. Prior to European occupation this EVC once existed extensively across the study area. It occurred on a number of geologies over a wide rainfall range and was floristically variable. It has also been mapped over large areas as a mosaic with Plains Grassland.

The majority of Plains Grassy Woodland occurs on fertile, flat or gently undulating basalt plains and associated volcanic cones. Most of these plains have a rainfall of 550-650mm per annum. The overstorey consists of an open woodland dominated by Red Gum *Eucalyptus camaldulensis.* The ground-layer is dominated by Kangaroo Grass *Themeda triandra* with a diversity of grasses and herbs including Common Everlasting Chrysocephalum apiculatum Yam Daisy Microseris scapigera, Scaly Buttons Leptorhynchos squamatus and Blue Devil Eryngium ovinum In higher rainfall areas (over 700mm) across the northern section of the study area such as around Creswick, Ballan, Tylden, Macedon and Kilmore, the overstorey is dominated by Swamp Gum E. ovata and Candlebark E. rubida, however, as no good quality remnants of this type were found, it is not possible to typify the understorey. The lowest rainfall areas often have an overstorey of Grey Box E. microcarpa and/or Yellow Gum E. leucoxylon with a ground layer dominated by Wallaby Austrodanthonia spp. and Spear Grasses Austrostipa spp. Other common species include Windmill Grass Chloris truncata, Common Wheat-grass Elymus scabra, Weeping Grass Microlaena stipoides, Kidney-weed Dichondra repens, Black-anther Flax-Iily Dianella revoluta, Saloop Saltbush Einadia hastata, Small-leaved Clematis Clematis microphylla and the shrubs Varnish Wattle Acacia verniciflua, Golden Wattle A pycnantha, Tree Violet Hymenanthera dentata and Sweet Bursaria Bursaria spinosa.

On the drier plains west of Melbourne large areas of Plains Grassy Woodland were also modelled on Tertiary and Quaternary alluvial and colluvial soils washed over the basalt plains from the surrounding sedimentary hills. These areas tend to have low rainfall and have similar species to the low rainfall areas on basalt geology. Plains Grassy Woodland has also been modelled on sedimentary soils near the Lal Lal State Forest which are dominated by Manna Gum E. viminalis over Spear Grasses in the ground laver.

Floristic Community 55-06 Riverina Plains Grassy Woodland

Riverina Plains Grassy Woodland is a floristic community of Plains Grassy Woodland. It was once widespread across the Northern Plains of Victoria, from Birchip to Albury with isolated occurrences in dry rain shadow areas south of the Great Dividing Range. Because of its wide geographic range, it is likely that a number of sub-units existed within it. However, due to its suitability for grazing and agriculture, few undisturbed remnants remain for analysis.

Within the Midlands and Otways study areas Riverina Plains Grassy Woodland has been modelled for the pre-1750 mapping exercise in the far north-west, on the plains near the Pyrenee Ranges and in isolated pockets south of the Great Dividing Range on the western plains near Melton. In the north, Riverina Plains

Grassy Woodland has been modelled on Quaternary alluvial flood plain deposits and in the south mainly on basalt plains in addition to some Quaternary colluvial deposits. Altitude ranges from 120-300m asl, rainfall is a low 500-550mm per annum.

Riverina Plains Grassy Woodland is an open woodland of Grey Box Eucalyptus microcarpa with scattered stands of Buloke Allocasuarina luehmanii. Extant remnants have few if any shrubs, however it is thought that this community may have been of a shubby nature prior to European settlement. Shrubs recorded include Gold-dust wattle Acacia acinacea, Golden Wattle A. pycnantha, Sticky Wattle A. verniciflua, Sweet Bursaria Bursaria spinosa, Tree Violet Hymenanthera dentata, Drooping Cassinia Cassinia arcuata and Turkey Bush Eremophila deserti. The grassy understorey is dominated by Wallaby-grasses and Spear Grasses including Common Wallaby-grass Austrodanthonia caespitosa, Bristly Wallaby-grass A. setacea, Stiped Wallaby-grass A. racemosa and Spear-grasses including Rough Spear-grass Austrostipa scabra ssp. falcata and Kneed Spear-grass A. bigeniculata. Other common grasses include Windmill Grass Chloris truncata, Red-leg Grass Bothriochloa macra, Common Wheat-grass Elymus scaber and Grey Tussock-grass Poa sieberiana. Chenopods such as Nodding Saltbush Einadia nutans, Wingless Bluebush Maireana enchylaenoides and Ruby Saltbush Enchylaena tomentosa are also common along with Kidney-weed Dichondra repens, Black-anther Flax-lily Dianella revoluta and Small-leaved Clematis Clematis microphylla.

The best remnants of Riverina Plains Grassy Woodland in the Midlands and Otways study area are on the Eynesbury Estate south of Melton on private land and not accessible to the public.

EVC 56 Floodplain Riparian Woodland

During the pre-1750 mapping exercise Floodplain Riparian Woodland was modelled across the study area on major slow-moving rivers and creeks where they meander across the plains. Floodplain Riparian Woodland was mapped along the Barwon River and the lower reaches of the Leigh, Moorabool and Werribee Rivers and the Sutherland and Thompson Creeks. No fully intact remnants were found.

It covers the lowest, most frequently flooded terraces and generally encompasses a network of former channels and intermittent and permanent wetlands. Species composition and positioning within the EVC depends on the frequency of flooding and length of inundation of each area. Due to high levels of disturbance (natural and man-made), soil fertility, abundance of water and general accessibility and proximity to arable lands, few intact remnants of Floodplain Riparian Woodland remain and where they do occur, weeds are a dominant feature.

The overstorey is a tall woodland dominated by Red Gum Eucalyptus camaldulensis with occasional Manna Gum E. viminalis and Swamp Gum E. ovata. The shrub stratum is patchy and includes Silver Wattle Acacia dealbata, Black Wattle A. mearnsii, Tree Violet Hymenathera dentata, River Bottlebrush Callistemon sieberi, and Woolly Tea-tree Leptospermum lanigerum. The ground layer is dominated by Common Tussock-grass Poa labillardierei on the drier elevated areas, with Common Reed Phragmites australis, Tall Sedge Carex appressa, Rushes Juncus spp., Spike Sedges Eleocharis spp. and Water-ribbons Triglochlin procerum on inundated soils beside rivers. Herbs range from dryland herbs on the banks to aquatics in the river and wetland areas

EVC 68 Creekline Grassy Woodland Elsewhere in the State Creekline Grassy Woodland has been mapped across northern Victoria on minor creeks and tributaries on the lower slopes of the foothills and on small, intermittent creeks on the plains. During the pre-1750 mapping exercise this EVC was modelled in the study area in the driest areas, in the far north-west from Beaufort to Stawell and south of the Great Dividing Range on the drier plains, particularly just west of Melbourne and Geelong. In the north, it was mapped in association with Alluvial Terraces Herb-rich Woodland, Low Rises Grassy Woodland and Plains Grassy Woodland. In the south it was associated with Plains Grassland, Plains Grassy Woodland and various wetland EVCs. Soils are usually Quaternary stream alluvials and rainfall is generally less than 600mm per annum

No intact examples of Creekline Grassy Woodland were found in the Midlands and Otways study areas. From the few remnants seen it was assumed to be the same EVC as described by Muir et.al. (1995) in the Box-Ironbark Region (which is similar to the Goldfields Region currently under review by the Environment Conservation Council) and by Berwick (in press) in the Goulburn-Broken Catchment Management Authority (CMA) Region.

The overstorey is dominated by Red Gum *Eucalyptus camaldulensis* with a scattered shrub layer of Black Wattle *Acacia mearnsii*, Blackwood *A*. melanoxylon and Sweet Bursaria Bursaria spinosa. The ground layer is dense with grasses and sedges, most commonly Common Tussock-grass Poa labillardierei, Weeping Grass Microleana stipoides, Kangaroo Grass Themeda triandra, Common Wheat-grass Elymus scabra, Common Blowngrass Agrostis avenacea, Tall Sedge Carex appressa and Rushes Juncus spp.

EVC 69 Metamorphic Slopes Shrubby Woodland

Within the Midlands and Otways study areas Metamorphic Slopes Shrubby Woodland has been modelled in the pre-1750 mapping exercise in only four tiny patches in the far north-west between Landsborough and Ararat. No intact remnants exist within this study area but these sites had the same distinctive geology and landform on which this EVC occurs in the nearby Goldfields region. Metamorphic Slopes Shrubby Woodland occurs on rocky slopes of contact metamorphosed rigdes adjacent to granitic plutons. These slopes have stony soils and fractured bedrock resulting in high permeability to water and low effective rainfall. Actual rainfall is also low, approximately 500-550mm per annum. Altitude is 300m asl.

In the Goldfields/Box-Ironbark region, these dry slopes support a very low open woodland with a dense layer of medium to tall shrubs. The overstorey is usually Grey Box *Eucalyptus microcarpa* although Drooping She-oak *Allocasuarina verticillata* can sometimes dominate. The shrub layer includes Sticky Hop-bush Dodonaea viscosa, Flame Heath Astroloma conostephioides, Daphne Heath Brachyloma daphnoides and Silky Guinea-flower Hibbertia sericea with different species dominating in different areas. The ground layer can be sparse with scattered grasses, forbs and low shrubs such as Cranberry Heath Astroloma humifusum, Wattle Mat-rush Lomandra filiformis, Spoon Cudweed Stuatina muelleri, Tall Raspwort Gonocarpus elatus, Rough Speargrass Austrostipa scabra ssp. falcata and Supple Spear-grass A. mollis. It is assumed similar species would occur at the Midlands and Otways sites.

EVC 93 Broombush Mallee

Within the Midland and Otways study areas Broombush Mallee was modelled as part of the pre-1750 mapping exercise in only a single location, in the far north-west, on a north-west facing ridge, on Ordovician sediments. Soils are infertile, skeletal and stony. Rainfall is low, 500-550mm per annum with effective rainfall even lower. Altitude is approximately 300m asl. This EVC is widespread north of the study area in the Goldfields/Box-Ironbark Region.

Remnant Broombush Mallee at this site consists of a low open canopy of Green mallee Eucalyptus viridis with a dense low shrub layer of Flame Heath Astroloma conostephioides and Daphne Heath Brachyloma daphnoides. Other species likely to have been present include Twiggy Bush-pea Pultenaea largiflorens, Grey Everlasting Ozothamnus obcordatus and Gold-dust Wattle Acacia acinacea. The ground layer is very sparse and species poor and includes Bristly Wallaby-grass Austrodanthonia setacea and Blackanther Flax-lily Dianella revoluta.

EVC 104 Lignum Wetland

Lignum Wetland is common across the arid areas of north-western Victoria, however within the Midlands and Otways study areas it is restricted to tiny areas scattered across the plains from Bacchus Marsh to Melton to south of Geelong. Rainfall in this area is very low (500-550mm per annum). Lignum Wetland generally occurs within areas of Plains Grassland, on swamp and lagoonal deposits and quaternary stream alluviums deposited in minor depressions on the basalt volcanic plains. Soils are very heavy grey clays, waterlogged for much of the year but also experience periods of extreme dryness. Species diversity is very low as few plants can thrive in these conditions.

Lignum Wetland is a shrubland dominated Tangled Lignum Muehlenbeckia florulenta. Ground species include Common Spikesedge Eleocharis acuta, Sharp Club-sedge Schoenoplectus pungens, Brown-back Wallaby-grass Austrodanthonia duttoniana, Yellow Rush Juncus flavidus, Large-fruit Tassel Ruppia megacarpa and Common Nardoo Marseilea drummondii.

Wetlands are complex by nature, with distinct zonation patterning dependent on water depth and period of inundation. Most have been severely disturbed by drainage and dam building works in addition to heavy grazing and weed invasion. As a result they are difficult to classify. It is likely that Lignum Wetland is a complex of a number of different entities. Of the wetlands mapped as Lignum Wetland in the Midlands and Otways study areaa, some are freshwater, some are slightly brackish and some, with less extreme soil conditions and hence more species, have close affinities with Plains Grassy Wetland.

EVC 125 Plains Grassy Wetland The pre-1750 extent of Plains Grassy Wetland was in very shallow depressions on the northern alluvial plain, scattered across the riverina bioregion and amongst the grassy woodlands of the basalt plateaus south west of Seymour. Average annual rainfall is less than 700mm. Some of the areas modelled are meanders of prior streams, others are discrete depressions. The unifying feature is the heavy clay soil which holds moisture as distinct from the more free-draining soils of the adjacent terrestrial vegetation. Inundation

is periodic over the winter months alternating with dry periods during the summer months

This EVC is a (usually) treeless shallow seasonal wetland. River Red Gum Eucalyptus camaldulensis may occur on perimeter or, less frequently, scattered throughout. Structure is generally a grassland, grading into sedgeland or herbland. Species present include a range of herbs and grasses which tolerate the seasonally inundated conditions. species may be recorded during periods of inundation.

Grasses present include species include Veined Swamp Wallaby-grass Amphibromus nervosus, Brown-back Wallaby-grass Austrodanthonia duttonianum, Common Blown Grass Agrostis avenacea, Rigid Panic Homopholis proluta, and Forbe Poa Poa fordeana. Barren Cane Grass Eragrostis infecunda may also be present. Herbs include Drumsticks Pycnosorus globosus, Swamp Daisy Brachscome basaltica var. gracilis, Hairy Willow-herb Epilobium hirtigerum, Rough Raspwort Haloragis aspera, Common Sneezeweed Centipeda cunninghami, Small Loosestrife Lythrum hyssopifloia, Buttercups Ranunculus spp., Poison Lobelia Lobelia pratioides, Sprawling Bluebell Wahlenbergia gracilis s.l., River Bluebell W. fluvialis and Slender Monkey-flower Mimulus gracili. Aquatic species typical of inundated sites include Common Nardoo Marsilea drummondii Water Plantain Alisma plantago-aquatica, Pacific Azolla Azolla filiculoides, Ferny Azolla Azolla pinnata, Western Water Starwart Callitriche cyclocarpa, Common Spike-sedge Eleocharis acuta, Swamp Lily Ottelia ovalifolia, Upright Milfoil Myriophyllum crispatum, Tiny Milfoil Myrophyllum integrifolium, Ridged Milfoil Myriophyllum porcatum and Amphibious Milfoil Myriophyllum simulans. Rushes and sedges include: Hollow Rush Juncus amabilis, Toad Rush Juncus bufonius, Yellow Rush Juncus flavidus, Jointleaf Rush Juncus holoschoenus. Rush Sedge Carex tereticaulis may dominate wetter areas.

Significant species include Stiff Groundsel Senecio behrianus (endangered in Victoria and Australia), Barren Cane Grass *Eragrostis infecunda* (vulnerable in Australia), Water Starwart *Callitriche cyclocarpa* (vulnerable in Victoria and Australia) and Ridged Milfoil Myriophyllum porcatum (vulnerable in Victoria and Australia)

EVC 132 Plains Grassland

During the pre-1750 mapping exercise within the Midlands and Otways study areas Plains Grassland was modelled on the dry basalt plains immediately north and west of Melbourne. It has also been modelled across large sections of the western volcanic plains as a mosaic with Plains Grassy Woodland. A vast majority has been cleared for agriculture and settlement and it now only occurs as small, isolated and disturbed remnants, mainly on road and rail reserves. Altitude is usually less than 200m asl (to 400m near Mt Wallace). Rainfall is generally 500-550mm per annum (to 650mm near Meredith). Soils are heavy grey cracking clays which are often waterloged in winter. The combination of these soils with low rainfall severely restricts tree-root growth resulting in virtually treeless plains.

The ground flora is generally visually dominated by grasses but species diversity and composition can vary greatly, largely depending on past management practices in the area; particlarly past fire and grazing regimes. The most common species include Kangaroo Grass Themeda trianda, Lemon Beauty-heads Calocephalus citreus, Pink Bindweed Convolvulus erubescens, Scaly Buttons Leptorhynchos squamatus, Blue Devil Eryngium ovinum Prickly Woodruff Asperula scoparia, Common Everlasting Chrysocephalum apiculatum Wallaby Grasses Austrodanthonia spp. Longhair Plume-grass Dichelachne crinita and Cut-leaf Goodenia Goodenia pinnatifida.

EVC 140 Mangrove Shrubland

Within the Midlands and Otways study areas Mangrove Shrubland was only mapped in tiny patches along the coast and in river estuaries from Altona Bay to Barwon heads. Altitude is at or just above sea level, rainfall is approximately 550-600mm per annum.

Mangrove Shrubland grows in saline waters, usually on mud flats within the tidal zone. Mangroves are common in this environment in warmer parts of Australia. Here they are near their southern-most limit and rarely grow over 1.5m in height. Mangrove Shrubland is often monospecific, dominated by White Mangrove Avicennia marina var. australasica This EVC is usually surrounded by or associated with Coastal Saltmarsh Complex.

EVC 175 Grassy Woodland

Within the Midlands and Otways study areas the pre-European extent of Grassy Woodland was modelled across large areas, on a variety of geologies and in a range of environments. All Grassy Woodlands, not considered part of the plains were placed in this group. It is therefore, a very broad EVC which encompasses a number of floristic communities, further sampling and analyses are required to resolve these groupings.

In general, Grassy Woodlands grow in areas with moderate to low rainfall and relatively fertile soils. The largest area of Grassy Woodland modelled is on the eastern section of the Otway Plain (including the Bellarine Peninsula). This is a large area of gently undulating plains extending from Portarlington to Colac. Geology is Tertiary sands, altitude is generally below 250m and the average annual rainfall varies from a low of 550mm per annum near Torquay to 700mm at Colac. The same land form and geology

continues further west but with increased rainfall that supports forested communities. In the drier eastern sections, the overstorey is dominated by Drooping She-oak Allocasuarina verticillata with Manna Gum *Eucalyptus viminalis* and Black Wattle Acacia mearnsii. The shrub layer is sparse and includes scattered Golden Wattle Acacia pycnantha and Sweet Bursaria *Bursaria spinosa* The ground layer is likely to have been dominated by Wallabygrasses Austrodanthonia spp.and Spear Grasses and Austrostipa spp. As rainfall increases to the west, Drooping She-oak and shrubs disappear, Manna Gum E.viminalis and Blackwood Acacia melanoxylor become dominant in the overstorey and Kangaroo Grass Themeda triandra dominates the ground layer.

Other areas mapped as Grassy Woodland include:

the Barrabool Hills just southwest of Geelong. Low but highly dissected hills of Cretaceous sandstone. Rainfall is low and the few remnants suggest the vegetation was similar to the nearby drier sections of the Otway Plain. Whether the steep sided valleys had the same vegetation as the flater hill tops was not clear. These hills have been virtually completely cleared

the Pentland Hills, north west of Bacchus Marsh. Steeply dissected hills of highly weathered Tertiary volcanics ranging from an altitude of 200m asl and 500mm annual rainfall at Bacchus Marsh to 500m and 700mm at Greendale. The overstorey is dominated by scattered Candelbark Eucalyptus rubida and Swamp Gum E. ovata near Greendale and of White Cyress Pine Callitris glaucophylla on steep and otherwise bare scree slopes near Bacchus Marsh. Blackwood Acacia melanoxylon and Black Wattle A. mearnsi are present throughout.

low hills just east of the Bamganie State Forest (southwest of Meredith). Gently undulating hills of Ordovician sediments and Tertiary fluvial gravels and silts. Altitude is 300m asl and mean annual rainfall is approximately 650mm. The overstorey is dominated by Manna Gum *Eucalyptus viminalis* with patches of Swamp Gum *E. ovata* and scattered tall shrubs including Blackwood Acacia melanoxylon, Black Wattle A.mearnsii and Black She-oak Allocasuarina littoralis. The ground layer is dominated by Spear-grasses Austrostipa spp. with Wallaby-grasses Austrodanthonia spp., Kangaroo Grass Themeda triandra, Blackanther Flax-lily Dianella revoluta and Honey-pots Acrotriche serrulata

Kongaderra Hills north of Mickleham. Low, undulating of hills of Silurian sediments (marine sandstones and siltstones) with an altitude range of 200-300m asl. Rainfall is approximately 600mm per annum. These hills are now virtually devoid of trees. Remnants include scattered Yellow Box Eucalyptus melliodora on lower slopes and gullies leading into Deep Creek and Red Gum *E. camaldulensis* in the creek itself in addition to a few Grey Box *E. microcarpa* and Drooping She-oak *Allocasuarina verticillata*. Shrubs are common along the roadside reserves including Blackwood Acacia melanoxylon, Hedge Wattle A. paradoxa, Black Wattle A. mearnsii, Golden Wattle A. pycnantha and Lightwood A. implexa. The the ground layer is dominated by grasses, particularly Spear-grasses Austrostipa spp., Wallaby-grasses Austrodanthonia spp. and Kangaroo Grass Themeda triandra, with Tussock-grasses *Poa* spp., Weeping Grass *Microleana stipoides* and Common Wheat-grass *Elymus scaber*.

Floristic Community 175-04 Low Rises Grassy Woodland Low Rises Grassy Woodland was once widespread across north-central Victoria where it occured on the boundary between the plains (usually *Riverina* Plains Grassy Woodland) and the dry forests (usually Box-Ironbark Forest) of the low hills. It has been largely cleared for agriculture and is described by Muir *et al.* (1995)

Within the pre-1750 mapping exercise for the Midland and Otways study areas Low Rises Grassy Woodland was modelled in the far northwest, around Ararat, Stawell and the Pyrenee Ranges and in a small, isolated area south of the Great Dividing Range in the dry rain shadow areas near Melton. Low Rises Grassy Woodland occurs on the lowest of rises on the boundary between the infertile Ordovician sediments of the hills and the more fertile Quaternary alluvials and colluvial geologies of the plains. Altitude varies from 200 to 300m, rainfall is generally below 550mm per annum.

The overstorey isdominated by Grey Box Eucalyptus microcarpa, though Yellow Gum *E. leucoxylon* may be co-dominant and Yellow Box *E. melliodora* is occasionally present. The shrub layer can be sparse or dense but is generally low and lacks diversity. Species include Sticky Wattle Acacia verniciflua, Gold-dust Wattle A. acinacea, Golden Wattle A. pycnantha, Drooping Cassinia Cassinia arcuata, Grey Everlasting Ozothamus obcordata and Moonah Melaleuca lanceolata. The ground layer is often sparse but diverse in grasses and forbs including Spear-grasses Austrostipa spp., Wallaby-grasses Austrodanthonia spp. Grey

Tussock-grass Poa sieberiana, Common Wheat-grass Elymus scaber, Windmill Grass Chloris truncata, Saloop Einadia hastata, Fuzzy New Holland Daisy Vittadinia cuneata, Pink Bindweed Convolvulus erubescens, Shiny Everlasting Bracteantha viscosa and Small-leaved Clematis Clematis microphylla.

Floristic Community 175-10 Lunette Grassy Woodland Lunette Grassy Woodland has been modelled on crescent-shaped rises of

Quaternary aeolian sands. These lunettes are found on the eastern shore of existing or past lakes from which they are derived, blown from the lake beds during dry periods. It is usually modelled in association with Plains Grassy Woodland, Stony Rises Herb-rich Woodland or Swamp Scrub. Mean annual rainfall ranges is approximately 550-700mm. No remnants of this community were observed, its pre-1750 extent has been modelled to follow Quaternary lunette geology. Other EVCs which also occupy lunettes are Sand Forest and Damp Sands Herb-rich Woodland from which Lunette Grassy Woodland is modelled by the absence of Austral Bracken Pteridium esculentum which occurs in these two EVCs and is rarely ever eradicated, regardless of disturbance. Environmental factors influencing their distribution are possibly depth of sand and drainage patterns.

Floristic Community 175-11 Granitic Grassy Woodland Granitic Grassy Woodland is a highly variable group and represents all Grassy Woodlands occurring on granite geologies within the study area. Variability in the structure and mineralogy of different granites (particularly clay content) impacts on the fertility and water holding capacity of the derived soils which in turn influences the vegetation present at a site. Granitic Grassy Woodland occurs on highly weathered granites, on gentle to flat topography and in moderate rainfall areas. Within the pre-1750 mapping exercise for the Midlands and Otways study areas, *Granitic* Grassy Woodland was modelled in only a few, small areas. The largest of these is in the Flagstaff Hill area, west of Linton where altitude ranges from 300-450m asl and average annual rainfall is approximately 650mm. In remnants the overstorey is dominated by Manna Gum *Eucalyptus viminalis* with Messmate Stringybark *E. obliqua*. The ground layer is rich in grasses and forbs. Common species include Kangaroo Grass *Themeda triandra*, Common Wheat-grass *Elymus scabra*, Wallaby-grasses *Austrodanthonia* spp., Grey Tussock-grass *Poa sieberiana*, Velvet Tussock-grass *P. rodwayii*, Bidgee-widgee Acaena novae-zealandiae, Common Everlasting Chrysocephalum apiculatum Stinking Pennywort Hydrocotyle laxiflora and Common Rice-flower Pimelea humilis.

This floristic community was also modelled in the Yendon/Mt Egerton area where altitude ranges from 480-540m asl and rainfall is approximately 700-800mm per annum. In remnants, the overstorey varies from open woodland towards open forest. It is dominated by Manna Gum *Eucalyptus viminalis* and Narrow-leaf Peppermint E. radiata with scattered Swamp Gum E. ovata and Snow Gum E. pauciflora and the understorey tree/shrub Blackwood Acacia melanoxylon. The ground layer is diverse and includes Tussock-grasses Poa spp., Wallaby-grasses Austrodanthonia spp., Reed Bent-grass Deyeuxia quadriseta, Weeping Grass Microleana stipoides, Yellow Rush-lily Tricoryne elatior, Austral Bracken Pteridium esculentum and Common Riceflower Pimelea humilis

EVC 196 Seasonally Inundated Sub-saline Herbland

The following description is from Yugovic (1985).

Within the Midlands and Otways study area Seasonally inundated Subsaline herbland was only mapped in the Lake Connewarre State Game Reserve south of Geelong which is the only known location of thisEVC in Victoria. Here it occupies the centre of a broad shallow basin, the relict of a former tidal lagoon. The area is totally surrounded by Coastal Saltmarsh Complex, it is not affected by tides, however a shallow brackish lake forms over the herbland for several months following major floods of the Barwon River (2km to the north). The soil ia a grey silty clay. The geology is recent aeolian estuarine sands and the rainfall is approximately 600 mm per annum

The low, prostrate shrub Silky Wilsonia Wilsonia humilis dominantes this EVC, forming extensive, almost pure stands. Narrow-leaf Wilsonia W. backhousei and Round-leaf Wilsonia W. rotundifolia are common in depressions at the southern end of the herbland.

EVC 200 Shallow Freshwater Marsh

During the pre-1750 vegetation mapping exercise, evidence of this EVC was found on a different geology to that of extant vegetation. This was swamp and lagoonal deposits within the newer volcanics, whereas extant examples were found on stream alluvium and depressions within tertiary sand areas. In both cases the soils are deep anaerobic silts. It was identified within the grounds of the Avalon Airport, approximately 15 km north east of Geelong. Due to lack of intact remnants in the pre-1750 area, species are presumed to be similar to extant examples.

EVC 203 Stony Rises Woodland

Stony Rises Woodland is found on Quaternary volcanics of the western volcanic plains of Victoria where lava tunnels have collapsed forming a mosaic of rocky woodland and wetlands. These wetlands are typically Plains Sedgy Wetland.

Stony Rises Herb-rich woodland was only identified on public land in a tiny area at the Floating Islands Flora Reserve to the south of Lake

Corangamite. During the pre-1750 vegetation mapping exercise it was modelled extensively to follow the Quaternary volcanic stonyrise geology. Soils are fertile clays though often shallow and rocky. The topography is undulating and the mean annual rainfall varies from approximately 550-700mm. Much of the prior extent of this EVC has been cleared for agriculture.

The overstorey is a woodland of Manna Gum Eucalyptus viminalis ssp. viminalis over a ground layer dominated by Austral Bracken Pteridium esculentum and Common Tussock-grass labillardieri. Frequently occurring shrubs are Tree Violet Hymenanthera dentata and Blackwood Acacia melanoxylon.

EVC 283 Plains Sedgy Woodland In the Midlands and Otways sutdy area Plains Sedgy Woodland was only identified in one location on the western basat plains, halfway between Beaufort and Streatham. Altitude is 320m asl, average annual rainfall is approximately 550mm and soils are the heavy grey clays associated with the basalt geology of the western volcanic plains.

Within this study area remnant Plains Sedgy Woodland is so disturbed and weed-infested adequate sampling was not possible. Generally the overstorey is sparse Red Gum *Eucalyptus* camaldulensis and a ground layer dominated by sedges including Juncus Joint-leaf Rush Juncus holoschoenus, Finger Rush J. subsecundus, Hollow Rush J. amabilis, Sword Sedge Lepidosperma spp., Tall Sedge Carex appressa, Common Blown Grass Agrostis avenacea, Wetland Wallaby-grass Austrodanthonia semiannualis and Poison Lobelia Lobelia pratiodes. This EVC was mapped extensively in the greater Grampians area, see Tumino and Roberts (1998) for a full description.

EVC 291 Cane Grass Wetland

Cane Grass Wetlands are shallow (~1m in depth) and occur on the northern alluvial plain in depressions with a clay soil base. The period of inundation lasts for approximately 4-6 months.

Structurally this EVC is an open swamp or shallow freshwater marsh dominated by Barren Cane Grass Eragrostis infecunda (vulnerable in Victoria) with other occasional species including Spiny Flat-sedge Cyperus gynmocaulos, Common Spike-sedge Eleocharis acuta, Upright Milfoil Myriophyllum crispatum, Red Milfoil M. verrucosum and Floating Pondweed Potamogeton tricarinatus. The outer periphery for the swamp may be finged with a woodland of River Red Gum Eucalyptus camaldulensis and occasionally Grey Box E. microcarpa. The outer verge may be may be more diverse and grade into Plains Grassy Wetland or Plains Grassy Woodland.

EVC 300 Reed Swamp Reed Swamp has only been mapped in one location in the Midlands and Otways study areas, in the Lake Connewarre State Game Reserve, south of Geelong, where it covers much of Reedy Lake. It occurs on Quaternary sedimentary geology of mainly estuarine sands. The soils are peaty, silty clays and average annual rainfall is approximately 600mm. Reed Swamp requires shallow water (to 1m deep) and low current-scour. It can only tolerate very low levels of salinity. It occupies approximately 5 square kilometres of the centre of Reedy Lake. The more saline margins of the lake support Coastal Saltmarsh Complex and Cane Grass-Lignum Halophytic Herbland.

Reed Swamp is a closed to open grassland/sedgeland dominated by Common Reed Phragmites australis to 2-3m tall. Amongst the Common Reed are more open areas of tall sedges to 2m including Cumbungi Typha orientalis, River Club-sedge Schoenoplectus validus and Tall Spike-sedge Eleocharis sphacelata. Also growing in these less shaded areas are small species such as Swamp Crassula Crassula helmsii, Water Buttons *Cotula coronophila and the floating species Pacific Azolla Azolla filiculoides and Common Duckweed Lemna minor.

EVC 311 Berm Grassy Shrubland Within the Midlands and Otways pre-1750 mapping exercise Berm Grassy Shrubland was only modelled as a very narrow strip along 14km of coastline from Seaholme to the western edge of the Point Cook RAAF Base. Within this narrow strip, areas of Berm Grassy Shrubland were too small to map at 1:100 000 scale and so have been mapped as a mosaic with Coastal Saltmarsh Complex, Mangrove Shrubland and Coastal Tussock Grassland. Rainfall in this area is approximately 500-550mm per annum and altitude is generally less than 1m asl. No fully intact examples of this EVC were located. It has been mapped and described in the Gippsland Regional Forest Agreement study area in south Gippsland on Margaret Island in Shallow Inlet.

Berm Grassy Shrubland occurs on 'berms', which are the low dunes just beyond the high tide mark and are formed by wave action and are continually reworked by the waves. They tend to form on beaches with insufficient sand to form full-scale dunes which generally support the closely related EVC Coastal Dune Scrub.

Berm Grassy Shrubland consists of a low windswept shrub layer of Coastal Saltbush Atriplex cinerea and Seaberry Saltbush Rhagodia candolleana. Other species likely to occur include Coast Fescue Festuca littoralis, Variable Groundsel Senecio pinnatifolius, Rounded Noon-flower Disphyma crassifolium Beaded Glasswort Sarcocornia quiqueflora, Knobby Club-sedge Isolepis nodosa and Bidgee-widgee Acaena novae-zelandiae.

EVC 851 Stream-bank Shrubland

Stream-bank Shrubland was not recognised during the extant vegetation mapping exercise where it was mapped as Riparian Forest/Riparian Shrubland Mosaic. Subsequent work during the pre-1750 mapping exercise identified quality intact remnants in the Midlands and Otways study area on the Moorabool River at the Meredith-Steiglitz Road crossing and along the gorge sections of the Werribee and Lerderderg Rivers.

Prior to European settlement it has been modelled on rivers and major streams throughout the study area on basalt geology or sediments where the watercourse has cut into the underlying rock producing rocky banks, a flat rocky stream bed and in the larger rivers, quite broad gravel banks which are often dry but are also regularly flooded by fast flowing waters. Where watercourses cut deeply into basalt, the upper banks (beyond the reach of floodwaters) often support Escarpment Shrubland. Where they cut deeply into sediments as in the Werribee and Lerderderg Gorges, the upper banks often support Midlands Escarpments Shrubby Dry Forest. Annual rainfall is usually below 700mm.

The overstorey is generally sparse, usually consisting of Manna Gum Eucalyptus viminalis or Red Gum E. camaldulensis though Blue Gum E. globulus and Swamp Gum E. ovata have also been recorded. The shrubs layer is the dominant stratum and includes Woolly Tea-tree Leptospermum lanigerum and River Bottlebrush Callistemon sieberi amongst the rocks on the stream bed, and Sweet Bursaria Bursaria spinulosa, Tree Violet Hymenanthera dentata, Shiny Cassinia Cassinia longifolia and Hop Goodenia Goodenia ovata occupying the stream banks. Other common species among the rocks and gravel on the stream bed are Bidgee-widgee Acaena novae-zelandiae, Willow-herb Epilobium spp., Carex polyantha and Spinv-headed Mat-rush Lomandra longifolia.

EVC 858 Calcarenite Dune Woodland

Within the Midlands/Otways study area, Calcarenite Dune Woodland is restricted to coastal and near coastal areas from Torquay to Altona Bay. It commonly occurs on the landward side of primary dunes and adjacent to Coastal Saltmarsh Complex in estuarine environments. It occurs on a variety of geologies and soil types Annual rainfall is approximately 550-

The overstorey is a dense woodland of Moonah Melaleuca lanceolata over a shrub layer including Wirilda Acacia retinodes, Coast Beard-heath Leucopogon parviflorus, and Thyme Rice-flower Pimelea serpyllifolia and a sparse understorey of Blue Tussock-grass Poa poiformis, Bower Spinach Tetragonia implexicoma, Seaberry Saltbush Rhagodia candolleana and Small-leaved Clematis Clematis microphllya.

EVC 863 Floodplain Reedbed

Floodplain Reedbed was identified in only one location in the Midlands and Otways study areas, in Craven, Costin and Hordern Lakes which are on the broad swampy flats of the lower reaches of the Aire River. It occurs in the slightly deeper areas of inundation on these flats. The remainder of the flats were mapped as Swamp Scrub. Soils are Quaternary swamp and lagoonal desposits of clays, silts and peat. Altitude is just above sea level (less than 5m). Rainfall is greater than 1000mm per annum.

Floodplain Reedbed is dominated by a dense sward of Common Reed Phragmites australis to 2m tall. Other species recorded include Sea Rush Juncus kraussii, Creeping monkey-flower Mimulus repens, Water Buttons *Cotula coronopifolia, Australian Gipsywort Lycopus australis and Waterribbons Triglochin procerum

EVC 891 Plains Brackish Sedge Wetland

Within the Midlands and Otways study areas Plains Brackish Sedge Wetland was only identified in the Lake Connewarre area south of Geelong. It occurs on flat to very gently sloping terrain in a strip around the southern edge of Reedy Lake. The width of this strip varies from a few meters to over 100m and is dependant on the degree of slope into the lake. This EVC appears to be very site-specific as it does not occur around the slightly more saline shores of nearby Lake Connewarre. The Quaternary aeolian geology mainly consists of estuarine sands. Annual rainfall is approximately 600mm.

Plains Brackish Sedge Wetland is grows in association with Reed Swamp, Plains Freshwater Ssedge Wetland and Coastal Saltmarsh Complex. It is a closed sedgeland to 80 cm tall dominant by Sharp Club-sedge Schoenplectus pungens, Creeping Cotula Leptinella reptans and River Buttercup Ranunculus rivularis. Swamp Crassula Crassula helmsii and Common Spike-sedge Eleocharis acuta are less common.

EVC 895 Escarpment Shrubland

Within the Midlands and Otways study area Escarpment Shrubland has been identified on escarpments associated with the edges of basalt flows or where watercourses have cut through a basalt capping. It occurs in lower rainfall areas or where effective rainfall is low, for example. steep west-facing escarpments. Prior to European settlement it is thought to have been scattered across the volcanic areas of the Midlands region. No extant quality intact examples of this EVC were identified and in the pre-1750 mapping exercise many of its prime habitat sites were too small to be mapped at 1:100 000 scale.

Species present varies depending on soil and water availability, cover is often sparse. Common shrubs include Tree Violet Hymenanthera dentata, Varnish Wattle Acacia verniciflua, Lightwood A. implexa, Hedge Wattle A. paradoxa, Sweet Bursaria Bursaria spinosa and Sticky Hop-Bush Dodonea viscosa. Turkeybush Eremophila deserti and Fragrant Saltbush Rhagodia parabolica can be locally common. Occasionally Drooping Sheoke Allocasuarina verticillata dominates. Eucalypts, mainly Candelbark E. rubida, when present, are usually concentrated on the upper edge of the escarpment.

EVC 898 Cane Grass – Lignum Halophytic Herbland

Within the Midlands and Otways study area, this EVC is restricted to the Lake Connewarre area south of Geelong. It occurs within shallow depressions on otherwise flat terrain, surrounded by Coastal Saltmash Complex and Plains Grassland The geology is Quaternary sedimentary estuarine sands. The soils is silty clays. subject to periodic freshwater flooding from the nearby Barwon river. Annual rainfall is approximately 600mm. This EVC has been identified in two small areas, to the south of Reedy Lake in the Lake Connewarre State Game Reserve and on the west bank of the Barwon River, south east of Geelong

Cane Grass – Lignum Halophytic Herbland is a shrubland dominated by Tangled Lignum *Muehlenbeckia florulenta*, though in slightly better drained areas the Lignum is sparse and Common Tussock Grass Poa labillardieri dominates. The ground layer is dominated by sedges, with Common Spike-sedge Eleocharis acuta prominent at the wetter sites and Sharp Schoenoplectus pungens in more brackish situations. Club-sedge

EVC 899 Plains Freshwater Sedge Wetland Within the Midlands and Otways study area this EVC is confined to the Lake Connewarre area south of Geelong. It is grows in association with Plains Grassland, Plains Brackish Sedge Wetland and Coastal Saltmarsh Complex. It occurs on quaternary sedimentary geology, consisting mainly of estuarine sands, the soils are peaty silty clays. Annual rainfall is approximately 600mm.

Plains freshwater segde wetland is an open to closed sedgeland, reaching heights to 1m. The dominant species are Common Spike-sedge Eleocharis acuta, Common Blown Grass Agrostis avenacea and the weed, Curled Dock *Rumex crispus with Swamp Crassula Crassula helmsii and Water-ribbons Triglochin procerum sub dominant.

GREATER GRAMPIANS VEGETATION DESCRIPTIONS

EVC 3 Damp Sands Herb-rich Woodland

In the Grampians, Damp Sands Herb-rich Woodland typically occurs on deep, damp sands beside creeks. The water table associated with these creeks provides permanent moisture and the fertile nature of the abutting creek geology provides a suitable substrate for herbs.

Within the study area, there are two floristic communities of Damp Sands Herb-rich Woodland. Grampians Damp Sands Herb-rich Woodland occurs on moister sites and is prolific in herbs, whilst Roses Gap Damp Sands Herb-rich Woodland is found on drier sands, with two shrub species forming a dense thicket. Roses Gap Damp Sands Herb-rich Woodland is also restricted geographically to the Roses Gap area, whilst Grampians Damp Sands Herb-rich Woodland is distributed widely across the study area.

Floristic Community 3-02 Grampians Damp Sands Herb-rich

Woodland Grampians Damp Sands Herb-rich Woodland typically occurs on loamy sands more than 1m deep. These sands are usually of alluvial origin, derived from adjacent creeks. The water table associated with these streams maintains moisture in the sand and the alluvium deposited provides a fertile loam for herbaceous growth, hence the name Damp Sands Herb-rich Woodland. Due to its position in the landscape, on terraces above creeks or alluvial flats, aspect and rainfall are of little significance. Grampians Damp Sands Herb-rich Woodland occurs in large areas in the lower reaches of the Wannon River catchment within the National Park.

This floristic community has a moderate overstorey typically to 25m but on occasions to 40m. A variety of eucalypt species comprise the overstorey with Swamp Gum Eucalyptus ovata the most commonly recorded. Scentbark E. aromaphloia, River Red Gum E. camaldulensis, Messmate E. obliqua and Manna Gum E. viminalis ssp. viminalis are also sometimes present.

A sparse secondary tree layer consists of Black Wattle Acacia mearnsii and/or Blackwood A. melanoxylon, ranging in height from 10m to 20m. Wirilda Acacia retinoides is also often present.

In general the understorey is open, with a few scattered narrow-leaved shrubs of Manuka *Leptospermum scoparium* and Prickly Currant-bush *Coprosma quadrifida*. Victorian Christmas-bush Prostanthera lasianthos is the only commonly occurring braodleaved shrub. Sparse, ericoid-leaved shrubs can also be found, including Flame Heath Astroloma conostephioides, Cranberry Heath A. humifusumand Common Heath Epacris impressa

Grampians Damp Sands Herb-rich Woodland often contains a dense field layer of Austral Bracken Pteridium esculentum. Another notable feature are the areas grazed by kangaroos and wallabies that are dominated by Weeping Grass Microlaena Wallables that are dominated by Weeping Grass *Microlaena* stipoides. Associated with this ground layer are numerous forbs, including Common Lagenifera *Lagenifera* stipitata, Small Poranthera *Poranthera microphylla*, Cat's Ear **Hypochoeris radicata*, Kidney-weed *Dichondra repens*, Common Woodrush *Luzula meridionalis* var. *flaccida*, Ivy-leaf Violet *Viola hederacea* ssp *hederacea*, Pimpernel **Anagallis arvensis*, Common Woodruff Asperula conferta, Small St John's Wort Hypericum gramineum, Narrow Groundsel Senecio tenuiflorus and Hairy Speedwell Veronica calycina. Important tussock grasses include Wallaby Grass Danthonia spp., Common Tussock-grass Poa labillardieri var. labillardieri, Soft Tussock-grass Poa morrisii and Slender Tussock-grass Poa tenera. The annual grasses Elegant Hair-grass *Aira elegans, Lesser Quaking-grass *Briza minor and Silvery Hairgrass * Aira caryophyllea are generally present.

The graminoid, Spiny-headed Mat-rush Lomandra longifolia ssp. longifolia, is a major component of the ground layer with other graminoids present including Red-fruit Saw-sedge Gahnia sieberiana, Tall Sedge Carex appressa and Black-anther Flax-lily Dianella revoluta

The damp nature of the environment provides suitable conditions for small ground ferns such as Necklace Fern Asplenium flabellifolium and occasionally Common Maidenhair Adiantum aethiopicum

Yarra Gum Rr Eucalyptus yarraensis is the only significant species recorded from this community.

Floristic Community 3-03 Rose's Gap Damp Sands Herb-rich Woodland

Roses Gap Damp Sands herb-rich Woodland occurs beside creeks in the vicinity of Rose's Gap in the northern Grampians. It occurs on deep sands that are much drier than Grampians Damp Sands Herb-rich Woodland. Subsequently, it supports a dense shrub layer and less herbaceous species. This also makes it difficult to distinguish from Grampians Shrubby Woodland, especially if it occurs under River Red Gum

Yellow Box Eucalyptus melliodora and Swamp Gum E. ovata are the most common eucalypt species. Other species present include Desert Stringybark E. arenacea, Brown Stringybark E. baxteri, River Red Gum E. camaldulensis, Long-leaf Box E. goniocalyxs.s., Rough-barked Manna Gum E. viminalis ssp. cygnetensis and Manna Gum E. viminalis ssp. viminalis. Black Wattle Acacia mearnsii is the only understorey tree.

The most striking feature of Roses Gap Damp Sands Herb-rich Woodland is the dominance of Grampians Thryptomene Thryptomene calycina, forming a dense shrub layer. Sallow Wattle Acacia longifolia to 5m is also common. Other shrubs that frequently occur are tree form Silver Banksia Banksia marginata and Hop Goodenia Goodenia ovata. Ground-hugging heaths beneath this dense shrub layer include Flame Heath Astroloma conostephioides, Cranberry Heath A. humifusum Pine Heath A. pinifolium Brush Heath Brachyloma ericoides and Upright Guinea-flower Hibbertia stricta s.l. The dominance of Grampians Thryptomene and Sallow Wattle suggest some past disturbance which has favoured their dominance, however there is no evidence of fire for a long period.

Graminoids include Twining Fringe-lily Thysanotus patersonii, Pale Grasslily Caesia parviflora, Corybas spp., Maroonhood Pterostylis pedunculata, Black-anther Flax-lily s.l. Dianella brevicaulis/revoluta, Little Club-sedge Isolepis marginata and Wattle Mat-rush Lomandra filiformis ssp. coriacea.

The only significant species recorded is Mossy Woodruff r Asperula minima.

EVC 6 Sand Heathland Sand Heathland is most often a treeless heathland, or if trees are present, they are usually small and spindly. It occurs in all catchments within the study area on sand deposits combining outwash, fluviatile and aeolian processes. The water table is often close to the surface, providing a moisture gradient inhibiting the growth of large dominant eucalypts. At the wetter end of this moisture gradient, Wet Heathland replaces Sand Heathland

Floristic Community 6-01 Grampians Dunes Sand Heathland

Grampians Dunes Sand Heathland occurs on deep aeolian sands that form dunes in the major valley systems of the Grampians. The soils are fine loamy sands that grade from white/grey to yellow down the soil profile. The sands are deeper than 1m, well-drained and often quite dry, with the soil surface low in organic content. Grampians Dunes Sand Heathland can occur as islands within extensive areas of Grampians Sand Heathland and Shallow Sand Heathland. It can also abut Sand Heathy Woodland and whilst they belong to separate EVCs, they are very similar floristically and sometimes structurally if the Grampians Dune Sand Heathland is treed.

Grampians Dunes Sand Heathland is most often treeless. Desert Banksia Banksia ornata is the tallest shrub at 2m in height with lower shrubs of 1.5m including Flame Heath Astroloma conostephioides, Silver Banksia Banksia marginata, Daphne Heath Brachyloma daphnoides, Common Correa Correa reflexa, Smooth Parrot-pea Dillwynia glaberrima, Twiggy Guinea-flower Hibbbertia virgata, Common Hovea Hovea linearis, Heath tea-tree Leptospermum myrsinoides. Common Beard-heath Leucopogon virgatus. Common Rice-flower Pimelea humilis, Golden Heath Styphelia adscendens, Slender Smoke-bush Conospermum patens, Prickly Cryptandra Cryptandra tomentosa, Gorse Bitter-pea Daviesia ulicifolia, Common Wedge-pea Gompholobium huegelii, Prickly Broom-heath Monotoca scoparia and Heathy Phyllota Phyllota pleurandroides.

Forbs are present in low densities, scattered over the sandy soil. These include Blunt Everlasting Argentipallium obtusifolium, Blue Pincushion Brunonia australis, Blue-spike Milkwort Comesperma calymega, Common Raspwort Gonocarpus tetragynus, Bent Goodenia Goodenia geniculata and Small Poranthera Poranthera microphylla. Grasses are not common either, but include Danthonia spp., Deyeuxia spp., Supple Spear-grass Stipa mollis and Rough Porcupine Grass Triodia scariosa ssp. scariosa.

Sedges, restionaceous species and graminoids include Tassel Rope-rush Hypolaena fastigata, Black Rapier-sedge Lepidosperma carphoides, Dwarf Mat-rush Lomandra nana, Matted Bog-sedge Schoenus breviculmis, Scale Shedder Lepidobolus drapetocoleus, Milkmaids Burchardia umbellata and Grass Trigger-plant Stylidium graminifolium.

Significant plants recorded in Grampians Dunes Sand Heathland include Early Golden Moths k Diuris sp. aff. lanceolata (Derrinallum) and Yucca r Xanthorrhoea caespitosa.

Floristic Community 6-02 Grampians Sand Heathland/Shallow Sand Heathland Complex Whilst Grampians Sand Heathland and Shallow Sand Heathland are

distinguished floristically in the analysis, they are very similar structurally and could not be separated easily on the ground, either floristically or with aerial

photographic interpretation. Subsequently, they have been mapped as a single map unit but are described here separately

Grampians Sand Heathland is found on loamy sands approximately 80 cm deep over a drainage-impeding clay layer. The sands are often dry at the surface, with increasing moisture as the sand meets the clay. In many instances, the sand is often waterlogged due to the medium to heavy clays that prevent water drainage. This community is most commonly found on the broad flood plains of the Glenelg River and the Wannon River.

Grampians Sand Heathland is typically treeless, however when eucalypts do occur, they are sparse, spindly and rarely reach 5m in height. Rough-barked Manna Gum *Eucalyptus vininalis* ssp. *cygnetensis* is the most common species. Shining Peppermint *E. willisii* also occurs as a small spindly tree, whereas Messmate *E. obliqua* and Brown Stringybark *E. baxteri* occur as larger trees with denser crowns. River Red Gum *E. camaldulensis* is present as either a remnant of the alluvial floodplain that has been covered in sand or the site is in close proximity to *Grampians* Shrubby Woodland or *Grampians* Alluvial Terraces Herb-rich Woodland in which this species is common.

The characteristic features of *Grampians* Sand Heathland are the dense shrub cover and high diversity of narrow-leaved and ericoid-leaved shrubs to approximately 1m. Associated with this are Blue Tinsel-Iily *Calectasia intermedia*, grass trees and Thatch Sawsedge *Gahnia radula* over a dense mat of restionaceous species.

Shrubs are typically less than 2m tall, but this can be influenced by fire frequency. The most common species in this dense shrub layer are shrub form Silver Banksia *Banksia marginata*, Heath Teatree *Leptospermum myrsinoides*, Prickly Geebung *Persoonia juniperina*, Prickly Tea-tree *Leptospermum continentale*, Common Rice-flower *Pimelea humilis*, Slender Sheoke *Allocasuarina misera*, Smooth Parrot-pea *Dillwynia glaberrima*, Common Heath *Epacris impressa*, Upright Guinea-flower *Hibbertia stricta*, Common Beardheath *Leucopogon virgatus*, Twisted Beard-heath *L. glacialis* and Golden Heath *Styphelia adscendens*. Slender Sheoke *Allocasuarina misera*, Heath Tea-tree *Leptospermum myrsinoides* and *L. continentale* structurally dominate this community.

Slender Dodder-laurel *Cassytha glabella* and Downy Dodder-laurel *C. pubescens* frequently intertwine the shrubs.

Grass trees are common, most frequently Austral Grass-tree *Xanthorrhoea australis*, with Yucca r *X. caespitosa* occurring in the Black Range.

Thatch Saw-sedge Gahnia radula and Black Rapier-sedge Lepidosperma carphoides occur above a layer of smaller sedges including Matted Bog-sedge Schoenus breviculmis and Common Bog-sedge S. apogon.

A number of restionaceous species are very common and often form a dense sward. Tassel Rope-rush *Hypolaena fastigata*, Scale Shedder *Lepidobolus drapetocoleus* and Slender Twine-rush *Leptocarpus tenax* are the most common restionaceous species. Bare Twig-sedge *Baumea juncea* is also present.

Scarlet Sundew Drosera glanduligera, Pale Sundew D. peltata ssp. peltata Common Raspwort Gonocarpus tetragynus, Bent Goodenia Goodenia geniculata and Hidden Violet Viola cleistogamoides are the only common forbs. Perennial geophytes present include Milkmaids Burchardia umbellata, Blue Squill Chamaescilla corymbosa var. corymbosa, whilst the graminoids include Short Purple-flag Patersonia fragilis, Grey-beard Grass Amphipogon strictus var. setifer and Supple Spear-grass Stipa mollis.

Significant species in *Grampians* Sand Heathland include Yucca r Xanthorrhoea caespitosa, Elegant Spider Orchid Ve Caladenia formosa, Veined Spider Orchid v C. reticulata s.s., Early Golden Moths k Diuris sp. aff. lanceolata (Derrinallum), Short-leaf Bogsedge r Schoenus laevigatus and Blotched Sun-orchid r Thelymitra benthamiana.

Grampians Sand Heathland differs from Shallow Sand Heathland in that the former has a deeper layer of loamy sand over clay. Grampians Sand Heathland has a greater diversity of species, more heathy shrubs, more herbs and fewer species known to favour wetter environments. Some of these species include Necklace Fern Asplenium flabellifolium Spreading Rope-rush Empodisma minus, Dagger Hakea Hakea teretifolia ssp. hirsuta, Common Scale-rush Lepyrodia muelleri, Branching Scale-rush L. tasmanica, Long Purple-flag Patersonia occidentalis, Swamp Selaginella Selaginella uliginosa, Pink Swamp-heath Sprengelia incarnata and Hair-sedge Tetraria capillaris. Shallow Sand Heathland is found on loamy sands. These sites are poorly drained and soils may become waterlogged in winter due to a clay layer 40-60cm beneath the sand. Shallow Sand Heathland is most frequently found on the gentle to flat outwash in the broad Wannon River valley system between the Serra and Mt William Ranges.

It is typically treeless, with sparse, small spindly eucalypts growing on slightly deeper sand, where the soil is better drained. Rough-barked Manna Gum *Eucalyptus viminalis* ssp. *cygnetensis* is nearly always present with a low cover together with Shining Peppermint *E. willisii.* The waterlogged nature of the soil may make it difficult for trees to survive.

Shrubs structurally dominate this community and are high in diversity, similar to that of *Grampians* Sand Heathland. Shrubs are dense and varied and include Slender Sheoke *Allocasuarina misera*, Prickly Tea-tree *Leptospermumcontinentale*, Heath Tea-tree *L. myrsinoides*, Showy Parrotpea *Dillwynia sericea*, Dagger Hakea *Hakea teretifolia* ssp. *hirsuta*, Upright Guinea-flower *Hibbertia stricta* s.l., Silver Banksia *Banksia marginata*, Common Heath *Epacris impressa*, Prickly Geebung *Persoonia juniperina*, Twisted Beard-heath *Leucopogon glacialis*, Smooth Parrot-pea *D. glaberrima*, Western Furze Hakea *Hakea repullulans*, Slender Honey-myrtle *Melaleuca gibbosa* and Pink Swamp-heath *Sprengelia incarnata*. Austral Grass-tree *Xanthorrhoea australis* also appears throughout the shrub layer. Slender Dodder-laurel *Cassytha glabella* takes advantage of the many host shrubs.

A dense layer of restioanceous species dominate the ground layer, including Slender Twine-rush *Leptocarpus tenax*, Tassel Rope-rush *Hypolaena fastigata*, Common Scale-rush *Lepyrodia muelleri*, and Branching Scale-rush *L. tasmanica*. The sedges, Thatch Saw-sedge *Gahnia radula* and Needle Bog-sedge *Tricostularia pauciflora*, also contribute to this ground layer. Short Purple-flag *Patersonia fragilis* also thrives in the moist conditions.

Amongst this dense field layer are the smaller herbs and ferns such as Common Raspwort *Gonocarpus tetragynus*, Grey Beard-grass *Amphipogon strictus* var. *setifer*, Pale Sundew *Drosera peltata* ssp. *peltata* Necklace fern *Asplenium flabellifolium* and Swamp Selaginella *Selaginella uliginosa*. Occasional perennial geophytes appear such as Milkmaids *Burchardia umbellata*, Blue Squill *Chamaescilla corymbosa* var. *corymbosa* and Rabbit Ears *Thelymitra antennifera*.

Shallow Sand Heathland also has affinities with Damp and Wet Heathland. They share species of wetter environments and these include Spreading Rope-rush *Empodisma minus*, Dagger Hakea *Hakea teretifolia* ssp, *hirsuta*, Common Scale-rush *Lepyrodia muelleri*, Branching Scale-rush *L. tasmanica*, Long Purple-flag *Patersonia occidentalis*, Swamp Selaginella *Selaginella uliginosa and* Pink Swamp-heath *Sprengelia incarnata*. These species also separate *Shallow* Sand Heathland from *Grampians* Sand Heathland.

Significant species include Yucca r $\ Xanthorrhoea\ caespitosa$ and Tiny Spyridium Rv Spyridium cinereum

EVC 8 Wet Heathland

Wet Heathland occurs on broad drainage lines, creeklines and flats of the major valley systems. In the Victoria Valley, at the base of the Victoria Range outwash slopes, it often occurs on slopes where ground water discharge reaches the surface and provides continuous moisture. It can also occur along thin drainage lines within the outwash and Sand Heathland systems, often associated with Riparian Scrub and along rocky creeks in the Victoria Range and on Mt William. However, it reaches its greatest expression within the flat expanses of the Glenelg River floodplain, where one contiguous patch is approximately 400ha in size. It occurs on silty clay loams 50-90cm in depth overlaying light to medium heavy clays. Water can be obtained from either the watertable or from moisture trapped above the heavy clay layer. In early to mid spring, there may be surface water due to saturated soils associated with winter rainfall.

Wet Heathland in many instances is treeless, although Rough-barked Manna Gum *Eucalyptus viminalis* ssp. *cygnetensis* sometimes occurs, but only as occasional, small trees on higher ground. Shining Peppermint *E. willisii* can also be present in low numbers.

Shrubs are not as dense and diverse compared with the communities of Sand Heathland. Prickly Tea-tree *Leptospermum continentale* is common with Scented Paperbark *Melaleuca squarrosa*, Silver Banksia *Banksia marginata*, Pink Swamp-heath *Sprengelia incarnata*, Dagger Hakea *Hakea teretifolia* ssp. *hirsuta*, Slender Sheoke *Allocasuarina misera*, Smooth Parrot-pea *Dillwynia glaberrima* and Slender Honey-myrtle *Melaleuca glabelia* twines amongst the shrubs.

The most notable feature of Wet Heathland is Button Grass *Gymnoschoenus sphaerocephalus*. It forms large hummocks amongst which grow the shrubs and the grass trees such as Austral Grass-tree *Xanthorrhoea australis* and Small Grass-tree *X. minor* ssp. *lutea*. Restionaceous species protrude from beneath and include Flat Cord-rush *Restio complanatus*, Spreading Rope-rush *Empodisma minus*, Slender Twine-rush *Leptocarpus tenax*, Branching Scale-rush *Lepyrodia tasmainca*, Pale Twig-sedge *Baumea acuta*, Tassel Rope-rush *Hypolaena fastigata* and Common Scale-rush Lepyrodia muelleri. Herbs present include Tall Yellow-eye Xyris operculata and Long Purple-flag Patersonia occidentalis.

Small ground-dwelling plants can be found underneath the Button Grass and shrubs. These include Swamp Selaginella Selaginella uliginosa, Screw Fern Lindsaea linearis, Forked Sundew Drosera binata, Pale Sundew D. peltata ssp. peltata, Tiny Sundew D. pygmaea and Scented Sundew D. whittakeri which grow well in this wet environment.

Significant species in Wet Heathland are Thready Bush-pea Rr Pultenaea luehmannii, Yucca r Xanthorrhoea caespitosa and Short-leaf Bog-sedge r Schoenus laevigatus.

EVC 16 Lowland Forest

Floristic Community 16-01 Grampians Lowland Forest

Grampians Lowland Forest occurs on shallow loams overlaying sandstones in sheltered areas where rainfall ranges from around 700mm to 1000mm per annum. In higher altitudes, rainfall is enhanced by cloud cover, often to ground level. These areas are on the gentle to moderately steep mid slopes along the south-east side of the Victoria Range, to the south of the Major Mitchell Plateau and along the Mt Difficult Range. Soils are well drained and rich in organic matter and can vary in depth from 45cm-100cm at low altitude sites to less than 10cm at higher altitudes where rocks begin to outcrop.

Brown Stringybark Eucalyptus baxteri and Messmate E. obliqua are the dominant trees in the overstorey, where they often co-occur with Mountain Grey-gum E. cypellocarpa.

A diverse assemblage of narrow-leaved and ericoid-leaved shrub species characteristic of drier and heath communities are present. These include Common Heath Epacris impressa, Pink-bells Tetratheca ciliata, Silver Banksia Banksia marginata, Honey-pots Acrotriche serrulata, Common Correa Correa reflexa, Rough Bushpea Pultenaea scabra, Slender Platysace Platysace heterophylla, Prickly Geebung Persoonia juniperina, Myrtle Wattle Acacia myrtifolia, Common Hovea Hovea linearis, Manuka Leptospermum scoparium Common Rice-flower Pimelea humilis, Dusty Miller Spyridium parvifolium Common Flat-pea Platylobium Platylobium obtusangulumand numerous other species forming the sometimes dense shrub layer. Other common species of heath communities which are present include Austral Grass-tree Xanthorrhoea australis and Wattle Mat-rush Lomandra filiformis.

In addition to this heathy component, a number of species characteristic of moister, sheltered environments with more fertile soils are also often present. These include the shrubs Rough Coprosma Coprosma hirtella, Hairy Correa Correa aemula and Hop Goodenia Goodenia ovata. Unlike other floristic communities, Grampians Lowland Forest is also rich in climbers, including Love Creeper Comesperma volubile, Mountain Clematis Clematis aristata, Common Apple-berry Billardiera scandens, Orange Bell-climber Billardiera bignoniaceae and Downy Dodder-laurel Cassytha pubescens s.s.

The ground layer is rich in herbs. Common forbs present include lvy-leaf Violet Viola hederacea ssp. hederacea, Tall Sundew Drosera peltata ssp. auriculata, Button Everlasting Helichrysum scorpioides, Shade Raspwort Gonocarpus humilis, Small Poranthera Poranthera microphylla, Tight Bedstraw Galium curvihirtum, Variable Stinkweed Opercularia varia, Common Raspwort Gonocarpus tetragynus, Bent Goodenia Goodenia geniculata, Broom Spurge Amperea xiphoclada ssp. xiphoclada, Cut-leaf Daisy Brachyscome multifida and Common Billy Buttons Craspedia glauca spp. agg. Perennial geophytes include Common Bird-orchid Chiloglottis valida, Milkmaids Burchardia umbellata and Grass Trigger-plant Stylidium graminifolium. Black-anther Flax-lily (s.l.) Dianella brevicaulis/revoluta is also present.

Grasses often found are Weeping Grass Microlaena stipoides var. stipoides. Grev Tussock-grass Poa sieberiana and Soft Tussockgrass P. morrisii.

Large sedges and rushes are often present which include Variable Sword-sedge Lepidosperma laterale, Wire Rapier-sedge L. semiteres, Red-fruit Saw-sedge Gahnia sieberiana and Spinyheaded Mat-rush Lomandra longifolia.

Austral Bracken Pteridium esculentumis also common.

Significant species in Grampians Lowland Forest are Rock Banksia r Banksia saxicola, Mossy Woodruff r Asperula minima, Grampians Bossiaea r Bossiaea rosmarinifolia, Mount William Beard-heath Rr Leucopogon neurophyllus, River Bossiaea r Bossiaea riparia, Glossy Hovea Rr Hovea corrickiae, Narrow-leaf Trymalium r Trymalium daltonii, Ribbed Bush-pea Rr Pultenaea costata and Branched Trymalium Rr Trymalium ramosissimum. However, none of these species are commonly found in Grampians Lowland Forest.

Floristic Community 16-02 Feldspar PorphyryLowland Forest Feldspar Porphyry Lowland Forest occurs in a few isolated patches on the summit of Mount Difficult, on exposed seams of feldspar porphyry. Grampians Lowland Forest, in some instances, can occur on quartz porphyry, with deep soils on protected southerly slopes. This is in contrast to the more exposed nature of Feldspar Porphyry Lowland Forest with a shallow soil layer over the feldspar porphyry.

The eucalypt species are similar to those found in Grampians Lowland Forest but are shorter in stature. Brown Stringybark Eucalyptus baxteri, Mountain Grey Gum E. cypellocarpa and Messmate E. obliqua are the common overstorey species, with Oyster Bay Cypress-pine Callitris rhomboidea the only tall understorey shrub.

Feldspar Porphyry Lowland Forest has a variety of lifeforms that defines its structure. It contains a layered strata of grasses, forbs, sedges, graminoids, climbers, ferns, shrubs and trees.

Shrubs recorded in Feldspar Porphyry Lowland Forest are Thin-leaf Wattle Acacia aculeatissima, Mitchell's Wattle A. mitchelli, Spike Wattle A. oxycedrus, Honey Pots Acrotriche serrulata, Pine Heath Astroloma pinifolium Dwarf Boronia Boronia nana var. pubescens, Common Correa Correa reflexa, Common Heath Epacris impressa, Variable Prickly Grevillea Grevillea aquifolium, Bushy Hakea Hakea sp. (ex H. sericea sensu Willis 1972), Prickly Tea-tree Leptospermum continentale, Heath Tea-tree L. myrsinoides, Manuka L. scoparium, Thyme Beard-heath Leucopogon thymifolius, Prickly Geebung Personnia juniperina, Notched Phebalium Phebalium bilobum Yellow Rice-flower Pimelea flava, Common Flat-pea Platylobium obtusangulum, Slender Platysace Platysace heterophylla, Soft Bush-pea Pultenaea mollis, Rough Bush-pea P. scabra, Golden Heath Styphelia adscendens, Pink-bells Tetratheca ciliata, Acacia spp. and Allocasuarina spp.

Common forbs include Broom Spurge Amperea xiphoclada var. xiphoclada, Austral Carrot Daucus glochidiatus, Tall Sundew Drosera peltata, Scented Sundew D. whittakeri, Clustered/Creeping Cudweed Euchiton gymnocephalus s.l., Rough Bedstraw Galium gaudichaudii, Common Raspwort Gonocarpus tetragynus, Button Everlasting Helichrysum scorpioides, Yellow Pennywort Hydrocotyle foveolata, Small St John's Wort Hypericum gramineum, Small Poranthera Poranthera microphylla, Hairy Speedwell Veronica calycina and Ivy-leaf Violet Viola hederacea ssp. hederacea. Grasses include Elegant Hair-grass *Aira elegans, Reed Bentgrass Deyeuxia quadriseta, Dichelacne spp., Poa ?morissii /sieberiana var. hirtella and Poa spp.

Perennial geophytes include Milkmaids Burchardia umbellata, Common Bird-orchid Chiloglottis valida, and Tall Greenhood Pterostylis longifolia s.l.

Sedge and restionaceous species recorded include Thick Twist-rush Caustis pentandra, Wire Rapier-sedge Lepidosperma semiteres, Common Bogsedge Schoenus apogon, as well as Wattle Mat-rush Lomandra filiformis and Lomandra sp.

Austral Grass-tree Xanthorrhoea australis and Austral Bracken Pteridium esculentumare also present.

EVC 18 Riparian Forest Riparian Forest is found along permanent, narrow, meandering creeks on flat terrain, or in rocky gullies which are fed by seasonal flowing waters. The soils are fertile sand/sand loam alluviums with variable sized rocks in the stream bed. Riparian Forest has a limited ecological range within the study area, with the floristics changing quickly as distance from the creek increases. On flat terrain, Riparian Forest is often surrounded by Grampians Damp Sands Herb-rich Woodland or Sedgy Riparian Woodland, so Riparian Forest is either exaggerated or absorbed into the surrounding vegetation. Some of the deeper, sheltered rocky streams within the Victoria, Serra, Mt Difficult and Mt William Ranges have been mapped as Riparian Forest in complex with Grampians Damp Forest and sometimes Grampians Lowland Forest. Riparian Forest is not common in the Grampians as it tends to occur in wetter environments associated with Wet Forest or Damp Forest. The ecological niche for Riparian Forest occurs on sheltered, semi-permanent creeks and gullies within the taller forests of the study area.

A medium forest of 25-30m in height of Messmate Eucalyptus obliqua overhangs the creek, with Mountain Grey Gum E. cypellocarpa commonly co-occuring. Brown Stringybark E. baxteri and Shining Peppermint E. willisii s.l. are present in small numbers from the surrounding vegetation community. Blackwood Acacia melanoxylon and Narrow-leaf Wattle A. mucronata to 10m tall as well as Rough Pomaderris Pomaderris aspera and Victorian Christmas-bush Prostanthera lasianthos are the most common species in the sparse secondary tree layer.

Rough Coprosma Coprosma hirtella, Scented Paperbark Melaleuca squarrosa, Prickly Moses Acacia verticillata, Woolly Tea-tree Leptospermum lanigerum and Prickly Bush-pea Pultenaea juniperina form an open understorev of occasional shrubs.

Due to the constant supply of moisture and shade, the most notable feature of Riparian Forest is the dense ground cover of These are predominantly the Water-ferns such as Hard ferns. Water-fern Blechnum wattsii, Fishbone Water-fern B. nudum and Soft Water-fern *B. minus*. Silky Fan-fern *Sticherus tener*, Austral King-fern *Todea barbara*, Pouched Coral-fern *Gleichenia dicarpa*, Scrambling Coral-fern *G. microphylla* and Austral Bracken Pteridium esculentum also line the creek bank.

Amongst the fern layer, Red-fruit Saw-sedge Gahnia sieberiana and Tall Sword-sedge Lepidosperma elatius can be found. Weeping Grass Microlaena stipoides var. stipoides is common but only as a few individual plants on the exposed bank edges.

The only significant species recorded in this EVC are Smooth teatree K Leptospermum glabrescens and Branched Trymalium Rr Trymalium ramosissimum

EVC 19 Riparian Shrubland

Floristic Community 19--01 Grampians Rocky Riparian Shrubland Grampians Rocky Riparian Shrubland occurs on rocky creeks,

soaks or depressions, often fed by springs. It can be found on steep gradients on permanent streams or on sediment beds trapped in rocks. It grows amongst Grampians Rocky Outcrop Shrubland and Grampians Rocky Outcrop Herbland.

Grampians Rocky Riparian Shrubland is often treeless, but areas have been mapped with an overstorey. This EVC is not easily accessible and thus has not been sampled. It possibly has affinities with several EVCs including Riparian Scrub, Sedgy Riparian Woodland, Riparian Forest and Wet Heathland. The treeless version is uncommon but does occur on the tops of the ranges, eg., on Mt Abrupt, on Mt Difficult and in the Wonderland. This community is similar, floristically, to Riparian Scrub, however the rock-dominating environment may account for the lack of taller thickets which are indicative of Riparian Scrub. Hence further sampling is required.

EVC 20 Heathy Dry Forest

Floristic Community 20-08 Grampians Heathy Dry Forest

Grampians Heathy Dry Forest is a meduim open forest, but can vary structurally to form occasional low open forest on more exposed sites with skeletal soils. It occurs on loamy sands variously derived from sandstones and granodiorites, usually less than 50cm deep, overlying clay or rock. Often this rock layer is very close to or above the soil surface, causing a decrease in tree height. The average annual rainfall is approximately 800mm, with some sites at higher altitudes receiving close to 1000mm. Soils are often in situ with parent rock present. It grows on slopes and ledges between rock outcrops and the sandy outwash. It is not confined to any particular aspect and is widespread in the Grampians National Park.

The overstorey is dominated by Brown Stringybark Eucalyptus baxteri and Messmate E. obliqua greater than 20m in height. Less common eucalypts include Shining Peppermint *E. willisii*, Scentbark *E. aromaphloia* and Mountain Grey Gum *E. cypellocarpa*. The taller *Grampians* Heathy Dry Forest occurs on more protected slopes which often abut Lowland Forest.

Narrow and ericoid leaved shrubs are prominent, often forming a thick, low to medium height in the understorey. Prominent shrubs 1-2m in height include shrub or tree form Silver Banksia Banksia marginata, Heath Tea-tree Leptospermum myrsinoides, Myrtle Wattle Acacia myrtifolia, Western Furze Hakea Hakea repullulans, Mitchell's Wattle Acacia mitchellii, Prickly Broom-heath Monotoca scoparium, Spike Wattle Acacia oxycedrus, Prickly Tea-tree Leptospermum continentale, Prickly Moses Acacia verticillata Soft Bush-pea Pultenaea mollis and Dusty Miller Spyridium parvifolium

Heath species usually less than 1m in height are prevalent. Those most often found are Pink-bells *Tetratheca ciliata*, Common Heath *Epacris impressa*, Common Correa *Correa reflexa*, Honey-pots Acrotriche serrulata, Common Beard-heath Leucopogon virgatus, Common Hovea Hovea linearis, Common Flat-pea Platylobium obtusangulum Flame Heath Astroloma conostephioides, Common Rice-flower Pimelea humilis, Leafless Bitter-pea Daviesia brevifolia, Upright Guinea-flower *Hibbertia stricta* s.s., Horny Cone-bush *Isopogon ceratophyllus*, Prickly Geebung *Persoonia juniperina*, Showy Parrot-pea *Dillwynia sericea*, Cat's Claws Grevillea *Grevillea alpina* Variable Prickly Grevillea *G. aquifolium*, Slender Platysace Platysace heterophylla, and Beaked Hakea Hakea Austral Grass-tree Xanthorrhoea australis also rostrata. contributes to the understorey layer.

The most common forbs are those frequently found in heath communities on infertile soils such as Button Everlasting

Helichrysum scorpioides, Scented Sundew Drosera whittakeri, Tall Sundew D. peltata ssp. auriculata, Variable Stinkweed Opercularia varia, Common Raspwort Gonocarpus tetragynus, Common Billy-buttons Craspedia glauca, Ivy-leaf Violet Viola hederacea ssp. hederacea Hidden Violet V. cleistogamoides and Bent Goodenia Goodenia geniculata. Frequently occurring graminoids include Black-anther Flax-lily Dianella revoluta, Wire Rapier-sedge Lepidosperma semiteres, Wattle Mat-rush Lomandra filiformis, Milkmaids Burchardia umbellata and Small-flower Mat-rush Lomandra micrantha.

Grasses typically account for little ground cover with Weeping Grass Microlaena stipoides, Grey Tussock-grass Poa sieberiana ssp. sieberiana and P. sieberiana ssp. hirtella being the most common. In a number of areas where disturbance has occurred, presumably by fire, Wiry Speargrass Stipa muelleri forms a dense cover. Wiry Spear-grass can dominate Grampians Heathy Dry Forest.

Significant species occurring in Grampians Heathy Dry Forest are Mossy Woodruff r Asperula minima, Ribbed Bush-pea Rr Pultenaea costata and River Bossiaea r Bossiaea riparia, none of which are common in this EVC.

EVC 22 Grassy Dry Forest Grassy Dry Forest occurs on the eastern upper scree and scarp slopes of the Mt Difficult, Wonderland, Serra and parts of the Mt William Range. On these ranges, it occurs on medium to fine grained quartzose sandstones and siltstones of the Silverband Formation and Red Man Bluff geologies. It also grows on steep north-western slopes along Chinaman Track on granodiorite. Soils are shallow, light brown, sandy loams that do not retain moisture. Loose rocks often lie on the soil surface. Grassy Dry Forest is also found in very rocky domains where it forms complexes and mosaics with *Grampians* Rocky Outcrop Shrubland and *Grampians* Rocky Outcrop Herbland.

Grassy Dry Forest has a variety of overstorey species. These include Red Stringybark Eucalyptus macrohyncha, Yellow Box E. melliodora, Mountain Grey Gum E. cypellocarpa, Messmate E. oblique and Rough-barked Manna Gum E. viminalis ssp. cygnetensis. Beneath the eucalypts, Black Wattle Acacia mearnsii and Blackwood A. melanoxylon form a secondary tree layer.

Shrubs are few and sparse, and include Sallow Wattle Acacia longifolia, Wirilda A. retinoides var. retinoides, Varnish Wattle A verniciflua, Sweet Bursaria Bursaria spinosa and Rough Bush-pea Pultenaea scabra. Occasional, small ground-hugging heaths include Honey-pots Acrotriche serrulata, Flame Heath Astroloma conostephioides, Cranberry Heath A. humifusum, Creeping Bossiaea Bossiaea prostrata, Common Hovea Hovea linearis and Common Rice-flower Pimelea humilis.

The appearance of Grassy Dry Forest is characterised by a dry field layer of forbs and grasses. Common forbs include Sheep's Burr Acaena echinata, Mossy Woodruff r Asperula minima, Blue Pincushion Brunonia australis, Pink Bindweed Convolvulus erubescens, Kidney-weed Dichondra repens, Tall Sundew Drosera peltata, Creeping Cudweed Euchiton gymnocephalus s.s., Common Raspwort Gonocarpus tetragynus, Yellow Pennywort Hydrocotyle foveolata, Stinking Pennywort H. laxiflora, Small St John's Wort Hypericum gramineum, Cat's Ear * Hypochoeris radicata, Coarse Lagenifera Lagenifera huegelli, Yam-daisy Microseris scapigera s.l., Magenta Stork's-bill Pelargonium rodneyanum, Variable Plantain Plantago varia, Small Poranthera Poranthera microphylla, Narrow Groundsel Senecio tenuiflorus, Hairy Speedwell Veronica calycina, Hidden Violet Viola cleistogamoides and Ivy-leaf Violet Viola hederacea ssp. hederacea and Wahlenbergia sp.

Many grass species occur in Grassy Dry Forest, however they are often sparse amongst much bare ground. Species include Danthonia sp., Deyeuxia sp., Dichelacne sp., Common Wheat-grass Elymus scabrus and Weeping Grass *Microlaena stipoides*. Other graminoids include Wattle Mat-rush *Lomandra filiformis* and Austral Grass-tree *Xanthorrhoea australis*. Common Bog-sedge *Schoenus apogon* is the only sedge recorded.

Climbers include Common Apple Berry Billardiera scandens and Twining Fringe-lily Thysanotus patersonii.

EVC 23 Herb-rich Foothill Forest

Floristic Community 23-10 Grampians 1 Herb-rich Foothill Forest Grampians 1 Herb-rich Foothill Forest occurs on moist southern slopes, with

an average annual rainfall of 870mm. Soils are fertile clay loams derived from soft siltstones and sandstones. Grampians 1 Herb-rich Foothill Forest can be geologically specific and grows on soft siltstone in the Red Man Bluff aeologies.

Grampians 1 Herb-rich Foothill Forest is characterised by an overstorey of medium to tall eucalypts, a low diversity of shrub species and a diverse, dense ground layer of tussock grasses and forbs. Eucalypts 20-30m in height include Messmate Eucalyptus obliqua with Grey Gum E. cypellocarpa / E. alaticaulis and Manna Gum E. viminalis ssp. viminalis the subdominant species. Blackwood Acacia melanoxylon is a common understorey tree.

Shrubs are typically sparse within this community and include Prickly Currant-bush Coprosma quadrifida, Prickly Moses Acacia verticillata, Hairy

Correa Correa aemula, Common Heath Epacris impressa, Narrowleaf Wattle Acacia mucronata, Pink-bells Tetratheca ciliata, Hop Goodenia Goodenia ovata and Manuka Leptospermum scoparium

Grass tussocks above a diverse forb layer is the indicative structure of this community. Tussock grasses include Slender Tussock-grass Poa tenera, Soft Tussock-grass Poa morrisii, Common Tussock-grass Poa labillardieri ssp. labillardieri, Sword Tussock-grass Poa ensiformis and Bent-grass Deyeuxia spp. with Weeping Grass Microlaena stipoides var. stipoides growing between the tussocks. Amongst this tussock grass layer also is a carpet of forbs including Cinquefoil Cranesbill Geranium potentilloides, Cat's Ear *Hypochoeris radicata, Kidney-weed Dichondra repens, Common Lagenifera Lagenifera stipitata, Prickly Starwort Stellaria pungens, Mossy Woodruff r Asperula minima, Ivy-leaf Violet Viola hederacea ssp. hederacea, Bidgee-widgee Acaena novae-zelandiae, Spear Thistle 'Cirsium vulgare, Hairy Pennywort Hydrocotyle hirta, Stinking Pennywort Hydrocotyle laxiflora, Forest Mint Mentha laxiflora, Sheep's Burr Acaena echinata, Austral Bugle Ajuga australis, Common Woodruff Asperula conferta, Fireweed Groundsel Senecio linearifolius, Slender Swainson-pea v Swainsona brachycarpa and Hairy Speedwell Veronica calycina. The predominance of perennial forbs indicates a retention of moisture by the soil overlying clay or rock in these typically sheltered and comparatively high rainfall sites.

Common graminoids include Spiny-headed Mat-rush Lomandra longifolia, Wattle Mat-rush Lomandra filiformis ssp. coriacea, Common Woodrush Luzula meridionalis var. flaccida and Grass Trigger-plant Stylidium graminifolium Sedges include Short-stem Sedge Carex breviculmis and Red-fruit Saw-sedge Gahnia sieberiana.

Austral Bracken *Pteridium esculentum* is also present. The moist nature of this community is reflected in the number of other ground fern species commonly present including Mother Shield-fern *Polystichum proliferum*, Common Maidenhair *Adiantum aethiopicum* and Necklace Fern *Asplenium flabellifolium*.

Mountain Clematis *Clematis aristata* occurs together with other climbers such as Love Creeper *Comesperma volubile* and Common Apple-berry *Billardiera scandens*.

Significant species recorded in this floristic community include Mossy Woodruff r Asperula minima, Slender Swainson-pea v Swainsona brachycarpa, Swamp Flax-lily v Dianella callicarpa, Hairy Raspwort r Gonocarpus mezianus and Smooth Tea-tree K Leptospermum glabrescens s.l.

Floristic Community 23-11 Grampians Montane Herb-rich Foothill Forest

Grampians Montane Herb-rich Foothill Forest occurs at high altitudes of at least 900m ASL on the southern slopes of the Major Mitchell Plateau, just below Montane Rocky Shrubland. In this situation, Grampians Montane Herb-rich Foothill Forest sometimes occurs as a mosaic with Grampians Damp Forest or Grampians Shrubby Foothill Forest.

The overstorey includes Messmate *Eucalyptus obliqua*, Swamp Gum *E. ovata*, Snow Gum r *E. pauciflora* ssp. *parvitructa*, Rough-barked Manna Gum *E. viminalis* ssp. *cygnatensis* and Shining Peppermint *E. willisii*. At higher altitudes pure stands of Snow Gum can dominate this community. Blackwood *Acacia melanoxylon* is the only understorey tree recorded.

Narrow leaved shrubs are typically sparse within this community, making the understorey strata quite open. Narrow-leaf Wattle *A. mucronata*, Hedge Wattle *A. paradoxa*, Rough Wattle *Acacia* ? aspera, Sweet Bursaria *Bursaria spinosa* and Small-leaf Pomaderris *Pomaderris elacophylla* are sparsely distributed. Mount William Beard-heath Vr *Leucopogon neurophyllus* is also present due to the proximity of this community to *Grampians* Shrubby Foothill Forest. Small ground shrubs include Honey-pots *Acrotriche serrulata*, Common Heath *Epacris impressa* and Netted Daisy-bush *Olearia speciosa*. This sparse shrub layer is the same as in *Grampians* 1 Herb-rich Foothill Forest.

Grasses form a dense field layer of hummocks through which many forbs are hidden. Common Tussock-grass *Poa labillardierei* ssp. *labillardierei* is the dominant tussock-forming grass, with Sword Tussock-grass *P. ensiformis* and Slender Tussock-grass *P. tenera* also dense. These species form the same hummock structure as *Grampians* 1 Herb-rich Foothill Forest. Other species common to both communities include Yorkshire Fog **Holcus lanatus*, Weeping Grass *Microlaena stipoides*, *Agrostis* sp., and *Danthonia* sp. Grasses not found in *Grampians* 1 Herb-rich Foothill Forest are Brown-top Bent **Agrostis capillaris*, Elegant Hair-grass **Aira elegans*, Common Hedgehog-grass *Echinopogon ovatus* and Wheat-grass *Elymus scabrus*.

Perennial forbs are dense and numerous and include Bidgee Widgee Acaena novae-zelandiae, Austral Bugle Ajuga australis, Brachyscome spp., Spear Thistle *Cirsium vulgare, Craspedia spp., Kidney-weed Dichondra repens, Cinquefoil Cranesbill Geranium potentilloides, Shade Raspwort Gonocarpus humilis, Common raspwort G. tetragynus, Satin Everlasting Helichrysum leucopsidium Button Everlasting H. scorpioides, Hairy Pennywort Hydrocotyle hirta, Shining Pennywort H. sibthorpiodes, Cat's Ear *Hypochoeris radicata, Common Lagenifera Lagenifera stipitata, Common Woodrush Luzula meridionalis, Forest Mint Mentha laxiflora, Oxalis spp., Pelargonium Forest/Subalpine Buttercup spp., Ranunculus plebius/scapigera, Small Poranthera Poranthera microphylla, Slender Dock Rumex brownii, Narrow Groundsel Senecio tenuiflorus, Prickly Starwort Stellaria pungens, Hairy Speedwell Veronica calycina and Ivy-leaf Violet Viola hederacea ssp. hederacea, Cardamine sp., Clustered/Creeping Cudweed Euchiton gymnocephalus s.l., Thread Speedwell Veronica sp. aff. gracilis and a native Carraway Oreomyrrhis ? eriopoda.

Graminoids include Tasman Flax-lily *Dianella ?tasmanica*, Wattle Mat-rush *Lomandra filiformis* and Spiny-headed Mat-rush *Lomandra longifolia* and *Carex* spp.

Mother Shield-fern Polystichum proliferum Austral Bracken Pteridium esculentum and Mountain Clematis Clematis aristata are also present.

EVC 28 Rocky Outcrop Shrubland

Floristic Community 28-01 Grampians Rocky Outcrop Shrubland

Grampians Rocky Outcrop Shrubland is common and widespread within the study area, occurring at an average altitude of 610m. Due to the spectacular rock formations it is associated with, it is one of the most notable features of the Grampians National Park. It occurs primarily on the Palaeozoic sandstones that form the main ranges of the Grampians and less frequently on granitic outcrops. This shrubland is found most frequently on westerly aspects on mid to upper dip slopes on hard sandstones. Fifty to ninety percent of the area that this community occupies is on exposed rocky substrate, mostly in the form of outcropping bedrock or less frequently, large free-standing rocks and boulders. Due to the harsh environment of this EVC, plants are either short-lived forbs or the shrubs possess water conserving strategies such as hairy leaves, narrow leaves or lack of leaves. *Grampians* Rocky Outcrop Herbland, which together form the characteristic vegetation on the rocky outcrops of the Grampians and less commonly on the Black Range.

A eucalypt overstorey is occasionally absent from this community. However, when it does occur, the eucalypts are sparse and spindly and form a component of the shrub layer, only occasionally reaching tree proportions. The most frequently occurring eucalypt species in this community was formerly known as Grampians Grey Gum *Eucalyptus alaticaulis*, which is a stunted form of Grey Gum *E. cypellocarpa*. Brown Stringybark *E. baxteri*, also commonly occurs.

Whilst a shrub understorey is absent from the outcropping rock, the interstitial spaces often have a dense understorey consisting of shrubby species characteristic of rocky sites as well as more widespread species that are rarely more than 2m in height. Species characteristic of *Grampians* Rocky Outcrop Shrubland vegetation include Grey Everlasting *Ozothamus* obcordatus, Wedge-leaf Hop-bush *Dodonaea viscosa* ssp. *cuneata* and Shiny Tea-tree *L. turbinatum* Oyster Bay Cypress-pine *Callitris rhomboidea* is common, usually as a shrub but may also reach small tree proportions. Other more common species include Manuka *Leptospermum scoparium* Heath Tea-tree *L. myrsinoides*, Common Fringe-myrtle *Calytrix tetragona*, Snow Myrtle *C. alpestris*, Pink-bells *Tetratheca ciliata*, Showy Parrot-pea *Dillwynia sericea*, Hairy Correa *Correa aemula*, Spike Wattle *Acacia oxycedrus* and Common Heath *Epacris impressa*.

The common forbs and geophytes include Tall Sundew *Drosera peltata* ssp. *auriculata*, Hairy Centrolepis *Centrolepis strigosa* ssp. *strigosa*, Australian Stonecrop *Crassula sieberiana*, Cat's Ear * *H. radicata*, Milkmaids *Burchardia umbellata*, Pink Purslane *Calandrinia calyptrata*, Scented Sundew *Drosera whittakeri* and Grampians Trigger-plant *Stylidium soboliferum* Wallaby Grass *Danthonia spp*. and Weeping Grass *Microlaena stipoides* are the two grasses most often present. Grasses are more abundant in *Grampians* Rocky Outcrop Herbland.

Necklace Fern Asplenium flabellifolium is the only commonly occurring fern, but grows only in sheltered crevices. Sedges include Variable Sword-sedge Lepidosperma laterale and Common Bog-sedge Schoenus apogon. Tall Greenhood Pterostylis longifolia s.s. is often present.

Significant species occurring in *Grampians* Rocky Outcrop Shrubland include Grampians Parrot-pea r *Dillwynia oreodoxa*, Glossy Hovea Rr *Hovea corrickiae*, Grampians Zieria r *Zieria* sp. (Grampians), Hairy Raspwort r *Gonocarpus mezianus*, Rock Rose Guinea-flower r *Hibbetia cistiflora* ssp. rostrata, Ribbed Bush-pea Rr *Pultenaea costat*, Rock Banksia r *Banksia saxicola*, Mountain Bertya Rr *Bertya findlayi*, Spreading Brachyloma r *Brachyloma depressum* and Grampians Grevillea Rr *Grevillea confertifolia*. Rare eucalypts include Serra Range Gum r *Eucalyptus serraensis* and Victoria Range Gum r *Eucalyptus victoriana*.

EVC 29 Damp Forest

Floristic Community 29-02 Grampians Damp Forest

Grampians Damp Forest has a limited distribution in the study area, confined to sheltered aspects in narrow moist gullies in high rainfall areas such as the eastern scarp gullies of the Victoria Range, the eastern scarp slopes of the Serra Range from Mt. Rosea to Serra Gap and around the Mt. William Range massif. Typically, it contains broad and narrow leaved shrubs, with a suite of fern species, indicating a moist habitat. This community is poorly sampled in the Grampians. One quadrat was taken in the Victoria Range, however a lack of similar data has led to this quadrat being grouped with *Grampians* Shrubby Foothill Forest within the analysis.

Species considered indicative of *Grampians* Damp Forest and not shared with *Grampians* Shrubby Foothill Forest include Rough Tree-fern *Cyathea australis*, Golden-tip *Goodia lotifolia* var. *pubescens*, Blue Howittia *Howittia trilocularis*, Forest Mint *Mentha laxiflora*, Mother Shield-fern *Polystichum proliferum*, Fireweed Groundsel *Senecio linearifolius* and Glossy Hovea Rr *Hovea corrickiae*.

Species also commonly found in *Grampians* Damp Forest, which also occur in other surrounding floristic communities include Blackwood Acacia melanoxylon, Prickly Moses Acacia verticillata, Mountain Clematis Clematis aristata, Tasman Flax-Ily Dianella tasmanica, Mountain Grey Gum Eucalyptus cypellocarpa, Messmate Eucalyptus obliqua, Slender Tussock-grass Poa tenera, Small Poranthera Poranthera microphylla, Austral Bracken Pteridium esculentum Forest Wire-grass Tetrarrhena juncea and Ivy-leaf Violet Viola hederacea.

Three other important species noted whilst mapping *Grampians* Damp Forest in this area include Forest Starwort *Stellaria flaccida*, Manna Gum *Eucalyptus viminalis* ssp. *viminalis* and Victorian Christmas-bush *Prostanthera lasianthos*.

Other species found in *Grampians* Damp Forest include Bat's Wing-fern *Histiopteris incisa* Common Ground-fern *Calochlaena dubia*, Rough Pomaderris *Pomaderris apetala* and Prickly Currantbush *Coprosma quadrifida*.

EVC 30 Wet Forest

Floristic Community 30-03 Grampians Wet Forest Grampians Wet Forest occupies an ecological niche that is

Grampians Wet Forest occupies an ecological niche that is physically and geographically limited in the Grampians. Sites are generally south, south-east facing, in steep, narrow gullies which are sometimes spring fed and are supplemented by high annual rainfall of approximately 1000mm. The low annual rainfall received in the Grampians and the lack of

The low annual rainfall received in the Grampians and the lack of fertile, heavy soils associated with Wet Forest elsewhere in the state, makes *Grampians* Wet Forest a significant community within the study area.

Overstorey species form a tall forest of Messmate *Eucalyptus obliqua*, Mountain Grey Gum *E. cypellocarpa* and Swamp Gum *E. ovata*. Tall understorey trees are Blackwood *Acacia melanoxylon* and Rough Pomaderris *Pomaderris apetela*

Broad-leaved shrubs distinctive of Wet Forest elsewhere in the state are lacking in *Grampians* Wet Forest. Narrow-leaved shrubs include Narrow-leaf Wattle Acacia mucronata, Prickly Currant-bush Coprosma quadrifida, Rough Coprosma C. hirtella, Glossy Hovea Hovea corrickiae, Bootlace Bush Pimelea axiflora, Small-leaf Bramble Rubus parviflorus, White Elderberry Sambucus gaudichaudiana and Indian Weed Sigesbeckia orientalis.

Ferns are the distinctive lifeform in *Grampians* Wet Forest. Soft Tree-fern *Dicksonia antarctica* is often the dominant tree-fern with Austral King-fern *Todea barbara* also occasionally dominating Beneath the tree-ferns are a thick layer of ground ferns which include Fishbone Water-fern *Blechnum nudum* Hard Water-fern *B. wattsii*, Bat's Wing Fern *Histiopteris incisa* Mother Shield-fern *Polystichum proliferum* and Spleenwort *Asplenium* spp. The epiphytic ferns, Long Fork-fern *Tmesipteris obliqua* and Kangaroo Fern *Microsorum pustulatum*are also often present. Mountain Clematis *Clematis aristata* is the only common climber.

Grampians Wet Forest occurring in the gullies is almost devoid of herbs due to the closed, dense fern layer. Herbs that are found in more open areas include Forest Wire-grass Tetrarrhena juncea, Forest Starwort Stellaria flaccida, Bidgee Widgee Acaena novaezelandiae, Clustered/Creeping Cudweed Euchiton gymnocephalus s.l., Cleavers *Galium aparine, Cinquefoil Cranesbill Geranium ? potentilloides, Hairy Pennywort Hydrocotyle hirta Common Lagenifera Lagenifera stipoides, Mint Mentha spp., Prickly Starwort Stellaria pungens, Ivy-leaf Violet Viola hederacea ssp. hederacea, Weeping Grass Microlaena stipoides, Common Tussock-grass *Poa labillardierei* and Slender Tussock-grass *P. tenera.* Mosses also form an important part of the floristic diverstiy and provide substrate for some small ferns to grow. **EVC 37 Montane Grassy Woodland**

EVC 37 Montalle Grassy woodialid

Floristic Community 37-03 GrampiansMontane Grassy Woodland

Grampians Montane Grassy Woodland is only mapped in one small area of the Grampians National Park on skeletal soils over a dark purple conglomerate rock. The site occurs at 900m on a north-westerly aspect.

Grampians Montane Grassy Woodland is a very open and sparsely treed woodland, with multi-stemmed, stunted trees, less than 5m in height. The combination of eucalypts are also unusual, with Snow Gum *Eucalyptus pauciflora* ssp. *parvifructa*, *E. viminalis/aromophioia* sp. *Nov*. and Brown Stringy Bark *E. baxteri* occurring together. Brown Stringybark is found in the surrounding *Grampians* Shrubby Foothill Forest and Snow Gum is nearby in the *Montane* Herb-rich Foothill Forest, but the *E. viminalis/aromophioia sp. Nov*. is currently being considered as a new species, only recorded from this site.

Shrubs are small and sparse, contributing little to the ground cover. They include Thin-leaf Wattle Acacia aculeatissima, Blackwood A. melanoxylon, Hedge Wattle A. paradoxa, Honey Pots Acrotriche serrulata, Pine Heath Astroloma pinifolium, Showy Parrot-pea Dillwynia sericea, Common Heath Epacris impressa, Manuka Leptospermum scoparium and Common Rice-flower Pimelea humilis.

Herbs form a major component of the field layer with Argentipallium sp. and Chrysocephalum apiculatum s.l. being prolific. Common forbs present include Blue Pincushion Brunonia australis, Hairy Centrolepis Centrolepis strigosa, Craspedia sp., Austral Carrot Daucus glochidiatus, Kidney-weed Dichondra repens, Tall Sundew Drosera peltata, Scented Sundew Drosera whitakerii, Geranium sp., Common Raspwort Gonocarpus tetragynus, Hairy Pennywort Hydrocotyle hirta, Small St John's Wort Hypericum gramineum, Smooth Cat's Ear *Hypochoeris glabra, Cat's Ear *Hypochoeris radicata, Lagenifera sp., Oxalis sp., Magenta Stork's-bill Pelargonium rodneyanum, Small Poranthera Poranthera microphylla, Prickly Starwort Stellaria pungens, Taraxacum sp., Hairy Speedwell Veronica calycina, Ivy-leaf Violet Viola hederacea ssp. hederacea and Wahlenbergia sp.

Grasses are numerous and form a lawn on the skeletal soil. Grasses present include Agrostis sp., Elegant Hair-grass *Aira elegans, Danthonia sp., Dichelacne sp., ?Elymus sp., Weeping Grass Microlaena stipoides, ?Poa annua, Common Tussock-grass Poa labillardieri, Poa spp. and Kangaroo Grass Themeda triandra.

Graminoids are also an important element of the ground layer and species include *Dianella callicarpa/tasmanica*, Black-anther Flax-lily *Dianella revoluta*, Wattle Mat-rush *Lomandra filiformis*, Spiny-headed Mat-rush *L. longifolia*, Dwarf Mat-rush *L. nana* and *?Neurachne alopecuroidea*.

Perennial geophytes identifiable in the dry conditions at the time of sampling include *Arthropodium* sp., Milkmaids *Buchardia umbellata*, Blue Squill *Chamaescilla corymbosa*, Parson's Bands *Eriochilus cuculatus* and *Orchidaceae* spp.

Sedges are few, with Common Woodrush *Luzula meridionalis* and Dwarf Rush **Juncus capitatus* the only species recorded.

EVC 45 Shrubby Foothill Forest

Floristic Community 45-02 GrampiansShrubby Foothill Forest

Grampians Shrubby Foothill Forest occurs primarily along the eastern side of the Victoria Range where the rainfall is between 800mm and 1140mm per annum. In higher altitude quadrats, this rainfall is enhanced by cloud cover, often to ground level. The soils are fertile loams to sandy clay loams rich in organic matter. Typically the soil is shallow over the parent rock, with many loose rocks at and above the surface of the soil. It is found at an average altitude of 745 m ASL on upper slopes, just below the ridge-line. It is most commonly found on east-facing slopes or with a sheltered south-easterly aspect.

This floristic community has two structural classes: a medium forest on deeper soils and a shorter forest on shallow soil over rock. In most instances, the taller structural class of *Grampians* Shrubby Foothill Forest has been logged, compared with the shorter structural class. The eucalypt overstorey is dominated by Messmate *E. obliqua*, growing to more than 20m. Brown Stringybark *E. baxteri* is co-dominant, with Mountain Grey Gum *E. cypellocarpa*, Shining Peppermint *E. willisii*, and Victoria Range Gum r *E victoriana* occurring less frequently.

Understorey trees include the occasional Blackwood Acacia melanoxylon, Rock Banksia r Banksia saxicola. and Broom-heath Rr Monotoca billawinica. Many sites appeared to be protected from fire, with well developed understoreys and old-growth Banksia saxicola.

The lower shrub layer consists of a variety of broad, narrow and ericoidleaved species. The most common broad leaved species include Rough Coprosma *Coprosma hirtella*, Moth Daisy-bush *Olearia erubescens* and Hairy Correa *Correa aemula*. Narrow-leaved species include Pink-bells Tetratheca ciliata, Rough Bush-pea Pultenaea scabra, Spike Wattle Acacia oxycedrus, Gorse Bitter-pea Daviesia ulicifolia, Slender Platysace Platysace heterophylla, Common Rice-flower Pimelea humilis, Dwarf Boronia Boronia nana var. pubescens, Shiny Tea-tree Leptospermum turbinatum, Silver Banksia Banksia marginata, Variable Prickly Grevillea Grevillea aquifolium, Rough Star-hair Astrotricha asperifolia, Manuka Leptospermum scoparium, Mount William Beard-heath Rr Leucopogon neurophyllus, Thyme Beard-heath L. thymifolius, Prickly Geebung Persoonia juniperina, Prickly Bush-pea Pultenaea juniperina and Soft Bush-pea Pultenaea mollis. Common ericoid-leaved shrubs present are Heath Epacris impressa, Honey-pots Acrotriche serrulata and Golden Heath Styphelia adscendens.

The broad leaved Tasman Flax-lily *Dianella tasmanica* and Blackanther Flax-lily *Dianella revoluta* s.s. are frequently present above a ground layer of forbs and grasses. Common forbs are Broom Spurge *Amperea xiphoclada* ssp. *xiphoclada*, Ivy-leaf Violet Viola hederacea ssp. hederacea, Tall Sundew Drosera peltata ssp. auriculata, Shade Raspwort Gonocarpus humilis and Button Everlasting *Helichrysum scorpioides*.

Graminoids present include Wattle Mat-rush Lomandra filiformis, Grass Trigger-plant Stylidium graminifolium, Austral Grass-tree Xanthorrhoea australis, and Cluster-headed Mat-rush r Lomandra longifolia ssp. exilis. Red-fruit Saw-sedge Gahnia sieberiana sometimes occurs with Variable Sword-sedge Lepidosperma laterale and Wire Rapier-sedge L. semiteres. Austral Bracken Pteridium esculentumis found at all sites.

The most common grasses are the trailing and climbing Hairy Ricegrass *Tetrarrhena distichophylla*, Heath Bent-grass *Deyeuxia densa*, Matted Tussock-grass *Poa clelandii* and Grey Tussockgrass *P. sieberiana* var. *hirtella*. Forest Wire-grass *Tetrarrhena juncea* dominates the lower stratum in a number of sites that have presumably been disturbed by selective timber harvesting. Litter and large fallen logs, many from logging activities, are common on the forest floor.

Downy Dodder-laurel *Cassytha pubescens* s.s. and Orange Bellclimber *Billardiera bignoniacea* are the common climbers, with Common Hovea *Hovea linearis* trailing along the ground.

Significant species found in this floristic community are Rock Banksia r Banksia saxicola, Mount William Beard-heath Rr Leucopogon neurophyllus, Grampians Broom-heath Rr Monotoca billawinica, Cluster-headed Mat-rush r Lomandra longifolia ssp. exilis, Swamp Flax-lily v Dianella callicarpa, Grampians Parrot-pea r Dillwynia oreodoxa, Rr Glossy Hovea Hovea corrickiae, Victoria Range Gum r Eucalyptus victoriana, Common Tussock Grass k Poa labillardieri var. acris and Ribbed Bush-pea Rr Pultenaea costata.

EVC 47 Valley Grassy Forest

Florsitic Community 47-03 Grampians Valley Grassy Forest

Grampians Valley Grassy Forest arises consistently on a variety of geologies. The soils are loams and sandy loams with high organic content. Depth of the soil is dependent on its position within the landscape. Sites on lower slopes are on deeper soils overlying clay. Soils on mid to upper slopes tend to be shallow loams over rock, with lose rocks and rock outcropping common. Grampians Valley Grassy Forest is most often located on protected easterly and southerly slopes. Altitude also varies considerably, occurring as low as 240m ASL on gentle slopes to 660m ASL below ridgelines. The largest area of *Grampians* Valley Grassy Forest grows along the Fyans Creek valley in which Halls Gap is situated.

Brown Stringybark *Eucalyptus baxteri* and Messmate *E. obliqua* are co-dominant, with Grampians Grey Gum *E. alaticaulis* subdominant. A variety of other eucalypt species occur, including Shining Peppermint *E. willisii*, Mountain Grey Gum E. *cypellocarpa*, Swamp Gum *E. ovata* and Scentbark *E. aromaphloia*.

An open shrubby understorey that is generally low in species diversity is found below the overstorey. The most common species, approaching 5m in height, are Blackwood Acacia melanoxylon, Black Wattle A. meamsii, Manuka Leptospermum scopariumand tree form Silver Banksia Banksia marginata.

With the exception of species forming a sparse lower understorey such as Common Heath *Epacris impressa*, Honey-pots *Acrotriche serrulata*, Pink-bells *Tetratheca ciliata* and Austral Grass-tree *Xanthorrhoea australis*, species that are otherwise quite ubiquitous in forests and woodlands in the Grampians are notably lacking in *Grampians* Valley Grassy Forest indicating the more fertile nature of the soils.

The most notable feature of *Grampians* Valley Grassy Forest is a herb-rich ground layer that is frequently associated with Weeping

Grass Microlaena stipoides. The most common forbs are Tall Sundew Drosera peltata ssp. auriculata, Hairy Speedwell Veronica calycina, Ivy-leaf Violet Viola hederacea ssp. hederacea, Cat's Ear *Hypochoeris radicata, Mossy Woodruff Asperula minima, Common Lagenifera Lagenifera stipitata Grassland Wood-sorrel Oxalis perennans, Small Poranthera Poranthera microphylla, Button Everlasting Helichrysum scorpioides, Variable Stinkweed Opercularia varia, Scented Sundew Drosera whittakeri, Small St John's Wort Hypericum gramineum Narrow Groundsel Senecio tenuiflorus, Common Raspwort Gonocarpus tetragynus and Kidney-weed Dichondra repens. Other common grasses in addition to Weeping Grass are Reed Bent-grass Deyeuxia quadriseta, Soft Tussock-grass Poa morrisii, Grey Tussock-grass P. sieberiana var. sieberiana and Slender Tussock-grass P.

A variety of lilies, sedges and mat-rushes are also present, the most common of these graminoids being Black-anther Flax-lily *Dianella revoluta*, Wattle Mat-rush *Lomandra filiformis*, Spiny-headed Mat-rush *L. longifolia* ssp *longifolia*, Milkmaids *Burchardia umbellata* and Short-stem Sedge *Carex breviculmis*. Climbers present are Love Creeper *Comesperma volubile*, Common Apple-berry *Billardiera scandens* and less commonly Twining Fringe-lily *Thysanotus patersonii*.

Austral Bracken *Pteridium esculentum* is also an important component of the ground layer. Large quantities of litter and some exposed sandstone are also present on the forest floor.

Significant species are r Asperula minima and less commonly Rock Banksia r Banksia saxicola, Hairy Raspwort Gonocarpus mezianus and Clover Glycine Vv Glycine latrobeana.

EVC 48 Heathy Woodland

Heathy Woodland is comprised of six floristic communities within the Greater Grampians, covering large tracts of the landscape between Rocky Outcrop communities, the taller forest growing in protected niches and the floodplains. This EVC is primarily on sandy outwash systems of variable depth and geology. Outwash sands range from pale, siliceous sands to orange-red lateritic gravels. Heathy Woodland contains two of the most species-rich communities in the study area. It also contains a number of ubiquitous heath species indicative of the Grampians, with each community having its own suite of distinguishing heaths.

Floristic Community 48-01 Plains Lateritic Heathy Woodland

Plains Lateritic Heathy Woodland occurs on well-drained, lateritic soils, usually on Pliocene ferruginised fluviatile gravels, sands and clays and on 'laterites' as well as on rhyolites south of Rocklands Reservoir. It grows on gently undulating to flat ground bordering alluvial flats, with æolian sand covering the 'A' soil horizon. The sand depth, in most instances, is greater than that of *Slopes Lateritic* Heathy Woodland.

A variety of eucalypts form the overstorey with Yellow Gum *E. leucoxylon* and Messmate *Eucalyptus obliqua* being the most common. Yellow Gum commonly occurs with Yellow Box *E. melliodora*, whilst Messmate is usually associated with Brown Stringybark *E. baxteri* and Long-leaf Box *E. goniocalyx*. Occasionally, up to four eucalypt species can be co-dominant. Trees are 20-30m tall, open-crowned and sparse in cover, whereas the eucalypts in *Slopes Lateritic* Heathy Woodland are much shorter, densely crowded and have crowns with a tangled spreading habit.

The most common species in the diverse shrubby understorey (typically 0.4-1m tall) are the narrow-leaved and ericoid-leaved Honey-pots Acrotriche serrulata, Flame Heath Astroloma conostephioides, Cranberry Heath A. humifusum, Daphne heath Brachyloma daphnoides, Heath Tea-tree Leptospermum myrsinoides, Silver Banksia Banksia marginata (shrub form or tree form to 5m tall), Common Correa Correa reflexa, Upright Guineaflower Hibbertia stricta s.l., Common Beard-heath Leucopogon virgatus, Common Flat-pea Platylobium obtusangulum Horny Cone-bush Isopogon ceratophyllus, Common Rice-flower Pimelea humilis, Leafless Bitter-pea Daviesia brevifolia, Dwarf Wedge-pea Gompholobium ecostatum, Cat's Claws Grevillea Grevillea alpina, Golden Heath Styphelia adscendens, Pinkbells Tetratheca ciliata, Slender Sheoke Allocasuarina misera, Common Fringe-myrtle Calytrix tetragona, Smooth Parrot-pea Dillwynia glaberrima, Showy Parrot-pea D. sericea and Beaked Hakea Hakea rostrata. These shrubs are often entwined by Downy Dodder-laurel Cassytha pubescens s.s. Leafless Bitter-pea Bossiaea prostrata and Running Postman Kennedia prostrata are common prostrate species.

Plains Lateritic Heathy Woodland has many more herb species than Slopes Lateritic Heathy Woodland, suggesting that this community may be wetter and more fertile. The most common forbs include Bent Goodenia Goodenia geniculata, Scarlet Sundew Drosera glanduligera, Stinking Pennywort Hydrocotyle laxiflora, Yam-daisy Microseris scapigera spp. agg., Sheep's Burr Acaena echinata, Blue Pincushion Brunonia australis, Pointed Centrolepis Centrolepis aristata, Common Raspwort Gonocarpus tetragynus, Smooth Cat's Ear *Hypochoeris glabra, Wiry Mitrewort Mitrasacme paradoxa, Small Poranthera Poranthera microphylla, Tall Bluebell Wahlenbergia stricta ssp. stricta, Yellow Pennywort Hydrocotyle foveolata, Small St John's Wort Hypericum gramineum, Hidden Violet Viola cleistogamoides, Annual Blue-bell Wahlenbergia gracilenta s.l., Austral Carrot Daucus glochidiatus, Creeping Cudweed Euchiton gymnocephalus s.s., Black's Goodenia Goodenia blackiana and Button Everlasting

Helichrysum scorpioides. Perennial geophytes include Chocolatelily Arthropodium strictum Milkmaids Burchardia umbellata, Blue Squill Chamaescilla corymbosa ssp. corymbosa, Black Anther Flax-lily Dianella revoluta and Twining Fringe-lily Thysanotus patersonii.

The most common grasses are Elegant Hair-grass *Aira elegans, Weeping Grass Microlaena stipoides, Supple Spear-grass Stipa mollis, Grey Tussock-grass Poa sieberiana var. hirtella, Velvet Wallaby-grass Rytidosperma pilosum, Bristly Wallaby-grass R. setaceum, Lesser Quaking-grass 'Briza minor and Five-awned Spear-grass Pentapogon quadrifidus.

The ground layer also contains sedges such as Common Bogsedge Schoenus apogon and Black Rapier-sedge Lepidosperma carphoides. Graminoids include Small Mat-rush Lomandra soraria and Dwarf Mat-rush Lomandra nana.

Yucca r Xanthorrhoea caespitosa is found in the State Forest to the south of the Black Range as well as in the west of the Grampians National Park. Austral Grass-tree Xanthorrhoea australis occurs elsewhere in this community within the Grampians National Park.

Significant species occurring in Plains Lateritic Heathy Woodland are Yucca r Xanthorrhoea caespitosa, Blotched Sun-orchid r Thelymitra benthamiana, Early Golden-moths k Diuris sp. aff. lanceolata (Derrinallum), Mossy Woodruff r Asperula minima and Azure Sun-orchid v Thelymitra azurea.

Florsitic Community 48-02 Gully Outwash Heathy Woodland Gully Outwash Heathy Woodland occurs along the western slopes

of the Serra Range on Mount Difficult Sandstones. It grows on the lower outwash slopes, where deep white sands with many loose surface rocks are thought to have been washed down in a single catastrophic event. The soils are medium and fine grained, derived from quartzose sandstones, with some pebble beds near the base.

Brown Stringybark Eucalyptus baxteri, Shining Peppermint E. willisii, Messmate E. obliqua and Rough-barked Manna Gum E. viminalis ssp. cygnetensis form the short and open canopy. Oyster Bay Cypress-pine *Califiris rhomboidea* and Cherry *Exocarpus cupressiformis* are patchy understorey trees. Ballart

Narrow and ericoid-leaved shrubs dominate this community, with indicator shrub species combined from numerous other heathy communities. Importantly, *Gully Outwash* Heathy Woodland contains species rarely seen in any of the other heathy communities. These include Showy Bossiaea Bossiaea cinerea, Flame Grevillea Grevillea dimorpha, Twisted Beard-heath Leucopogon glacialis and Rough Bush-pea Pultenaea scabra.

Other shrubs that commonly occur are Spike Wattle Acacia oxycedrus, Broom Spurge Amperea xiphoclada var. xyphoclada, Fringed Brachyloma Brachyloma ciliatum, Common Fringe-myrtle Calytrix tetragona, Victorian Smoke-bush Conospermum mitchellii, Western Furze Hakea Hakea repullulans, Beaked Hakea Hakea rostrata, Bushy Hakea Hakea sp. (ex H.sericea sensu Willis 1972), Silky Guinea-flower Hibbertia sericea s.l., Twiggy Guinea-flower H. virgata, Manuka Leptospermum scoparium, Pink Beard-heath Leucopogon ericoides, Heathy Phyllota Phyllota pleurandroides, Dwarf Bush-pea Pultenaea humilis, Soft Bush-pea Pultenaea mollis, Dusty Miller Spyridium parvifolium and Winged Spyridium S. vexilleferum.

Ubiquitous heath species that consistently occur but are not used as indicator species include Allocasuarina spp., Flame Heath Astroloma conostephioides, Silver Banksia Banksia marginata, Dwarf Boronia Boronia nana var. pubescens, Common Correa Correa reflexa, Leafless Bitter-pea Daveisia brevifolia, Smooth Parrot-pea Dillwynia glaberrima, Common Heath Epacris impressa, Variable Prickly Grevillea Grevillea aquifolium, Bundled Guineaflower Hibbertia prostrata, Horny Cone-bush Isopogon ceratophyllus, Heath Tea-tree Leptospermum myrsinoides, Common Beard-heath Leucopogon virgatus, Prickly Broom-heath Monotoca scoparia, Prickly Geebung Persoonia juniperina, Common Flat-pea Platylobium obtusangulum, Golden Heath Styphelia adscendens and Pink-bells Tetratheca ciliata.

Common graminoids include Thick Twist-rush Caustis pentandra, Black-anther Flax-lily Dianella revoluta, Tassel Rope-rush Hypolaena fastigata, Dwarf Wire-lily Laxmannia orientalis, Scaleshedder Lepidobolus drapetocoleus, Black Rapier-sedge Lepidosperma carphoides, Wire Rapier-sedge L. semiteres, Wattle shedder Mat-rush Lomandra filiformis, Small Mat-rush L. soraria and Austral Grass-tree Xanthorrhoea australis.

Perennial geophytes are not common but include Milkmaids Burchardia umbellata and Red-beaks Lyperanthus nigricans. Forbs are few, but include Sundew Drosera macrantha, Scented Sundew D. whittakeri, Bent Goodenia Goodenia geniculata, Button

Everlasting Helichrysum scorpioides and Narrow Groundsel Senecio tenuiflorus. Grasses are few with the main one dominating the community being Wiry Spear-grass Stipa muelleri.

Floristic Community 48-03 Grampians Desert Heathy Woodland Grampians Desert Heathy Woodland is confined to well-drained deep loamy sands on gentle outwash slopes surrounding Mt Stapylton and Mt Zero in the northern part of the Grampians National Park. These usually pink or orange sands, typically 50-100cm deep, overlay either clay or bedrock. Occasionally, small, loose rocks lie at the soil surface. The northern part of the Grampians receives the least rainfall in the study area, with Grampians Desert Heathy Woodland receiving an average of 560mm per annum. Whilst this annual rainfall is greater than 300-400mm per annum received in the Victorian deserts and Mallee to the north-west of the Grampians, the combination of low rainfall and deep sand provides similar environmental conditions. Subsequently, a number of species more commonly found in the Victorian deserts and Mallee occurs in Grampians Desert Heathy Woodland of the Northern Grampians. These include Desert Stringybark Eucalyptus arenaceae, Slaty Sheoke Allocasuarina muelleriana ssp. muelleriana, Leafless Currant-bush Leptomeria aphylla, Tiny Bog-sedge Schoenus nanus and Desert Baeckea Baeckea crassifolia.

Grampians Desert Heathy Woodland often has a sparse eucalypt overstorey typically less than 10m tall, although on rare occasions it may reach 20m. The most common eucalypt is Desert Stringybark Eucalyptus arenaceae which is a characteristic species of this community and frequently codominates with Long-leaf Box E. goniocalyx. Where the sands are more shallow or less well drained, Yellow Gum E. leucoxylon is present either with these species or less commonly as the only eucalypt species. Oyster Bay Cypress-pine Callitris rhomboidea often occurs to tree height.

The layered shrub strata includes taller shrubs to 2m in height, with a lower layer of heathy species. Taller shrubs include Slaty Sheoke Allocasuarina muelleriana ssp. muelleriana, Bushy Hakea Hakea sp. (sensu Willis) and Golden Wattle Acacia pycnantha.

The lower shrub laver consists of narrow-leaved and ericoid-leaved species such as Common Fringe-myrtle Calytrix tetragona, Cat's Claws Grevillea Grevillea alpina, Heath Tea-tree Leptospermum myrsinoides, Pine Heath Astroloma pinifolium, Variable Prickly Grevillea Grevillea aquifolium, Ruddy Beard-heath Leucopogon rufus, Flame Heath Astroloma conostephioides, Daphne Heath Brachyloma daphnoides, Showy Parrot-pea Dillwynia sericea, Upright Guinea-flower Hibbertia stricta s.l., Common Beard-heath Leucopogon virgatus, Thyme Spurge *Phyllanthus hirtellus*, Horny Cone-bush *Isopogon ceratophyllus* and *Hibbertia* sp. cf *riparia* (Grampians). Austral Grass-tree *Xanthorrhoea australis* is also commonly present.

Litter and/or bare ground are frequently the most common constituents of the herbaceous woodland floor.

Common forbs are Scarlet Sundew Drosera glanduligera, Pointed Centrolepis Centrolepis aristata, Sundew Drosera macrantha, Small Pennywort Hydrocotyle callicarpa, Smooth Cat's Ear *Hypochoeris glabra, Hairy Centrolepis Centrolepis strigosa ssp strigosa, Scented Sundew Drosera whittakeri and Common Raspwort Gonocarpus tetragynus. Geophytes include Twining Fringe-Iily Thysanotus patersonii, Blue Squill Chamaescilla corymbosa, and Early Golden Moths k Diuris sp. aff. lanceolata (Derrinallum).

The only significant species is Early Golden Moths k Diuris sp. aff. lanceolata (Derrinallum).

Floristic Community 48-05 Slopes Lateritic Heathy Woodland Slopes Lateritic Heathy Woodland occurs on well-drained orange lateritic soils, usually of sedimentary origin and sometimes igneous. It grows in low elevations, with slight to moderate to steep slopes. Exceptions to this occur in the Black Range, where *Slopes Lateritic* Heathy Woodland is on gently undulating terrain south of Rocklands Resevoir.

The structure is distinctive with a dense canopy of eucalypts short in stature (10-15m) with crowns exhibiting a spreading and tangled habit and trunks often leaning. The stringybark eucalypts dominate this community, with Brown Stringybark Eucalyptus baxteri and Messmate E. obliqua codominant. Long-leaf Box Eucalyptus goniocalyx can also dominate and is present on shallow rocky soils at exposed sites, often in close proximity to the two communities of Hills Herb-rich Woodland.

The most common species in the diverse shrubby understorey are the narrow-leaved and ericoid-leaved species including Flame Heath Astroloma conostephioides, Common Correa Correa reflexa, Prickly Grevillea Grevillea aquifolium, Heath Tea-tree Leptospermum myrsinoides, Common Flat-pea, Platylobium obtusangulum, Pink-bells Tetratheca ciliata, Daphne heath Brachyloma daphnoides, Showy Parrot-pea Dillwynia sericea, Common Beard-heath Leucopogon virgatus, Honey-pots Acrotriche serrulata, Cranberry Heath Astroloma humifusum, Silver Banksia Banksia marginata, Horny Cone-bush *Isopogon ceratophyllus*, Thyme Spurge *Phyllanthus hirtellus*, Myrtle Wattle *Acacia myrtifolia*, Leafless Bitter-pea *Daviesia brevifolia*, Erect Guinea-flower *Hibbertia riparia*, Silky Guinea-flower *H*. sericea s.l., Ruddy Beard-heath Leucopogon rufus, Pine Heath Astroloma pinifoliumand Golden Heath Styphelia adscendens. These shrubs are often

entwined by Downy Dodder-laurel Cassytha pubescens s.s. and Love Creeper Comesperma volubile.

The ground layer species include the decumbent Hovea Hovea linearis and forbs such as Blue Pincushion Brunonia australis, Common Raspwort Gonocarpus tetragynus, Button Everlasting Helichrysum scorpioides, Variable Stinkweed Opercularia varia, Tall Sundew Drosera peltata ssp. auriculata, Black's Goodenia Goodenia blackiana, Scented Sundew Drosera whittakeri, Pointed Centrolepis Centrolepis aristata, Scarlet Sundew Drosera glanduligera, Bent Goodenia Goodenia geniculata, Small Pennywort Hydrocotyle callicarpa and Hidden Violet Viola cleistogamoides.

The most common grasses are Grey-beard Grass Amphipogon strictus var. setifer, Wallaby Grasses Austrodanthoniaspp., Fox-tail Mulga-grass Neurachne alopecuroidea, Supple Spear-grass Austrostipa mollis and Weeping Grass Microlaena stipoides.

Yucca r Xanthorrhoea caespitosa and Austral Grass-tree Xanthorrhoea australis are also present.

The most common graminoids are Small Mat-rush Lomandra sororia and Dwarf Mat-rush L. nana. Sedges include Black Rapiersedge Lepidosperma carphoides, Common Bog-sedge Schoenus apogon, and Wire Rapier-sedge Lepidosperma semiteres. The restionaceous Tassel Rope-rush Hypolaena fastigata and Scale-shedder Lepidobolus drapetocoleus are also present.

Significant species occurring in *Slopes Lateritic* Heathy Woodland are Ribbed Bush-pea Rr *Pultenaea costata*, Yucca r *Xanthorrhoea caespitosa*, Rock Wattle r *Acacia rupicola*, Early Golden-moths k *Diuris* sp. aff. *lanceolata* (Derrinallum), Hairy Raspwort r *Gonocarpus mezianus*, Scented Bush-pea v *Pultenaea graveolens*, Mt. Byron Bush-pea *Pultenaea patellifolia*, Williamson's Bush-pea *Pultenaea williamsoniana* and Narrow-leaf Trymalium r *Trymalium daltonii*.

Florsitic Community 48-08 Sandy Outwash Heathy Woodland Sandy Outwash Heathy Woodland is typically found on deep outwash, fine to medium grained quartzose sands. On upper slopes, the sand can be quite shallow, with many small sandstone rocks at the soil surface. Progression further downslope brings deeper outwash sand, more typical of this community. Sandy Outwash Heathy Woodland is generally found on outwash slopes, often with some rock components of variable size in the outwash. It can occur directly under rocky outcrops or as part of larger areas of sand at the mid to lower end of the outwash profile. Average annual rainfall for this community is variable because it is present in all ranges within the National Park and in the Black Range State Park.

The overstorey comprises woodland eucalypts most frequently 10-20m tall, although occasionally reaching 25-30m. The dominant eucalypt species is Messmate *Eucalyptus obliqua*. Brown Stringybark *E. baxteri* frequently co-occurs or dominates at times. Various other eucalypts can be present, however their occurrence is sub-dominant to *E. obliqua* or *E. baxteri*. These include Scentbark *E. aromaphloia*, Shining Peppermint *E. willisii*, Long-leaf Box *E. goniocalyx* and Rough-barked Manna Gum *E. viminalis* ssp. *cygnetensis*.

The understorey is rich in narrow-leaved and ericoid-leaved species typical of heath communities that form an open understorey usually less than 1.5m tall. The most common of these species are Heath Tea-tree *Leptospermum myrsinoides*, Common Heath *Epacris impressa*, Bundled Guinea-flower *Hibbertia prostrata*, Horny Cone-bush *Isopogon ceratophyllus*, Common Beard-heath *Leucopogon virgatus*, Common Rice-flower *Pimelea humilis*, Flame Heath *Astroloma conostephioides*, shrub form Silver Banksia *Banksia marginata*, Showy Parrot-pea *Dillwynia sericea*, *Allocasuarina* spp., Smooth Parrot-pea *D. glaberrima*, Common Flat-pea *Platylobium obtusangulum*, Pinkbells *Tetratheca ciliata* and Common Correa *Correa reflexa* while numerous other (heathy) species are also found. Austral Grasstree Xanthorrhoea australis also forms an important component of this community. Taller shrubs to 5m tall include tree form Silver Banksia *Banksia marginata* and Oyster Bay Cypress-pine *Callitris rhomboidea*.

Forbs do not contribute significantly to the ground cover. Those present include Common Raspwort *Gonocarpus tetragynus*, Bent Goodenia *Goodenia geniculata*, Tall Sundew *Drosera peltata* ssp. *auriculata*, Scented Sundew *Drosera whittakeri*, Variable Stinkweed *Opercularia varia*, Hidden Violet *Viola cleistogamoides* and Button Everlasting *Helichrysum scorpioides*.

Geophytes and graminoids are quite common and diverse. Blue Squill Chamaescilla corymbosa var. corymbosa, Milkmaids Burchardia umbellata, Chocolate Lily Arthropodim strictum, Twining Fringe Lily Thysanotus patersonii and numerous orchids such as Pink Fingers Caladenia carnea spp. agg., Wax-lip Orchid Glossodia major, Rabbits-ears Thelymitra antennifera, Spotted Sun-orchid T. ixioides, Redbeaks Lyperanthus nigricans and Greenhood Pterostylis spp. Prominent graminoids are Black-anther Flax-lily Dianella revoluta, Small-flower Matrush Lomandra micrantha, Small Mat-rush L. soraria and Wattle Mat-rush L. filiformis.

Thatch Saw-sedge *Gahnia radula* and Wire Rapier-sedge *Lepidosperma* semiteres are the two dominant sedges. Tassel Rope-rush *Hypolaena* fastigata is frequently present but does not dominate the ground cover as in wetter heath EVCs such as Sand Heathland.

The climbers Downy Dodder-laurel Cassytha pubescens and Love Creeper Comesperma volubile are typically found intertwining the low heath species.

Grasses are low in diversity and abundance, with Wallaby Grass *Austrodanthoniaspp.* and Weeping Grass *Microlaena stipoides* var. *stipoides* usually present. When disturbed by fire, a dense cover of Wiry Spear-grass *Austrostipa muelleri* can dominate in some areas of the Park.

There are few significant species in Sandy Outwash Heathy Woodland. Those noted include Blotched Sun-orchid r Thelymitra benthamiana, Mossy Woodruff r Asperula minima and Scented Bush-pea v Pultenaea graveolens.

Floristic Community 48-09 Sand Heathy Woodland

Sand Heathy Woodland occurs on. gently undulating terrain at the base of slopes and on deep sands on the plains. Soils are deep, well drained, white aeolian and outwash sands

Sand Heathy Woodland has a diverse shrub layer, dominated by narrowleaved and epacrid shrubs. The taller, narrow-leaved shrubs from 1-1.5m in height include Slender Sheoke Allocasuarina misera, Silver Banksia Banksia marginata, Desert Banksia B. ornata, Common Fringe-myrtle Calytrix tetragona, Victorian Smoke-bush Conospermum mitchellii, Common Correa Correa reflexa, Western Furze Hakea Hakea repullulans, Bushy Hakea Hakea sp. (ex H. sericea sensu Willis 1972), Heath Tea-tree Leptospremum myrsinoides and Winged Spyridium Spyridium vexilliferum

Small heaths include Broom Spurge Amperea xiphoclada ssp. xiphoclada, Flame Heath Astroloma conostephioides, Daphne heath Brachyloma daphnoides, Blue Tinsel-lily Calectasia intermedia, Leadless Bitter-pea Daveisia brevifolia, Smooth Parrot-pea Dillwynia galberrima, Showy Parrotpea D. sericea, Common Heath Epacris impressa, Common Wedge-pea Gompholobium huegelii, Bundled Guinea-flower Hibbertia prostrata, Erect Guinea-flower H. riparia, Silky Guinea-flower Hibbertia sericea s.l., Twiggy Guinea-flower H. virgata, Common Hovea Hovea linearis, Horny Cone-bush Isopogon ceratophyllus, Pink Beard-heath Leucopogon ericoides, Common Beard-heath L. virgatus, Prickly Broom-heath Monotoca scoparia, Prickly Geebung Persoonia juniperina, Heathy Phyllota Phyllota pleurandroides, Common Rice-flower Pimelea humilis, Common Flat-pea Platylobium obtusangulum, Golden Heath Styphelia adscendens and Pink-bells Tetratheca ciliata.

Austral Grass-tree Xanthorrhoea australis also foms part of the shrub layer, with Downy Dodder-laurel Cassytha pubescens s.s. entwined amongst the shrubs.

The deep, sandy nature limits the variety of herbs in Sand Heathy Woodland. Forbs include Common Raspwort Gonocarpus tetragynus, Bent Goodenia Goodenia geniculata and Button Everlasting Helichrysum scorpioides. Few grasses are present, with negligible cover.

Perennial geophytes include Nodding Chocolate-lily Arthropodium fimbriatum Creamy Candles Stackhousia monogyna and Grass Triggerplant Stylidium graminifolium

Other ground covers include Thatch Saw-sedge Gahnia radula, Tassel Rope-rush Hypolaena fastigata, Scale-shedder Lepidobolus drapetocoleus and Black Rapier-sedge Lepidosperma carphoiodes.

EVC 55 Plains Grassy Woodland

Floristic Community 55-02 Greater Grampians Plains Grassy Woodland

Greater Grampians Plains Grassy Woodland occurs on shallow, fine sandy clay loams from 20-40cm in depth. These sands overlay drainage-impeding light to medium clays. Laterites are often found where the sand grades into clay. Undulating lower slopes and plains that may occasionally be seasonally inundated are the common landscapes in which Greater Grampians Plains Grassy Woodland occurs. Average annual rainfall is low at around 620 mm, but the clay layer not far from the soil surface helps in the retention of some moisture. It is found in the Black Range State Park and adjacent State Forest as well as Dadswells Bridge in the north-eastern end of the Grampians National Park.

The overstorey is typically composed of Yellow Gum *Eucalyptus leucoxylon* and Yellow Box *E. melliodora*. Less frequently, Grey Box *E. microcarpa* occurs as either a pure stand or co-dominant with the first two species mentioned. River Red Gum *E. camaldulensis* can also be present.
Taller shrubs are neither common nor diverse. Those that do occur include Oyster Bay Cypress-pine Callitris rhomboidea and Buloke d Allocasuarina luehmannii. The understorey is virtually devoid of low shrubs, with the ericoid-leaved Cranberry Heath Astroloma humifusum the most common. At much lower frequencies, Flame Heath Astroloma conostephioides and Brush Heath Brachyloma ericoides occur as scattered small plants.

Grasses dominate the ground layer with the most frequently occuring being Lesser Quaking-grass *Briza minor, Elegant Hairgrass * Aira elegans, Common Wheat-grass Elymus scabrus, Hairgrass *Aira spp., Large Quaking-grass *B. maxima, Weeping Grass Microlaena stipoides, Five-awned Spear Grass Pentapogon quadrifidus, Kneed Wallaby-grass Rytidosperma geniculatum and Fibrous Spear-grass Austrostipa semibarbata. Many more grass species occur at lower frequencies and these include Common Blown Grass Agrostis avenacea var. avenacea, Velvet Wallabygrass Austrodanthoniapilosa ssp. coriacea, Wallaby-grass Austrodanthoniaspp., Common Plume-grass Dichelacne rara, Squirrel-tail Fescue *Vulpia bromoides, Long-hair Plume-grass Dichelacne crinita, Fox-tail Mulga-grass Neurachne alopecuroidea, Wallaby-grass Grey Tussock-grass Poa sieberiana var. sieberiana, Hill Wallabygrass Rytidosperma erianthum, Rough Spear-grass Austrostipa scabra ssp. falcata Kangaroo Grass Themeda triandra and Rat'stail Fescue * Vulpia myuros forma myuros.

Forbs are also well represented although accounting for less cover than grasses. Stinking Penney wort Hydrocotyle laxiflora, Cat's ear *Hypochoeris radicata, Sheep's Burr Acaena echinata, Austral Carrot Daucus glochidiatus, Small St John's Wort Hypericum gramineum Solenogyne Solenogyne dominii, Pimpernel *Anagallis arvensis, Creeping Cudweed Euchiton gymnocephalus, Scaly Buttons Leptorhynchos squamatus and Hop Clover *Trifolium campestre occur frequently in this community.

Perennial geophytes are also present in spring. These include Chocolate-lily Arthropodium strictum, Nodding Chocolate-lily A. fimbriatum, Yellow Rush-lily Tricoryne elatior, Common Onionorchid Microtis unifolia, Milkmaids Burchardia umbellata, Common Onion-grass * Romulea rosea var. australis and Blue Squill Chamaescilla corymbosa var. corymbosa.

Dwarf Mat-rush Lomandra nana, Dwarf Rush *Juncus capitatus, Finger Rush J. subsecundus, Wattle Mat-rush Lomandra filiformis ssp. coriacea and Small Mat-rush L. soraria collectively represent the rush lifeform. Due to the drier nature of this environment, sedges are not present in high numbers, with Common Bog-sedge Schoenus apogon and Tiny Flat-sedge *Cyperus tenellus the only common sedaes.

The large number of introduced species reflects the fertility of the soil and the proximity of most quadrats to public land boundaries and adjacent farmland. In addition, past and ongoing disturbance from grazing and timber harvesting adds to the high weed numbers.

Significant species in this EVC are Buloke d Allocasuarina luehmannii, Hairy-tails e Ptilotus erubescens, Small Milkwort v Comesperma polygaloides, Early Golden Moths k Diuris sp. aff. lanceolata (Derrinallum), Trailing Hop-bush Vv Dodonaea procumbens, Quinetia r Quinetia urvillei, Corkscrew Spear-grass r Austrostipa setaceae and Yucca r Xanthorrhoea caespitosa.

Floristic Community 55-04 Western Basalt Plains Grassy Woodland

Western Basalt Plains Grassy Woodland occupies a very small area of an easement adjoining the Grampians National Park on the south-western side of the Wannon River. The basalt geology gives rise to a suite of species different to the surrounding vegetation. Tussocks of ?Poa sp. line the banks of the creek up to the abutting farmland, with other grasses present including many weed species.

EVC 67 Alluvial Terraces Herb-rich Woodland

Floristic Community 67-02 Grampians Alluvial Terraces Herbrich Woodland

Within the study area, Grampians Alluvial Terraces Herb-rich Woodland occurs on broad alluvial flood plains, drainage lines and shallow moist depressions of the Glenelg and Wannon River systems. Due to its low position in the topographic profile, Grampians Alluvial Terraces Herb-rich Woodland is often subject to seasonal water inudation. The soils are poorly drained duplex soils with sandy loam to 30cm deep, overlying medium to heavy mottled clay. A layer of buckshot gravel is often found at the boundary of the sand/clay horizon Floristic comparisons with this EVC in the Goldfields Bioregion (Muir et al., 1995) indicate this is a separate community which is endemic to the Grampians.

The most common overstorey species in this open woodland is Red Gum Eucalyptus camaldulensis 20-30m tall. River

Occasionally River Red Gum is co-dominant with or replaced by Yellow Box E. melliodora or Scentbark E. aromaphloia. The open nature of the canopy, in some circumstances, may be an artifact of past timber harvesting.

The most striking structural feature of this community is the high diversity of the ground layer, along with its low biomass, especially in summer. The most characteristic feature of *Grampians* Alluvial Terraces Herb-rich Woodland is the ground layer that is rich in forbs, many of which are annuals. Annual herbs include, Slender Cicendia * Cicendia filiformis, Smooth Cat's Ear *Hypochoeris glabra, Pimpernel * Anagallis arvensis, Dwarf Aphelia Aphelia pumilo, Small Wrinklewort Siloxerus multiflorus, Slender Aphelia Aphelia gracilis and Yellow Pennywort Hydrocotyle foveolata. Perennial herbs include Pointed Centrolepis Centrolepis aristata, Hairy Centrolepis C. strigosa ssp. strigosa, Cat's Ear *Hypochoeris radicata, Pale Sundew Drosera peltata ssp. peltata, Small St John's Wort Hypericum gramineum and Solenogyne Solenogyne dominii.

The perennial geophytes Blue Squill Chamaescilla corymbosa, Sheath Star Hypoxis vaginata, Common Early Nancy Wurmbea dioica, Pink Fingers Caladenia carnea, Yellow Bulbine-lily Bulbine bulbosa, Milkmaids Burchardia umbellata and Twining Fringe-lily Thysanotus pattersonii also commonly occur

Common sedges that indicate seasonally moist conditions are Tiny Flatsedge *Cyperus tenellus, Common Bog-sedge Schoenus apogon, Dwarf Rush *Juncus capitatus, Toad Rush J. bufonius, Finger Rush J. subsecundus, Floating Club-sedge Isolepis fluitans and Little Club-sedge I. marginata.

Frequently occurring grasses are Lesser Quaking-grass *Briza minor and Weeping Grass Microlaena stipoides, Elegant Hair-grass *Aira elegans, Wallaby Grass Austrodanthoniaspp., Squirrel-tail Fescue * Vulpia bromoides, Common Onion-grass *Romulea rosea var. australis, Bristly Wallaby-grass Rytidosperma setaceum, Five-awned Spear-grass Pentapogon quadrifidus and Grey Tussock-grass Poa sieberiana.

The disturbance by past timber harvesting and often heavy grazing by rabbits and marsupials is reflected in the large number of weeds.

Mossy Woodruff r Asperula minima, Buloke d Allocasuarina luehmanii and wetland Blown Grass k Agrostis avenacea var. perennis are the significant species recorded in this floristic community.

EVC 71 Hills Herb-rich Woodland Hills Herb-rich Woodland is a dry open woodland often with no discernible shrub layer. Its floristic composition is dominated by a carpet of forbs and grasses. The dry nature of the environment is favourable for annual herbs, with the fertile nature of the various geologies also supporting perennial herbs. The environment can vary from relatively flat ground to ridge tops on sedimentary sandstones (along seams of mineral-rich sandstone) and on undulating, rounded, granite hill landforms.

Floristic Community 71-01 Granitic Hills Herb-rich Woodland Granitic Hills Herb-rich Woodland occurs on Palaeozoic granite and granodiorite. Parent rock is often close to the soil surface and in some instances outcrops as large rocky boulders. The soils are coarse, sandy loams, thereby having a poor water-holding capacity. Topography varies from relatively flat ground, to west and north facing slopes and to ridge tops. The exposed aspects that Granitic Hills Herb-rich Woodland inhabits are subjected to scorching summer heat, thereby limiting the range of species that can survive. Subsequently, annual herbs are an important feature of this community, growing and setting seed before the summer heat.

A variety of eucalypts form the overstorey of Granitic Hills Herb-rich Woodland. At any one site there can be up to 5 eucalypt species, however more commonly there are only two or three. Messmate Eucalyptus obliqua and Yellow Box *E. melliodora* are co-dominant, with Scentbark *E. aromaphioia* and Long-leaf Box *E. goniocalyx* often co-occurring. River Red Gum E. camaldulensis often co-occurs with Yellow Box. Black Wattle Acacia mearnsii is often the only understorey tree present.

The shrub layer is sparse and species-poor, with Daphne Heath Brachyloma daphnoides and Heath Tea-tree Leptospermum myrsinoides the only common shrub above 0.5m. The shallow soil over the parent rock prevents many shrub species from dominating, with only the small ground-hugging shrubs common. Flame Heath Astroloma conostephioides, Cranberry Heath A. humifusum Common Rice-flower Pimelea humilis, Honey Pots Acrotriche serrulata and Common Beard-heath Leucopogon virgatus form the characteristic small clumps scattered amongst a carpet of grasses and forbs. Another indicative feature of Granitic Hills Herb-rich Woodland is the Austral Grass-tree Xanthorrhoea australis. It is often the only plant above 0.5m and can be quite common.

The enormous variety of herbs that inhabit Granitic Hills Herb-rich Woodland make it one of the most species-rich communities in the world (Lunt, 1990). Weeping Grass Microlaena stipoides occurs at all sites, forming a 'lawn' from which macropods and rabbits graze. Various forbs proliferate amongst the carpet of Weeping Grass. Perennial forbs that prevail include Grassland Wood-sorrel Oxalis perennans, Small Poranthera microphylla, Austral Carrot Daucus glochidiatus, Common Raspwort Gonocarpus tetragynus, Stinking Pennywort Hydrocotyle laxiflora, Cat's Ear *Hypochoeris radicata, Hidden Violet Viola cleistogamoides, Yellow Pennywort Hydrocotyle foveolata, Smooth Cat's Ear H. glabra, Common Lagenifera Lagenifera stipitata and Cotton Fireweed Senecio quadridentatus. Perennial geophytes include Pink Fingers Caladenia carnea spp. agg., Blue Squill Chamaescilla corymbosa var. corymbosa, Yam Daisy Microseris scapigera spp. agg. and Twining Fringe-Iliy Thysanotus patersonii. Small annual forbs are also common. These include Wiry Mitrewort Mitrasacme paradoxa, Hairy Centrolepis Centrolepis strigosa ssp. strigosa, Spoon Cudweed Stuartina muelleri, Dwarf Aphelia Aphelia pumilio, Pointed Centrolepis Centrolepis aristata, Soft Millotia Millotia tenuifolia, Small Wrinklewort Siloxerus multiflorus and Annual Bluebell Wahlenbergia gracilenta s.l.

Larger graminoids include Black-anther Flax-lily *Dianella revoluta*, Wattle Mat-rush *Lomandra filiformis*, Small Mat-rush *L. soraria* and Dwarf Mat-rush *L. nana*.

There are few species of significance in *Granitic* Hills Herb-rich Woodland, which is surprising for such a species-rich community. Mossy Woodruff r *Asperula minima* and Quinetia r *Quinetia urvillei* are the only recorded significant species.

Floristic Community 71-02 Fertile Hills Herb-rich Woodland

Fertile Hills Herb-rich Woodland occurs on intrusive igneous geology such as quartz porphyry, Cambrian chert and greenstone and on soft siltstone and sandstone. Seams of mineral-rich siltstone and sandstone are exposed where Golton Creek and Briggs Creek have cut through the harder Red Man Bluff geologies just north of Roses Gap. These seams are occupied by *Fertile* Hills Herb-rich Woodland. Soils are sandy loams over light to medium clays or shallow sandy loams over rock. Sites are in a variety of ecological niches such as on gentle to moderate slopes, around rocky outcrops, along gullies and on steep rocky slopes.

Yellow Box *Eucalyptus melliodora* is the dominant eucalypt with sub-dominants including River Red Gum *E. camaldulensis* and Yellow Gum *E. leucoxylon* on flatter terrain and Long-leaf Box *E. goniocalyx* on steeper slopes. Black Wattle *Acacia mearnsii* is also present.

Shrubs are sparse, with only the small ground-hugging plants present. Cranberry Heath Astroloma humifusumfrequently occurs, with the next most common shrub being Flame Heath A. conostephioides. Upright Guinea flower Hibbertia stricta s.l. and Common Rice-flower Pimelea humilis are less common. Taller shrubs found include Daphne Heath Brachyloma daphnoides and Heath Tea-tree Leptospermum myrsinoides.

A carpet of Weeping Grass Microlaena stipoides var. stipoides is common, interspersed with numerous annual and perennial herbs. Perennial herbs include Stinking Pennywort Hydrocotyle laxiflora, Sheep's Burr Acaena echinata, Austral Carrot Daucus glochidiatus, Yellow Pennywort H. foveolata, Small St John's Wort Hypericum gramineum Cat's Ear *Hypochoeris radicata, Cotton Fireweed Senecio quadridentatus, Smooth Cat's Ear *H. glabra, Small Pointed Centrolepis Poranthera microphylla, Poranthera Centrolepis aristata, Hairy Centrolepis Centrolepis strigosa ssp. strigosa, Creeping Cudweed Euchiton gymnocephalus s.s and Tall Bluebell Wahlenbergia stricta ssp. stricta. Annual herbs are also important in Fertile Hills Herb-rich Woodland and include Wiry Mitrewort Mitrasacme paradoxa, Pimpernel *Anagalis arvensis, Spoon Cudweed Stuartina muelleri, Yellow Sebaea Sebaea ovata, Dwarf Aphelia Aphelia pumilio, Small Wrinklewort Siloxerus multiflorus and Annual Bluebell Wahlenbergia gracilenta s.l. Two other weedy grasses can be found amongst the Weeping Grass and these are Lesser Quaking-grass Briza minor and Elegant Hair-grass *Aira elegans. Perennial geophytes are not common, but include Blue Squill Chamaescilla corymbosa var. corymbosa and Yellow Bulbine-lily Bulbine bulbosa.

An important indicator species for *Fertile* Hills Herb-rich Woodland is Green Rock Fern *Cheilanthes austrotenuifolia*. The small sedge Common Bog-sedge *Schoenus apogon* and Dwarf Rush **Juncus capitatus* are the only commonly occurring sedge species. Dwarf Mat-rush *Lomandra nana* and Black-anther Flax-lily *Dianella revoluta* are the only consistently represented graminoids.

Species of significance include Mossy Woodruff r Asperula minima, Small Milkwort v Comesperma polygaloides, Clover Glycine Vv Glycine latrobeana, Ribbed Bush-pea Rr Pultenaea costata and Blotched Sun-orchid r Thelymitra benthamiana.

EVC 134 Sand Forest

Floristic Community 134-02 Grampians Sand Forest Grampians Sand Forest occurs on deep sand dunes, possibly aeolian in nature. The sand is well-drained and subsequently, the soil is very dry, supporting few shallow-rooted plants. This EVC is similar in appearance to *Grampians* Damp Sands Herb-rich Woodland, with Austral Bracken *Pteridium esculentum* forming a dense ground cover. However, the deep sands are much further from the water table in *Grampians* Sand Forest and thus, the environment is much drier, supporting fewer herbs. This EVC often abuts farmland where it has been cleared.

Tree species that are present in *Grampians* Sand Forest are Brown Stringybark *Eucalyptus baxteri*, River Red Gum *E. camaldulensis* and Messmate *E. obliqua*. Trees are often tall, but can also be of a woodland nature, similar to that of *Sand* Heathy Woodland, which often abuts this community.

Black Wattle Acacia mearnsii and tree form Silver Banksia Banksia marginata are the most common understorey trees, often to 15m. Beneath this, is a layer of sparse, smaller heaths which include Flame Heath Astroloma conostephioides, Cranberry Heath A. humifusum Daphne Heath Brachyloma daphnoides, Bundled Guinea-flower Hibbertia prostrata, Heath Tea-tree Leptospermum myrsinoides and Manuka L. scoparium

Forbs are almost absent, with the occasional individual plant beneath the dense Austral Bracken layer. Herbs present include Mossy Woodruff r Asperula minima, Hydrocotyle ?laxiflora, Smooth Cat's Ear Hypochoeris glabra and Small Poranthera Poranthera microphylla. A few grasses are dispersed across the sand, but they do not form a lawn as in Grampians Damp Sands Herb-rich Woodland. Grasses include Aira sp., Weeping Grass Microlaena stipoides var. stipoides, Poa spp. and Vulpia sp.

EVC 136 Sedge Wetland

Sedge Wetland occurs on the fringes of open freshwater swamps. It is a transition zone between Shallow Freshwater Marsh and Sedge-rich Wetland and other seasonally inundated EVCs. During the wetter months it is covered in water of varying depths but the water recedes over the drier months, leaving Shallow Freshwater Marsh the only community submerged.

Eucalypt species are often absent from Sedge Wetland as the environment is too wet. When River Red Gum *Eucalyptus camaldulensis* does occur, it often overhangs from surrounding vegetation communities, which are seasonally inundated for much shorter periods.

Shrubs are most often absent from this EVC, although occasionally River Tea-tree *Leptospermum obovatum* may form a dense stand, with Downy Dodder-laurel *Cassytha pubescens* s.s. tangled amongst it.

Dominating above the water surface are sedge and rush species. Fine/Soft Twig-sedge Baumea arthrophylla/rubiginosa, Common Spike-sedge Eleocharis acuta, Floating Club-sedge Isolepis fluitans and Joint-leaf Rush Juncus holoschoenus are the most common. Combined with the some of the following species, Square Twig-sedge Baumea tetragona, Rush Sedge Carex tereticaulis, Hollow Rush Juncus amabilis, Pale Rush J. pallidus, Tall Rush J. procerus, Tassel Cord-rush Restio tetraphyllus ssp. tetraphyllus, Soft Bog-sedge Schoenus tesquorum and Typha spp., sedges become the dominant life form protruding from the water.

The environment amongst the sedges is occupied by various aquatic and semi-aquatic herbs. Streaked Arrow-grass *Triglochin striatum* has a high cover at all sites. Other water-dwelling species include Running Marsh-flower *Villarsia reniformis*, Water Starwort **Callitriche hamulata*, Australian Lilaeopsis *Lilaeopsis polyantha*, Amphibious Milfoil *Myriophyllum simulans*, White Pursulane *Neopaxia australasica* and Floating Pondweed *Potamogeton tricarinatus* s.1.

Whilst Sedge Wetland is covered with water for most parts of the year, some species suggest that the water does recede to some extent over summer. These species include *Lobelia/Isotoma* spp., *Poaceae* spp., Shade Raspwort *Gonocarpus humilis*, Swamp Goodenia *Goodenia humilis*, Hairy Hawkbit **Leontodon taraxacoides* and Small Poranthera *Poranthera microphylla*.

EVC 184 Montane Wet Heathland

Floristic Community 184-01 *Grampians* Montane Wet Heathland *Grampians* Montane Wet Heathland occurs at an average altitude of 1030m on the Major Mitchell Plateau and also on D'Altons peak in the Serra Range.

on the Major Mitchell Plateau and also on D'Altons peak in the Serra Range. It inhabits wet soak depressions, narrow gullies and the headwaters of the First Wannon Creek, where the soil is a little deeper and moister than the surrounding *Grampians* Montane Rocky Shrubland. Rock is, however, at or very close to the soil surface. On the Major Mitchell Plateau annual average rainfall is 1200mm, with cloud cover to ground level supplementing precipitation. *Grampians* Montane Wet Heathland is similar structurally to Wet Heathland, but contains fewer plants and occurs at much higher elevations.

For the most part, *Grampians* Montane Wet Heathland is treeless, with small spindly Victoria Range Gum r *Eucalyptus victoriana* (now included in *E. baxteri*) the most common. Sporadic occurrences of Snow Gum r *E. pauciflora* ssp. *parvifructa* (now included in *E. pauciflora* ssp. *pauciflora*) and Scentbark *E. aromaphloia* (often synonymous with *E. viminalis* ssp. *cygnatensis*).are also recorded.

The shrub layer is quite dense with common shrubs including Prickly Teatree Leptospermm continentale, Shiny Tea-tree L. turbinatum, Mealy Honeymyrtle Melaleuca squamea, Showy Parrot-pea Dillwynia sericea, Hairy Boronia Boronia pilosa, Rosy Bush-pea Rr Pultenaea subalpina, Pink Swamp-heath Sprengelia incarnata, Common Heath Epacris impressa, Manuka L. scoparium and Thyme Beardheath Leucopogon thymifolius.

The ground is dominated by a combination of sedges and rushes. Red-fruit Saw-sedge Gahnia sieberiana, Branching Scale-rush Lepyrodia tasmanica and Flat Cord-rush Restio complanatus are present at all sites. Other common species include Common Rapier-sedge Lepidosperma filiforme and Spreading Rope-rush Empodisma minus.

The high sedge and rush density, combined with the dense shrub layer, subsequently leaves little light or substrate for herbs to establish and hence they are not a large component of this community. Grey-beard Grass Amphipogon strictus var. setifer and Matted Tussock-grass Poa clelandii are the only grass species, with Purple Bladderwort Utricularia dichotoma and Grass Trigger-plant Stylidium graminifolium the only forbs recorded.

Significant species occurring in Grampians Montane Wet Heathland are Victoria Range Gum r Eucalyptus victoriana, Rosy Bush-pea Rr Pultenaea subalpina and Snow Gum r Eucalyptus pauciflora ssp. parvifructa.

EVC 191 Riparian Scrub

Riparian Scrub forms a dense thicket along creeks and in gullies where spring water or underground streams provide constant variable seasonal flows. Soils are dark, fine sandy loams, anaerobic and high in organic matter. Riparian Scrub is common and occurs in a number of ecological niches. These include where streams emerge from the rocky ranges and meet the sandy, heathy outwash system; along major rivers such as the Wannon River where it alternates with patches of Sedgy Riparian Woodland and sometimes forms complexes with this floristic community and occasionally as broad flat expanses, on creeks within the Glenelg River catchment.

Eucalypts are often absent from Riparian Scrub but when they do occur, they overhang from adjacent communities. Even so, a structural domain of tree-covered Riparian Scrub has been mapped and isolated from a treeless version in the mapping. The treeless version of Riparian Scrub often has Wet Heathland associated with it and is possibly closer to the Wet Heathland floristic community than the treed version which is more likely to be situated in better drained valleys. Swamp Gum Eucalyptus ovata is the most common eucalypt with Brown Stringybark Eucalyptus baxteri or Messmate E. obliqua, 6-25m tall, being occasional species overhanging the dense thicket.

One of the main structural features of Riparian Scrub is a dense and impenetrable thicket of Scented Paperbark Melaleuca squarrosa 2-6m tall, which is frequently entangled with Coral-fern Gleichenia spp. In areas where the Scented Paperbark is a little more open, Button Grass Gymnoschoenus sphaerocephalus and Pink Swamp-heath Sprengelia incarnata are common. Understorey shrubs present include Prickly Tea-tree Leptospermum continentale, Woolly Tea-tree L. lanigerum and Prickly Moses Acacia verticillata.

Spreading Rope Rush Empodisma minus is found at all sites climbing amongst the shrubs, together with Pouched Coral Fern Gleichenia dicarpa and Scrambling Coral Fern G. microphylla. The sedges, Square Twig-sedge Baumea tetragona, Red-fruit Saw-sedge Gahnia sieberiana and Slender Bog-sedge Schoenus lepidosperma, and the restionaceous species, Slender Twine-rush Leptocarpus tenax and Flat Cord-rush Restio complanatus are found beneath the shrub layer.

Although accounting for only a small proportion of the ground cover, the forbs Tufted Centrolepis Centrolepis fasicularis, Forked Sundew Drosera binata, Hairy Mitrewort Mitrasacme pilosa, and Purple Bladderwort Utricularia dichotoma are often present. The graminoid Tall Yellow-eye Xyris operculata is also common as is the grass Slender Tussock-grass Poa tenera.

This EVC shows floristic similarities to Wet Heathland, but differs most noticeably by the tall dense thickets of Melaleuca squarrosa intertwined with Gleichenia spp.

Smooth Tea-tree K *Leptospermum glabrescens* s.l. is the only significant species recorded in this EVC for the study area.

EVC 192 Montane Rocky Shrubland

Montane Rocky Shrubland is an EVC with a restricted distribution, occurring on rocky sites with a mean elevation of around 1050m. It occurs in the study area on Mt. William, Major Mitchell Plateau the Victoria Range, including Mt. Thackerav. and Field

observations also indicate its presence in the Serra Range on Mt. Rosea and D'Alton Peaks

Annual rainfall is above 1200mm and precipitation is supplemented by cloud cover to ground level. Snow and strong winds lead to wind-pruned and layered shrubs except where shelter in narrow gullies permits taller plants to develop. Montane Rocky Shrubland usually occurs on gentle to moderate slopes on exposed mountain tops and plateaus. Soils are well-drained skeletal sandy loams, varying in depth between sedimentary rocks and boulders and overlaying rocky outcrops.

Montane Rocky Shrubland is one of the most species-poor communities in the study area. There are 4 floristic communities within this EVC. The first community is more species rich and specifically has more forbs and grasses than the second community, however both are rich in shrub species and have stunted eucalypts. The third community occurs in gullies on the Major Mitchell Plateau and is the most species poor of the four communities. The fourth community is uncommon and occurs only as small patches on the steep south-east escarpment of the Major Mitchell Plateau.

Floristic Community 192-01 Mt. William Montane Rocky Shrubland

This floristic community is restricted to the Mt William Range, occurring on the upper slopes of Mt William and on steep slopes around the perimeter of the Major Mitchell Plateau. Rainfall for this community is high, with low cloud cover for much of the winter contributing to a higher effective rainfall. Soils are shallow between slabs of rock and boulders. Tree and shrub species are short in stature due to exposure to strong winds.

An overstorey of eucalypts is usually absent, with eucalypts commonly forming part of the shrub layer. Where present, the Victoria Range Gum r *Eucalyptus victoriana* (now included in *E. baxteri*) is the most common eucalypt species, typically less than 3m in height. Only at lower altitudes do the eucalypts, Brown Stringybark E. baxteri, Messmate E. obliqua and E. viminalis/rubida attain heights in excess of 5m.

The most characteristic feature of *Mt William* Montane Rocky Shrubland is the diversity of broad, narrow and ericoid-leaved shrubs that form a dense layer to 2m tall. Beneath the shrub layer is a variable covering of restionaceous species, sedges and herbs. Exposed rocks typically account for at least 50% of the ground area and are covered in lichen and moss.

The most common shrub species are Spike Wattle Acacia oxycedrus, Pine Heath Astroloma pinifolium, Rock Banksia r Banksia saxicola, Snow Myrtle Calytrix alpestris, Thyme Beard-heath Leucopogon thymifolius, Green Sheoke Allocasuarina paradoxa, Victorian Smoke-bush Conospermum mitchellii, Rock Rose Guinea-flower r Hibbertia cistiflora ssp. rostrata, Heath Tea-tree Leptospermum myrsinoides, Rosy Bush-pea Rr Pultenaea subalpina, Silver Banksia Banksia marginata, Dwarf Boronia Boronia nana var. pubescens, Oyster Bay Cypress-pine Callitris rhomboidea, Mountain Correa Correa lavrenciana, Grampians Parrot-pea r Dillwynia oreodoxa, Common Heath Epacris impressa, Shiny Tea-tree Leptospermum turbinatumand Mount William Beard-heath Rr Leucopogon neurophyllus.

The sedges Red-fruit Saw-sedge Gahnia sieberiana, Flat Cord-rush Restio complanatus, Common Bog-sedge Schoenus apogon, and Common Rapiersedge Lepidosperma filiforme are common, but not abundant.

Herbs are low in cover and the only forb present is Cat's Ear **Hypochoeris radicata.* Perennial geophytes include Orchidaceae spp, Grass Triggerplant Stylidium graminifolium and Grampians Trigger-plant Stylidium soboliferum Grasses are generally sparse and include Matted Tussockgrass Poa clelandii, Wallaby Grasses Austrodanthoniaspp. and Yorkshire Fog *Holcus lanatus.

There are 7 significant species in Mt WilliamMontane Rocky Shrubland, 6 of which are endemic to the Grampians and Black Range. A majority of these species occur only at higher altitudes, including Rock Banksia r *Banksia saxicola*, Grampians Bossiaea r *Bossiaea rosmarinifolia*, Grampians Parrotpea r Dillwynia oreodoxa, Victoria Range Gum r Eucalyptus. victoriana, Rock Rose Guinea-flower r Hibbertia cistiflora ssp. rostrata Mount William Beard-heath Rr Leucopogon neurophyllus, and Rosy Bush-pea Rr Pultenaea subalpina.

Floristic Community 192-02 Grampians Montane Rocky Shrubland Grampians Montane Rocky Shrubland occurs on the Major Mitchell Plateau, in the Victoria Range including Mount Thackeray and isolated patches on the higher peaks of the Serra Range at an average altitude of 1030m. In the Victoria Range, it occurs on slabs of loose rock and boulders whereas on the Major Mitchell Plateau the environment is more flat and open.

An overstorey of eucalypts is usually absent, however, if eucalypts do occur they commonly form part of the shrub layer. Victoria Range Gum r *Eucalyptus victoriana* (now included in *E. baxteri*) is the most common eucalypt species, typically less than 3m. There are, however, taller treed versions of this community on the Major Mitchell Plateau.

Grampians Montane Rocky Shrubland is species poor with shrubs dominating over a sparse ground layer of forbs, grasses and perennial geophytes. The common shrubs include Shiny Tea-tree *Leptospermum turbinatum* Spike Wattle *Acacia oxycedrus*, Silver Banksia *Banksia* marginata, Hairy Boronia Boronia pilosa, Common Heath Epacris impressa, Mount William Beard-heath Rr Leucopogon neurophyllus, Thyme Beard-heath L. thymifolius, Manuka Leptospermum scoparium, Notched Phebalium Phebalium bilobum Pink-bells Tetratheca ciliata, Slender Sheoke Allocasuarina misera, Pine Heath Astroloma pinifolium, Rock Banksia r Banksia saxicola, Showy Parrot-pea Dillwynia sericea, Heath Tea-tree Leptospermum myrsinoides and Shrubby Platysace Platysace lanceolata.

Sedges are the only other commonly occurring lifeform and include Red-fruit Saw-sedge Gahnia sieberiana, Common Rapier-sedge Lepidosperma filiforme and Slender Bog-sedge Schoenus lepidosperma. Flat Cord-rush Restio complanatus can also form dense mats over the rock strata on the Major Mitchell Plateau.

This community is also notable for its eleven significant species including Victoria Range Gum r *Eucalyptus victoriana*, Mount William Beard-heath Rr *Leucopogon neurophyllus*, Rock Banksia r *Banksia saxicola*, Grampians Parrot-pea r *Dillwynia oreodoxa*, Grampians Broom-heath Rr *Monotoca billawinica*, Rosy Bush-pea Rr *Pultenaea subalpina*, Grampians Boronia Rr *Boronia latipinna*, Grampians Bossiaea r *Bossiaea rosmarinifolia*, Swamp Flax-lily v *Dianella callicarpa*, Grampians Grevillea Rr *Grevillea confertifolia* and Short-leaf Bog-sedge r *Schoenus laevigatus*.

Floristic Community 192-03 *Gully* Montane Rocky Shrubland *Gully* Montane Rocky Shrubland occurs on the Major Mitchell Plateau in protected gullies. Rocky boulders cover most of the area, with shrubs and trees growing on soil substrate between these boulders.

The only dominant tree is Serra Range Gum r *Eucalyptus* serraensis, ranging in height from 4-8m.

Shrubs account for 65% of the lifeforms in this community and include Spike Wattle Acacia oxycedrus, Rock Banksia r Banksia saxicola, Grampians Boronia Rr Boronia latipinna, Mountain Correa Correa lawrenciana, Manuka Leptospermum scoparium, Shiny Tea-tree L. turbinatum, Mount William Beard-heath Rr Leucopogon neurophyllus, Notched Phebalium Phebalium bilobum, Rosy Bushpea Rr Pultenaea subalpina, Mountain Hickory Wattle Acacia obliquinerva, Grampians Bossiaea r Bossiaea rosmarinifolia, Smooth Parrot-pea Dillwynia glaberrima, Grampians Parrot-pea r D. oreodoxa, Common Heath Epacris impressa, Rock Rose Guinea-flower r Hibbertia cistiflora ssp. rostrata, Prickly Tea-tree Leptospermum continentale, Totem-poles Melaleuca decussata, Netted Daisy-bush Olearia speciosa, Victorian Christmas-bush Prostanthera lasianthos and Pink-bells Tetratheca ciliata.

The ground layer is sparse, with Grey Tussock-grass *Poa siberiana* var. *hirtella* and Red-fruit Saw-sedge *Gahnia sieberiana* the only species that occur at both sites. Necklace Fern *Asplenium flabellifolium* also occurs at both sites, nestled in moist boulder overhangs. Other ferns include Bat's Wing Fern *Histiopteris incisa* and Austral Bracken *Pteridium* esculentum Giant Mountain Grass *Dryopoa dives* and Flat Cord-rush *Restio complanatus* are also present.

Rare plants recorded include Rock Banksia r Banksia saxicola, Grampians Boronia Rr Boronia latipinna, Mount William Beardheath Rr Leucopogon neurophyllus, Rosy Bush-pea Rr Pultenaea subalpina, Grampians Bossiaea r Bossiaea rosmarinifolia, Grampians Parrot-pea r Dillwynia oreodoxa and Rock Rose Guinea-flower r Hibbertia cistiflora ssp. rostrata.

Floristic Community 192-04 Escarpment Montane Rocky Shrubland Escarpment Montane Rocky Shrubland occurs on the protected,

Escarpment Montane Rocky Shrubland occurs on the protected, steep, precipitous southerly slopes of the Major Mitchell Plateau. It grows on the plateau escarpment, in small protected pockets where snow may lie for the longest periods. Whilst the vegetation is quite stunted, *Escarpment* Montane Rocky Shrubland would have some protection from strong winds, whilst still receiving high annual rainfall and often cloud cover to ground level. It occurs at an average altitude of 1130m, on 31 - 34° slopes.

Escarpment Montane Rocky Shrubland is the only floristic community of Montane Rocky Shrubland to have Snow Gum r *E. pauciflora* ssp. *parvifructa* (now included in *E. pauciflora* ssp. *pauciflora*) as the dominant eucalypt species. The trees are stunted, growing no more than 5m in height. Victoria Range Gum r *Eucalyptus victoriana* (now included in *E. baxteri*) is also occasionally present.

Shrubs are a dominant feature of this floristic community and include Pine Heath Astroloma pinifolium, Silver Banksia Banksia marginata, Grampians Bossiaea r Bossiaea rosmarinifolia, Showy Parrot-pea Dillwynia sericea, Shiny Tea-tree Leptospermum turbinatum Mount William Beard-heath Rr Leucopogon neurophyllus, Thyme Beard-heath L. thymifolius, Slender Rice-

flower Pimelea linifolia, Prickly Bush Pea Pultenaea juniperina s.l. and Pinkbells Tetratheca ciliata.

Another distinctive floristic feature of *Escarpment* Montane Rocky Shrubland is the presence of Spreading Rope-rush *Empodisma minus*. It forms a dense mat beneath the Snow Gum and even climbs part way up the shrubs and trees. Amongst the Spreading Rope-rush, grasses present include Grey-beard Grass *Amphipogon strictus* var. *setifer*, Matted Tussock-grass *Poa clelandii*, Grey Tussock-grass *P. sieberiana* var. *hirtella* Grey Tussock-grass *P. sieberiana* var. *setifer*, Matted Another Stevense and Heath Bent-grass Deyeuxia dens.

Forbs and geophytes are present in low numbers with low cover and include Silver Daisy *Celmisia asteliifolia spp. agg.*, Tall Sundew *Drosera peltata* ssp, *auriculata*, Turquoise Berry *Drymophila cyanocarpa*, Button Everlasting *Helichrysum scorpioides* and Grass Trigger-plant *Stylidium graminifolium*.

Escarpment Montane Rocky Shrubland has 6 plants of significance including Grampians Bossiaea r *Bossiaea rosmarinifolia*, Snow Gum r *Eucalyptus pauciflora* ssp. *parvifructa*, Mount William Beard-heath Rr *Leucopogon neurophyllus*, Rock Banksia r *Banksia saxicola*, Victoria Range Gum r *E. victoriana* and Rosy Bush-pea Rr *Pultenaea subalpina*.

EVC 193 Rocky Outcrop Herbland

Floristic Community 193-01 Grampians Rocky Outcrop Herbland

Grampians Rocky Outcrop Herbland is common and widespread within the study area. Due to the spectacular rock formations it is associated with, it is one of the most notable features of the Grampians National Park. Grampians Rocky Outcrop Herbland occurs primarily on the Palaeozoic sandstones that form the main ranges of the Grampians and less frequently on granitic outcrops. This community most frequently occurs on northern and western aspects, on quite steep mid to upper slopes. It grows on exposed rocky substrates, mostly in the form of outcropping bedrock or less frequently on large rocks and boulders. Due to the harsh environment of this EVC, plants are either short-lived forbs, perennial geophytes or possess water conserving strategies such as succulency or resurrection capabilities (resurrection plants such as Narrow Rock Fern *Cheilanthes sieberi*).

This EVC is often treated as a mosaic with *Grampians* Rocky Outcrop Shrubland, which together form the vegetation characteristic of the rocky outcrops of the Grampians and less commonly on the Black Range. *Grampians* Rocky Outcrop Herbland is comprised of exposed slabs of rock covered with lichens and mosses over a skeletal soil layer which transiently retains moisture. This provides a substrate for annual and perennial herbs and geophytes to grow. This life strategy reflects the short growing season available at these sites, where winter rains saturate the soil profile before it rapidly dries out over summer.

A eucalypt overstorey is rare in this community. However, Long-leaf Box *Eucalyptus goniocalyx* and less often Brown Stringybark, *E. baxteri* can occur as spindly scattered individuals. Oyster Bay Cypress-pine *Callitris rhomboidea* is the only small tree.

Wedge-leaf Hop-bush *Dodonea viscosa* ssp. *cuneata*, Cranberry Heath *Astroloma humifusum*, Common Fringe-myrtle *Calytrix tetragona*, Shiny Tea-tree *Leptospermum turbinatum*, Grey Everlasting *Ozothamnus obcordatus*, Grampians Thryptomene *Thryptomene calycina* and Pine Heath *Astroloma pinifolium* occasionally occur as scattered individuals, with little cover.

The life form profile of this EVC is dominated by grasses, forbs and geophytes. Forbs include Smooth Cat's Ear *Hypochoeris glabra*, Pink Pursulane *Calandrinia calyptrata*, Hairy Centrolepis *Centrolepis strigosa* ssp. strigosa, Australian Stonecrop *Crassula sieberiana*, Pointed Centrolepis *Centrolepis aristata*, Austral carrot *Daucus glochidiatus*, Tall Raspwort *Gonocarpus elatius*, Cat's Ear *Hypochoeris radicata*, Hairy Stylewort *Levenhookia dubia*, Wiry Centrolepis *Centrolepis polygyna*, Tall Sundew *Drosera peltata* ssp. *auriculata* and Soft Millotia *Millotia tenuifolia*.

Native grasses are not as common as weedy grass species but do include Hill Wallaby-grass *Rytidosperma erianthum*, Kneed Wallaby-grass *R. geniculatum*, Bristly Wallaby-grass *R. setaceum* and Supple Spear-grass *Austrostipa mollis*.

Nodding Blue-lily *Stypandra glauca* is a rock-loving species, in addition to perennial geophytes such as Chocolate-lily *Arthropodium strictum* and Pale Grass-lily *Caesia parviflora*. Narrow Rock Fern *Cheilanthes sieberi* ssp. *sieberi* and Necklace Fern *Asplenium flabellifolium* the only ferns.

The only significant species that occurs in this EVC is Hairy Raspwort r Gonocarpus mezianus.

EVC 195 Seasonally Inundated Shrubby Woodland

Seasonally Inundated Shrubby Woodland occurs on flat terrain with soils that have variable levels of inundation at different times of the year. In winter, the heavy clay layer impedes drainage and hence surface water may lay for many months. Warmer conditions dry the soil, with summer heat baking hard the soil surface. The overstorey trees are predominantly large, sparse gum trees, with the understorey shrubs dense, but in isolated patches, with much bare ground in between. Whilst much of the ground is unvegetated, species diversity is quite high.

Three floristic communities occur within this EVC. *Plains* Seasonally Inundated Shrubby Woodland often occurs on the fringes of the study area where the outwash of the ranges meets This community has affiliations with Plains the fertile plains. Lateritic Heathy Woodland and Greater Grampians Plains Grassy Woodland and therefore has a higher species diversity than the second community. Valley Seasonally Inundated Shrubby Woodland occurs in the broad floodplains of the Victoria Valley and has associations with Alluvial Terraces Herb-rich Woodland, Shrubby Woodland and Shallow Freshwater Marsh. The third community, Rocklands Seasonally Inundated Shrubby Woodland was isolated from the above two floristic communities.

Forbs, grasses and heathy low shrubs are more common in Plains Seasonally Inundated Shrubby Woodland than Valley Seasonally Inundated Shrubby Woodland due to the former's affiliations with Plains Lateritic Heathy Woodland and Greater Grampians Plains Grassy Woodland. Yellow Gum Eucalyptus leucoxylon is the most common overstorey species in *Plains* Seasonally Inundated Shrubby Woodland, whilst River Red Gum *E. camaldulensis* dominates in Valley Seasonally Inundated Shrubby Woodland. This is indicative of the better drained soils in Plains Seasonally Inundated Shrubby Woodland.

Floristic Community 195-01 Valley Seasonally Inundated Shrubby Woodland

Valley Seasonally Inundated Shrubby Woodland inhabits the broad floodplains of the Victoria Valley and Glenelg River systems. It occurs on broad drainage lines and flats that are inundated for extended periods during winter. Surface soil is baked hard in summer, forming a shallow, powdery, sandy loam that is often hydrophobic. The soils are duplex, with an abrupt change in the profile from sand to drainage-impeding, light to medium clays. Valley Seasonally Inundated Strubby Woodland often occurs on the periphery of Shallow Freshwater Marshes, where the water depth recedes during summer, allowing trees and shrubs to grow. It also inhabits ecological niches within the Glenelg River floodplain abutting Grampians Floodplain Thicket and the River itself.

River Red Gum Eucalyptus camaldulensis is common, but Swamp Gum E. ovata and Messmate E. obliqua may also be present. River Red Gum forms an open woodland, with tree height varying between 15-30m. Blackwood Acacia melanoxylon is the only common understorey tree. In contrast, Plains Seasonally Inundated Shrubby Woodland is dominated by Yellow Gum E. leucoxylon and Yellow Box E. melliodora, indicating a somewhat drier environment.

Shrubs are either clumped in small patches, or quite dense but evenly spread, with bare ground and leaf litter beneath. The shrubs that occur in this community are able to tolerate seasonal water fluctuations and include Prickly Tea-tree Leptospermum continentale, Totem-poles Melaleuca decussata, Manuka L. scoparium, Yellow Hakea Hakea nodosa, Mealy Honey-myrtle Melaleuca squamea and Allocasuarina spp. Small heath species found in *Plains* Seasonally Inundated Shrubby Woodland are absent in *Valley* Seasonally Inundated Shrubby Woodland.

Sedges and rushes comprise 30% of the ground layer species. The most common species are Soft Bog-sedge Schoenus tesquorum Red-fruit Saw-sedge Gahnia sieberiana, Floating Clubsedge Isolepis fluitans, Pale Rush Juncus pallidus, Bare Twig-sedge Baumea juncea, Tiny Flat-sedge "Cyperus tenellus, Plain Quillwort Isoetes drummondii, Little Club-sedge I. marginata, Hollow Rush Juncus amabilis, Bulbous Rush J. bulbosus and Joint-leaf Rush J. holoschoenus. Running Marsh-flower Villarsia reniformis is also indicative of the wet environment.

Forbs are also diverse and those able to tolerate this wet environment include Small St John's Wort Hypericum gramineum, Swamp Goodenia Goodenia humilis, Cat's Ears Hypocheeris radicata, Slender Aphelia Aphelia gracilis, Hairy Centrolepis Centrolepis strigosa ssp. strigosa, Kidney-weed Dichondra repens, Mossy Woodruff r Asperula minima, Hydrocotyle spp., Variable Stinkweed Opercularia varia, Matted Pratia Pratia pedunculata s.l. and Solenogyne Solenogyne dominii. Geophytes are not common, however Slender Sun-orchid Thelymitra pauciflora s.l. and Sheath Star Hypoxis vaginata are sometimes present. Unlike Plains Seasonally Inundated Shrubby Woodland with 10 common grass species, only two grasses are consistently recorded and these are Reed Bent-grass Deyeuxia quadriseta and Bristly Wallaby Grass Rvtidosperma setaceum.

Mossy Woodruff r Asperula minima is the only significant species recorded in this community.

Floristic Community 195-02 Plains Seasonally Inundated Shrubby Woodland

Plains Seasonally Inundated Shrubby Woodland occurs on broad drainage lines and flats that are inundated for extended periods during winter. Surface soil is baked hard in summer, forming a shallow, powdery, sandy clay. The soils are duplex, with an abrupt change to drainage-impeding, light to heavy clays. Species diversity is quite high for such a seasonally variable environment and this may be due to its proximity in the landscape to Plains Grassy Woodland and Plains Lateritic Heathy Woodland. particular, grass and heath species are shared from these two EVCs.

The overstorey of Plains Seasonally Inundated Shrubby Woodland consists of scattered Yellow Gum Eucalyptus leucoxylon 10-15m tall, occasionally reaching 30m. Yellow Box E. melliodora and Grey Box E. microcarpa sometimes occurs with Yellow Gum. There are no commonly occurring understorey trees or tall shrubs.

The understorey consists of a mosaic of often dense but separate stands of narrow-leaved shrubs such as Totem Poles Melaleuca decussata, Common Fringe-myrtle Calytrix tetragona, Varnish Wattle Acacia verniciflua, Prickly Moses A. verticillata, Prickly Tea-tree Leptospermum continentale, Heath Tea-tree L. myrsinoides and less commonly Scarlet Bottlebrush Callistemon rugulosus. Amongst this dense thicket, low, narrow and ericoid-leaved shrubs include Upright Guinea-flower Hibbertia stricta, Dwarf Hakea Hakea rugosa, Flame Heath Astroloma conostephioides, Cranberry Heath A. humifusum Common Eutaxia Eutaxia microphylla, Cat's Claws Grevillea Grevillea alpina, Honey-pots Acrotriche serrulata and Beaked Hakea H. rostrata.

Although ground cover is minimal, the species diversity is quite high. Sedges form a large component of the ground cover due to the seasonal fluctuations of inundation. Common Bog-sedge *Schoenus apogon*, Finger Rush Juncus subsecundus, Tiny Flat-sedge *Cyperus tenellus, Dwarf Rush * Juncus capitatus, Clustered Sword-sedge Lepidosperma congestum Black Bristle-sedge Chorizandra enodis, Little Club-sedge Isolepis marginata, Black Rapier-sedge L. carphoides and Little Sword-sedge L. curtisiae are all common

Common graminoids are Twining Fringe-lily Thysanotus patersonii, Milkmaids Burchardia umbellata, Black-anther Flax-lily Dianella revoluta, Small mat-rush Lomandra sororia and Yellow Rush-lily Tricoryne elatior.

Numerous forbs and grasses also occur. These include Hairy Centrolepis C. strigosa ssp. strigosa, Sheep's Burr Acaena echinata, Pointed Centrolepis C. aristata, Black's Goodenia Goodenia blackiana, Common Raspwort Gonocarpus tetragynus, Wiry Mitrewort Mitrasacme paradoxa, Stinking Pennywort Hydrocotyle laxiflora, Small St John's Wort Hypericum gramineum, Smooth Cat's Ear *Hypochoeris glabra, Car's Ear *H. radicata, Scaly Buttons Leptorhynchos squamatus and Variable Stinkweed Opercularia varia. Common grasses include Bristly Wallaby-grass Rytidosperma setaceum, Elegant Hair-grass **Aira elegans*, Lesser Quaking-grass **Briza minor*, Velvet Wallaby-grass *R. pilosum*, Common Blown-grass Agrostis avenacea var. avenacea, Five-awned Spear-grass *Pentapogon* quadrifidus, Kneed Wallaby-grass R. geniculatum, Weeping Grass Microlaena stipoides var. stipoides, Grey Tussock-grass Poa sieberiana var. sieberiana and Squirrel-tail Fescue *Vulpia bromoides.

Significant species found in Plains Seasonally Inundated Shrubby Woodland are Small Milkwort v Comesperma polygaloides, Trailing Hop-bush Vv Dodonea procumbens, Clustered Daisy-bush v Olearia suffruticosa, Bent-grass v Deyeuxia imbricata and Short-leaf Bog-sedge r Schoenus laevigatus.

Floristic Community 195-03 Rocklands Seasonally Inundated Shrubby Woodland

Rocklands Seasonally Inundated Shrubby Woodland, in the draft mapping, was included in the floristic community Valley Seasonally Inundated Shrubby Woodland. In the final mapping it was separated because it was not sampled and was geographically isolated from the Glenelg River system where Valley Seasonally Inundated Shrubby Woodland occurs. It also includes man-made ecological environments, that is, dense stands of young River Red Gum E. camaldulensis within the Rocklands reservoir waterbody, which are seasonally inundated by deep water.

EVC 198 Sedgy Riparian Woodland Sedgy Riparian Woodland occurs on riparian flats and along creek banks that frequently flood. It is also commonly found in the heads of gullies, some saddles and at water discharge sites. Soils vary from sandy loams to sitty clay loams high in organic content. On the flatter sites, water may sit or run through the vegetation whereas gully sites have better drained, moister soils.

A canopy of Swamp Gum Eucalyptus ovata is present with tree height ranging from 15-30m. Field observations also suggest a consistent variation in tree height, thereby making it possible for this community to be classified as either a woodland or a forest. Messmate *E. obliqua* is the only other common tree found in this EVC. Understorey trees include both Blackwood Acacia melanoxylon and Black Wattle A. mearnsii.

Under this eucalypt layer, tall shrubs form a sparse understorey and include Prickly Moses Acacia verticillata, Scented Paperbark Melaleuca squarrosa, Wirilda A. retinoides var. retinoides, Woolly Tea-tree Leptospermum lanigerum Manuka L. scoparium and tree form Silver Banksia Banksia marginata.

The ground layer is dominated by a dense cover of sedges and sedge-like species such as Red-fruit Saw-sedge Gahnia sieberiana, Square Twig-sedge Baumea tetragona, Tall Sedge Carex appressa, Leafy Flat-sedge Cyperus lucidus, Common Reed Phragmites australis, Tall Sword-sedge Lepidosperma elatius or Tassel Cord-rush Restio tetraphyllus. Tall Sword-sedge Lepidosperma elatius tends to dominate on gully or well-drained sites, whereas Square Twig-sedge Baumea tetragona and Tall Sedge Carex apressa tend to dominate at sites where there is flowing water.

Depending on the density of sedges and moisture availability, the ground cover has varying numbers of forbs, grasses and ferns. Weeping Grass *Microlaena stipoides* and Slender Tussock-grass *Poa tenera* frequently occur but never account for a significant proportion of the ground cover. Forbs include Centella *Centella cordifolia*, Shade Raspwort *Gonocarpus humilis*, Austral Brooklime *Gratiola peruviana* and Cat's Ear **Hypochoeris radicata*. Austral Bracken *Pteridium esculentum* often present but rarely abundant. At wetter sites, Fishbone Water-fern *Blechnum nudum* occurs as a minor component of the vegetation.

Sedgy Riparian Forest is typically species poor. Significant species which occur are Showy Willow Herb d *Epilobium pallidiflorum* and Mossy Woodruff r As *perula minima*.

EVC 200 Shallow Freshwater Marsh

Shallow Freshwater Marsh occurs on floodplains where creeks and rivers broaden and decrease in flow. The soils are deep, anaerobic silts over which lay varying depths of water. Seasonal variation determines the depth of inundation, with water availability at the periphery of the marsh contracting during dry periods. In the Glenelg River system, Shallow Freshwater Marsh forms linear strips along riparian zones whereas in the Wannon valley and in State Forest west of the Grampians, spherical swamps not fed by streams are common. A unique example of Shallow Freshwater Marsh occurs on the top of a rocky outcrop system in a swale, west of Lake Wartook in the Mount Difficult Range.

This wetland has River Red Gum *Eucalyptus camaldulensis* skirting the fringes, with the main body of the swamp devoid of trees.

Shallow Freshwater Marsh is species poor, with Upright Milfoil *Myriophyllum crispatum* and Water Ribbons *Triglochin alcockiae* occurring in the deeper, flowing water. Fine Twig-sedge *Baumea arthrophylla* is also common. Fringe-dwelling species present which are influenced by depth and duration of inundation include Tall Spike-sedge *Eleocharis sphacelata*, Bulbous Rush *Juncus bulbosus*, Tall Rush *Juncus procerus*, Finger Rush *Juncus subsecundus*, Pithy Sword-sedge *Lepidosperma longitudinale* and Running Marsh-flower *Villarsia reniformis*.

EVC 278 Herb-rich Heathy Forest

Floristic Community 278-01 Metamorphics Herb-rich Heathy Forest

Metamorphics Herb-rich Heathy Forest occurs on mineralised metamorphosed sandstone formed from igneous intrusions. It occurs on the tops of ridges, where the soils are shallow and rocky and support a rich herb layer.

Brown Stringybark *Eucalyptus baxteri* and Messmate *E. obliqua* are the common tree species, forming a tall overstorey with Grampians Grey Gum *E. alaticaulis* sometimes being present further upslope. There is no understorey tree layer, with shrubs to 5m forming an open, lower stratum.

Narrow leaf shrubs are scattered and low in density. Species include Spreading Wattle Acacia genistifolia, Wirilda A. retinodes ssp. retinodes, Prickly Moses A. verticillata, Varnish Wattle A. verniciflua, Silver Banksia Banksia marginata, Sweet Bursaria Bursaria spinosa, Oyster Bay Cypress-pine Callitris rhomboidea, Grey Everlasting Ozothamnus obcordatus and Dusty Miller Spyridium parvifolium

Small heathy species are abundant and include Honey-pots Acrotriche serrulata, Flame Heath Astroloma conostephioides, Cranberry Heath A. humifusum Pine Heath A. pinnifolium Creeping Bossiaea Bossiaea prostrata, Daphne Heath Brachyloma daphnoides, Common Fringe-myrtle Calytrix tetragona, Common Correa Correa reflexa, Narrow-leaf Bitter-pea Daviesia leptophylla, Smooth Parrot-pea Dillwynia glaberrima, Showy Parrot-pea D sericea, Common Heath Epacris impressa, Cat's Claw Grevillea Grevillea alpina, Variable Prickly Grevillea G. aquifolium, Bundled Guineaflower Hibbertia prostrata, Silky Guinea-flower H. sericea s.l., Upright Guinea-flower H. stricta, Common Hovea Hovea linearis, Horny Cone-bush Isopogon ceratophyllus, Running Postman Kennedia prostrata, Common Lagenifera Lagenifera stipitata, Heath Tea-tree Leptospermum myrsinoides, Ruddy Beard-heath Leucopogon rufus, Common Beard-heath L. virgatus, Prickly Geebung Persoonia juniperina, Thyme Spurge Phyllanthus hirtellus, Smooth Rice-flower Pimelea glauca, Common Rice-flower P. humilis, Common Flat-pea Platylobium obtusangulum, Rough Bush-pea Pultenaea scabra, Golden Heath Styphelia adscendens and Pink-bells Tetratheca ciliata. Austral Grass-tree Xanthorrhoea australis is present in Iow numbers.

Many perennial forbs are scattered beneath the understorey shrubs. These include Sheep's Burr Acaena echinata, Woolly Everlasting Argentipallium blandowskianum Mossy Woodruff r Asperula minima, Rayless Daisy Brachyscome perpusilla, Blue Pincushion Brunonia australis, Pointed Centrolepis Centrolepis aristata, Hairy Centrolepis C. strigosa, Slender Cicendia *Cicendia filiformis, Austral Carrot Dauchus glochidiatus, Tall Sundew Drosera peltata ssp. auriculata, Common Raspwort Gonocarpus tetragynus, Germander Raspwort G. teucrioides, Bent Goodenia Goodenia geniculata, Button Everlasting Helichrysum scorpioides, Small Pennywort Hydrocotyle callicarpa, Yellow Pennywort H. foveolata, Stinking Pennywort H. laxiflora, Small St John's Wort Hypericum gramineum Yam Daisy Microseris scapigera, Wiry Mitrewort Mitrasacme paradoxa, Variable Stinkweed Opercularia varia, Variable Plantain Plantago varia, Small Poranthera Poranthera muelleri, Hairy Speedwell Veronica calycina, Hidden Violet Viola cleistogamoides, Ivy-leaf Violet V. hederacea ssp.

Grasses are also common and include Small Hair-grass **Aira cupaniana*, elegant Hair-grass **A. elegans*, *Austrodanthonias*p., Reed Bent-grass *Deyeuxia quadriseta*, Weeping Grass *Microlaena stipoides*, *Poa* sp. and Supple Spear-grass *Austrostipa mollis*.

Graminoids include Black-anther Flax-lily Dianella revoluta, Black Rapiersedge Lepidosperma carphoides, Wire Rapier-sedge L. semiteres, Wattle Mat-rush Lomandra filiformis, Dwarf Mat-rush L. nana and Small Mat-rush L. soraria. Perennial geophytes include Milkmaids Burchardia umbellata, Pink Fingers Caladenia carnea, Blue Squill Chamaescilla corymbosa var. corymbosa, Common Bird-orchid Chiloglottis valida and Wax-lip Orchid Glossodia major.

Climbers present are Common Apple-berry Billardiera scandens, Downy Dodder-laurel Cassytha pubescens s.s., Love Creeper Comesperma volubile and Twining Fringe-lily Thysanotus patersonii.

Austral Bracken Pteridium esculentumis the only fern species recorded.

EVC 279 Heathland Thicket

Floristic Community 279-01 Grampians Heathland Thicket Grampians Heathland Thicket occurs as isolated patches within larger areas

Grampians Heathland Thicket occurs as isolated patches within larger areas of Sand Heathland. It can be similar, structurally, to *Grampians* Floodplain Thicket, however *Grampians* Heathland Thicket occurs in Sand Heathland, which is higher in the landscape profile than the communities on the floodplain. *Grampians* Heathland Thicket can form linear patches along drainage lines or form thicket islands in shallow depressions within expanses of Sand Heathland.

A dense, impenetrable thicket of Totem Poles *Melaleuca decussata* dominates this floristic community, with the occasional Manuka *Leptospermum scoparium* present. Due to the dense nature of the thicket, very little light reaches the ground stratum, so the ground is mostly bare, with occasional moss cover. These dense thickets form at the lower end of the landscape profile in which Sand Heathland dominates. Anecdotal observations suggest that some patches of *Grampians* Heathland Thicket may also be related to fire frequency effects, being patches of Sand Heathland which have escaped ecological burning by the Parks Service and developed into thickets.

EVC 280 Floodplain Thicket

Floristic Community 280-01 Grampians Floodplain Thicket

Grampians Floodplain Thicket occurs on floodplains in the Glenelg River and Wannon River Catchments. Water running off the ranges finally reaches the lowest part of the landscape profile, seasonally providing large volumes of water which cover these areas. The flat, alluvial landscape gives rise to a multitude of interlinking capillary channels, which form within the larger floodplain. It is on these channels and the interstitial zones between channels, that *Grampians* Floodplain Thicket thrives. Thickets are often impenetrable, however some structural variations do occur, probably due to varying disturbance intensity from flooding. Variations in floristics are most likely due to floodplain profile and the catchment within which it occurs. Soils are alluviums varying from black anaerobic alluvial clay sands to pale grey silty clays.

The dominant eucalypt is River Red Gum *Eucalyptus camaldulensis,* with Yellow Gum *E. leucoxylon* sub-dominant. Fringing Brady Swamp is a patch

of Grampians Floodplain Thicket that has Swamp Gum E. ovata overhanging the site. Occasionally, spindly and sparse Roughbarked Manna Gum E. viminalis ssp. cygnetensis is present although in many instances this floristic community is treeless. Blackwood Acacia melanoxylon is the only understorey tree in sites that have eucalypt cover.

The shrubs form a tall dense thicket, with dominant species including Totem-poles Melaleuca decussata, Slender Honey-myrtle M. gibbosa, Scented Paperbark M. squarrosa, Mealy Honey-myrtle *M.* squamea, Woolly Tea-tree *Leptospermum lanigerum* and Prickly tea-tree *L. continentale.* Occasional shrubs include Narrow-leaf Wattle *Acacia mucronata*, Wirilda A. retinoides ssp. retinoides, Prickly Moses A. verticillata, Slender Sheoke Allocasuarina misera, Scarlet Bottlebrush Callistemon rugulosus, Calytrix sp., Yellow Hakea Hakea nodosa and Golden Spray Viminaria juncea. Parasitic climbers include Slender Dodder-laurel Cassytha glabella and Downy Dodder-laurel C. pubescens.

Various densities of sedge and restionaceous species can sometimes dominate the ground stratum. These include Tall Sedge Carex appressa, Red-fruit Saw-sedge Gahnia sieberiana, Tassel Rope-rush Hypolaena fastigiata, Pale Rush Juncus pallidus, Lepyrodia sp., Slender Twine-rush Leptocarpus tenax, Tassel Cord-rush Restio tetraphyllus and Common Bog-sedge Schoenus apogon.

Ground-dwelling herbs include Pointed Centrolepis Centrolepis aristata, Hairy Centrolepis C. strigosa, Blue Squill Chamaescilla corymbosa var. corymbosa, Tall Sundew Drosera peltata ssp. peltata, Tiny Sundew D. pygmaea, Creeping Raspwort Gonocarpus micranthus, Austral Brooklime Gratiola peruviana, Villarsia sp. and other tiny annual herbs.

EVC 281 Sedge-rich Wetland

Floristic Community 281-01 Grampians Sedge-rich Wetland Grampians Sedge-rich Wetland occurs in small swamps in the northern part of the Grampians National Park or on seasonally inundated drainage lines on the plains in the Black Range. Swamp sites are most often permanent, but can dry in drought years or towards the end of summer. This community is restricted in distribution, with two of the sites in the northern part of the park nominated for state significance under the Flora and Fauna Guarantee Act (Meredith et al., 1992). *Grampians* Sedge-rich Wetland also occupies a number of specific ecological niches in the floodplain system of the Glenelg River. It occurs where floodwaters converge out of the channels under the floristic community Grampians Floodplain Thicket and flow into bends or low positions in the watercourse.

Unlike Grampians Floodplain Thicket, Grampians Sedge-rich Wetland is usually devoid of a shrub layer, possibly due to the scouring action of flooding and lying water. The community generally has a sparse overstorey of River Red Gum *E.* camaldulensis, with the ground layer consisting of sedges in patches and bare earth.

River Red Gum Eucalyptus camaldulensis is frequently present with Yellow Box *E. melliodora* sub-dominant. Overhan branches of River Red Gum occur on the margin of the swamp. Overhanging

Shrubs are few and sparse, skirting the edges of the swamp. Golden Wattle Acacia pycnantha fringes sites in the northern Grampians, whilst Prickly Tea-tree Leptospermum continentale occurs in theBlack Range.

As the EVC name suggests, the dominant lifeforms are sedges, comprising a quarter of the species recorded. Common sedges include Black Bristle-sedge Chorizandra enodis, Common Spikesedge Eleocharis acuta, Joint-leaf Rush Juncus holoschoenus, Common Sedge Carex inversa, Awned Club-sedge *Isolepis hystrix, Toad Rush Juncus bufonius, Soft Bog-sedge Schoenus tesquorum, Rush Sedge Carex tereticaulis, Floating Club-sedge I. fluitans, Hollow Rush J. amabilis, Common Bog-sedge S. apogon, and Medusa Bog-sedge S. latelaminatus.

Of equal importance in the swamp environment are the aquatic perrenials which include Running Marsh-flower Villarsia reniformis, Floating Pondweed Potamogeton tricarinatus s.l., Water-ribbons Triglochin procerum spp. agg. and Dwarf Brooklime Kk Gratiola numilo

Many forbs and grasses occur on the fringe of the swamp, where the water-level recedes during drier months. Forbs include Slender Dock Rumex brownii, Cat's Ear Hypochoeris radicata, Small Loosestrife Lythrum hyssopifolia, Wiry Mitrewort Mitrasacme paradoxa, Sheep's Burr Acaena echinata, Slender Cicendia * Cicendia filiformis, Austral Carrot Daucus glochidiatus, Variable Willow-herb Epilobium billardierianum, Slender Goodenia Goodenia gracilis, Hairy Hawkbit *Leontodon taraxacoides, Woolly-

heads Myriocephalus rhizocephalus, Solenogyne Solenogyne dominii and Purple Bladderwort Utricularia dichotoma. Grasses are also common, which indicates the proximity to grassy woodlands as well as farmland. The main grasses include Long-nosed Swamp Wallaby-grass Amphibromus macrorhinus, Lesser Quaking-grass Briza minor, Brown-black Wallaby-grass Rytidosperma duttonianum, Large Quaking-grass B. maxima, Mediterranean Barley-grass *Critesion hystrix, Wimmera Rye-grass *Lolium rigidumand Squirrel-tail Fescue *Vulpia bromoides.

Common geophytes include Chocolate-lily Arthropodium strictum, Scented Leek-orchid Prasophyllum odoratum, Common Onion-grass *Romulea rosea var. australis, Small Trigger-plant Stylidium despectum, Common Onion-orchid Microtis unifolia, Slender Sun-orchid Thelymitra pauciflora s.l. and Yellow Rush-lily *Tricoryne elatior*.

Significant species in Grampians Sedge-rich Wetland are few, but include Dwarf Brooklime Kk Gratiola pumilo and Gilgai Blown Grass v Agrostis aemula var. setifolia.

EVC 282 Shrubby Woodland

There are two floristic communities of Shrubby Woodland both occurring in all major catchments of the study area. *Grampians* Shrubby Woodland is confined to the valley floors of all major catchments within the study area, whilst Sand Shrubby Woodland extends from the edge of the valley floor, often along drainage lines. Sand Shrubby Woodland differs to Grampians Shrubby Woodland with the former occurring higher in the landscape profile, on deeper sands, with different overstorey species and dominated by restionaceous and sedge species rather than grasses and forbs.

Floristic Community 282-01 Grampians Shrubby Woodland Within the study area, Grampians Shrubby Woodland is found on Pliocene-Pleistocene sediments with duplex soils. Varying depths of sandy loam up to 1m deep overlay a heavy clay subsoil (Lunt et al., unpublished). It occurs around the perimeter of the Grampians National Park abutting private property, and along all major streams within the study area, such as along Scrubby Creek where it widens to form a broad, seasonally inundated floodplain associated with more permanent swamps. The Glenelg River floodplain, Briggs Ck at Roses Gap, McKenzie River, and Wannon River floodplain all have Grampians Shrubby Woodland present. Water availability is driven by seasonal inundation periods due to the impeding clay laver.

Grampians Shrubby Woodland has a variable structure and may occur as a woodland or an open forest. The dominant overstorey species is River Red Gum *Eucalyptus camaldulensis* 20-25m tall, often with Yellow Box *E. melliodora* sub-dominant. Yarra Gum *E. yarraensis* and Swamp Gum *E.* ovata are dominant at some sites.

An understorey tree layer, occasionally to 15m tall consists of Black Wattle Acacia mearnsii and less commonly Blackwood A. melanoxylon. Tree-form Silver Banksia Banksia marginata can also from part of the taller shrub layer. Grampians Shrubby Woodland receives its name from the often dense layer of smaller tea-tree shrubs including Prickly Tea-tree *Leptospermum continentale*, Manuka *Leptospermum* scoparium and Heath Tea-tree *L*. myrsinoides. The ericoid-leaved Flame Heath Astroloma conostephioides, Cranberry Heath A. humifusumand Daphne Heath Brachyloma daphnoides also occur as low shrubs to 1m. Where the shrubs and smaller trees are more open, Austral Bracken *Pteridium esculentum* sometimes forms an open field layer, sometimes making it difficult to distinguish from Grampians Damp Sands Herb-rich Woodland.

The ground layer is dominated by Weeping Grass Microlaena stipoides and is rich in forbs. Creeping Cudweed Euchiton gymnocephalus, Cat's Ear *Hypochoeris radicata, Grassland Wood-sorrel Oxalis perennans, Stinking Pennywort Hydrocotyle laxiflora, Small St John's Wort Hypericum gramineum Common Lagenifera Lagenifera stipitata, Small Poranthera Poranthera microphylla, Common Woodrush Luzula meridionalis, Yellow Pennywort Hydrocotyle foveolata, Smooth Cat's Ear *Hypochoeris glabra, Ivy-leaf Violet Viola hederacea ssp. hederacea, Mossy Woodruff r Asperula minima, Cotton Fireweed Senecio quadridentatus and Hidden Violet Viola cleistogamoides are the most common species, although numerous others are also present.

Short-stem Sedge Carex breviculmis, Common Bog-sedge Schoenus apogon and Finger Rush Juncus subsecundus are the only common sedges and rushes.

Introduced species are common in this floristic community, perhaps reflecting the past history of disturbance from grazing and timber harvesting, in addition to the relatively fertile soil.

There are two significant species in this community: Mossy Woodruff r Asperula minima and Rr E. yarraensis.

Floristic Community 282-02 Sand Shrubby Woodland

Sand Shrubby Woodland occurs on deep sands in drainage lines and on floodplains that have been covered with sand. Shrub density varies from dense thickets of Manuka to older patches with a tall Blackwood overstorey and an open shrub understorey. Sand Shrubby Woodland differs to Grampians Shrubby Woodland with the former occurring higher in the landscape profile, on deeper sands, with different overstorey species and

dominated by restionaceous and sedge species rather than grasses and forbs.

Sand Shrubby Woodland occurs where deeper sands meet heavier soils that retain moisture. It often occurs in the transition zone between *Grampians* Damp Sands Herb-rich Woodland and the following communities: *Grampians* Shrubby Woodland, Sand Heathy Woodland and *Grampians* Valley Grassy Forest. It can also occur as a drainage line or as a transition zone where Riparian Scrub, Sedgy Riparian Woodland, *Sand* Heathy Woodland or Sand Heathland meets either *Grampians* Shrubby Woodland or Sand Ifoodplains. A considerable area of *Sand* Shrubby Woodland is found east of Mt William where it dominates in drainage lines and atypically on outwash slopes abutting *Grampians* Heathy Dry Forest and *Slopes Latertic* Heathy Woodland upslope, and riparian EVCs downslope.

Sand Shrubby Woodland occupies an ecological niche that lies between a number of floristic communities and subsequently, overstorey species are variable, depending on the communities it is abutting. The suite of overstorey species include Brown Stringybark *Eucalyptus baxteri*, River Red Gum *E. camaldulensis*, Yellow Box *E. melliodora*, Messmate *E. obliqua*, Swamp Gum *E. ovata*, Rough-barked Manna Gum *E. viminalis* ssp. *cygnetensis* and Shining Peppermint *E. willisii*. Black Wattle Acacia mearnsii is often present as an understorey tree, with occasional Blackwood A. *melanoxylon*. In the northern Grampians, Sallow Wattle A. *longifolia* often dominates the understorey.

Narrow leaved shrubs such as Prickly Tea-tree Leptospermum continentale, Heathy Tea-tree L. myrsinoides, Manuka L. scoparium and tree form Silver Banksia Banksia marginata form a consistent understorey, with occasional Oyster Bay Cypress-pine Callitris rhomboidea and Austral Grass-tree Xanthorrhoea australis also being present. Manuka often forms dense thickets, especially on the eastern side of the Mount William range.

A few small heath species are typical of Sand Shrubby Woodland and these include Honey-pots Acrotriche serrulata, Flame Heath Astroloma conostephioides, Cranberry Heath A. humifusum Daphne Heath Brachyloma daphnoides, Smooth Parrot-pea Dillwynia glaberrima, Bundled Guinea-flower Hibbertia prostrata, Twiggy Guinea-flower H. virgata, H. sp., Common Beard-heath Leucopogon virgatus, Prickly Broom-heath Monotoca scoparia and Pink-bells Tetratheca ciliata.

Sedges and restionaceous species are low in number, but often high in density. Thatch Saw-sedge *Gahnia radula*, Tassel Roperush *Hypolaena fastigata*, Slender Twine-rush *Leptocarpus tenax*, and various restionaceous spp are often present beneath the shrub layer.

Herbs are sparse on the ground but include Tall Sundew Drosera peltata spp. auriculata, Scented Sundew D. whittakeri, Geranium sp., Common Raspwort Gonocarpus tetragynus, Goodenia sp., Button Everlasting Helichrysum scorpioides, Small St John's Wort Hypericum gramineum, Hairy Pennywort Hydrocotyle hirta, Smooth Cat's Ear *Hypochoeris glabra, Cat's Ear *H. radicata, Lagenifera sp., Hairy Speedwell Veronica calycina and Hidden Violet Viola cleistogamoides. Grasses include Aira sp., Austrodanthoniaspp., Weeping Grass Microlaena stipoides, Poa spp., and Austrostipa spp.

Perennial geophytes include Blue Squill Chamaescilla corymbosa var. corymbosa, Common Bird-orchid Chiloglottis valida, Sheath Star Hypoxis vaginata, Red-beaks Lyperanthus nigricans and Grass Trigger-plant Stylidium graminifolium.

Graminoids include Black-anther Flax-lily *Dianella revoluta* s.l., Wattle Mat-rush *Lomandra filiformis* and Spiny-headed Mat-rush *L. longifolia.*

EVC 283 Plains Sedgy Woodland

Plains Sedgy Woodland sits low in the landscape profile and subsequently the clay layer is closer to the soil surface, impeding water drainage. This EVC often forms small sedgy depressions within *Greater Grampians* Plains Grassy Woodland and *Grampians* Alluvial Terraces Herb-rich Woodland. Thus, whilst it has a sedgy component, it also has grass, herb and geophyte species common to the surrounding woodlands. This EVC is found throughout the Greater Grampians Study Area.

Plains Sedgy Woodland is an open woodland dominated by Yellow Box *Eucalyptus melliodora*. River Red Gum *E. camaldulensis* is subdominant, with Yellow Gum *E. leucoxylon* also present. There are no understorey trees present in this EVC.

Shrubs are also lacking due to the wet nature of the environment. Small shrubs occasionally present include Cranberry Heath Astroloma humifusum, Spreading/Common Eutaxia Eutaxia diffusa/microphylla and Dwarf Hakea Hakea rugosa, each only recorded in one of the three quadrats.

Sedges are a dominant lifeform in Plains Sedgy Woodland. Those that commonly occur are Joint-leaf Rush *Juncus holoschoenus*, *Lepidosperma* spp., Black Bristle-sedge *Chorizandra enodis*, Small Spike-sedge *Eleocharis pusilla*, Hollow Rush *J. amabilis*, Pale Twig-sedge *Baumea acuta*, Fine/Soft Twig-sedge *B. arthrophylla/rubiginosa*, Tall Sedge *Carex appressa*, Rush-sedge *C. tereticaulis*, Common Spike-sedge *E. acuta*, Toad Rush *J. bufonius*, Wiry Rush *J. homalocaulis*, Finger Rush *J. subsecundus* and Common Bog-sedge *Schoenus apogon*.

Other species associated with seasonally inundated environments include Water Starwort **Callitriche hamulata*, Running Marsh-flower *Villarsia reniformis*, Small Swamp-daisy *Brachyscome uliginosa*, Common Sneezeweed *Centipeda cunninghamii*, Austral Water-mat *Lepilaena australis*, Upright Milfoil *Myriophyllum crispatum*, White Pursulane *Neopaxia australasica* and Water-ribbons *Triglochin procerum* spp. agg.

Some of the grasses and forbs common to surrounding woodland vegetation are shared in Plains Sedgy Woodland. Grasses include Common Blown Grass Agrostis avenacea var. avenacea, Veined Swamp Wallaby-grass Amphibromus nervosus, Briza spp., Common Wheat-grass Elymus scabrus, Weeping Grass Microlaena stipoides var. stipoides and Wetland Wallabygrass Rytidosperma semiannularis.

Dominant forbs include Hairy Hawkbit *Leontodon taraxacoides, Solenogyne Solenogyne dominii, Pimpernel *Anagalis arvensis, Variable Willow-herb Epilobium billardierianum, Blue Devil Eringium ovinum, Varied Raspwort Haloragis heterophylla, Cat's Ear *Hypochoeris radicata, Poison Lobelia Lobelia pratioides, Small Loosestrife Lythrum hyssopifolia, Clustered Dock *Rumex conglomeratus and Sow-Thistle *Sonchus oleraceus.

Perennial geophytes include *Hypoxis* sp., Common Onion-grass **Romulea* rosea var. *australis*, Yellow Rush-lily *Tricoryne elatior*, Blue Squill *Chamaescilla corymbosa* var. *corymbosa* and Wax-lip Orchid *Glossodia major*.

EVC 284 Claypan Ephemeral Wetland

Claypan Ephemeral Wetland is found on the southern boundary of the Grampians National Park, just north of the Wannon River. It occurs on both private and public land in this area as a mosaic with *Grampians* Alluvial Terraces Herb-rich Woodland. This EVC occurs on large areas of cracking, silty clays which are seasonally inundated.

River Red Gum *Eucalyptus camaldulensis* grows on the margins of the wetland, overhanging from the *Grampians* Alluvial Terraces Herb-rich Woodland. Shrubs do not occur in this EVC.

Species indicative of seasonal variations in water inundation include *Centipeda ?cunninghamii, Isotoma* sp., *Juncus* sp., *Myriophyllum* sp., *Pratia* sp., *Ranunculus* sp., *?Samolus* sp. and *Villarsia* sp.

Other perennial forbs include Spear Thistle **Cirsium vulgare*, Kidney-Weed *Dichondra repens*, Hairy Hawkbit **Leontodon taraxacoides*, Solenogyne Solenogyne dominii, Goodenia sp., *Mentha* sp. and *Euchiton* sp. Grasses are few but include Australian Salt-grass *Distichlis distichophylla* and *Dichelacne/Deyeuxia* sp. Common Bog-sedge *Schoenus apogon* is the only common sedge.

EVC 285 Dry Creekline Woodland

Floristic Community 285-01 Grampians Dry Creekline Woodland

Grampians Dry Creekline Woodland is restricted to the drier, northern part of the Grampians National Park. It occurs on small ephemeral creeks that are dry during the summer period and subsequently it does not support a rich ground layer. Grampians Dry Creekline Woodland is often linear and the creeks are narrow (1-1.5m wide). Therefore, the vegetation quickly changes into other abutting floristic communities. Hence it is difficult to map and is often absorbed in much larger polygons of other communities. It has also been mapped in a complex with Sedgy Riparian Woodland or Grampians Damp Sands Herb-rich Woodland.

A mixture of overstorey species occur in *Grampians* Dry Creekline Woodland. These include Desert Stringybark *Eucalyptus arenacea*, Mountain Grey Gum *E. cypellocarpa*, Swamp Gum *E. ovata* and Manna Gum *E. viminalis* ssp. *viminalis* to 15m.

Narrow-leaved shrubs are common, but not dense. Species present are Sallow Wattle Acacia longifolia, Common Fringe-myrtle Calytrix tetragona, Hairy Correa Correa aemula, Wedge-leaf Hop-bush Dodonea viscosa ssp. cuneata, Hop Goodenia Goodenia ovata, Shrubby Velvet-bush Lasiopetalum macrophyllum, Manuka Leptospermum scoparium, Victorian Christmas-bush Prostanthera lasianthos and Grampians Thryptomene Thryptomene calycina. Coarse Dodder-laurel Cassytha melantha is found entwined amongst the shrubs.

Austral Bracken *Pteridium esculentum* is often dense above a species-poor ground layer. Most of the ground layer is bare, with much leaf litter. Forbs

are few, sparse and comprised of Asperula/Galium sp., Hydrocotyle ?hirta, Lagenifera sp., Lobelia/Pratia sp., Senecio sp. and Hidden Violet Viola cleistogamoides. The only grass recorded is Weeping Grass Microlaena stipoides var. stipoides.

Large sedges are present but not dominant and include Red-fruit Saw-sedge Gahnia sieberiana and Variable Sword-sedge Lepidosperma laterale.

EVC 292 Red Gum Wetland

Red Gum Wetland only occurs in the south-east end of the park in the vicinity of Brady Swamp. It occurs in drainage lines or depressions and seasonally inundated areas, with the clay soil surface cracking during dry conditions. It lies in a zone between Shallow Fresh Water Marsh, Grampians Floodplain Thicket on the Wannon River and Grampians Shrubby Woodland.

River Red Gum Eucalyptus camaldulensis is the only eucalypt to occur in this EVC and has a spreading woodland form. Blackwood Acacia melanoxylon is present but not in high numbers. Tall Sedge Carex appressa is always present and does not extend beyond the periphery of the Red Gum crowns. Tall Sedge is also very dense, accounting for 80-90% of the ground cover. Amongst the Tall Sedge are the occasional Red-fruit Saw-sedge Gahnia sieberiana, Juncus spp., Prickly Tea-tree Leptospermum continentale and Common Tussock-grass Poa labillardieri.

Smaller herbs include Agrostis sp., Spear Thistle *Cirsium vulgare, Cyperus sp., Euchiton sp., Marsilea sp., Ranunculus sp., ?Stellaria media and Trifolium sp

EVC 300 Reed Swamp

Reed Swamp occurs along the Wannon River system in the southern part of the Grampians National Park in the vicinity of Brady Swamp.

Reed Swamp is dominated by either Cumbungi Typha sp. or Common Reed *Phragmites australis*. Small aquatic and semiaquatic species occur amongst the reeds, however they are not visible during inundation. Occasional Woolly Tea-tree Leptospermum lanigerum, may be dotted along the fringes of the swamp. Red Gum Wetland dominated by River Red Gum *Eucalyptus camaldulensis* is often found abutting Reed Swamp.

EVC 710 Damp Heathland Damp Heathland occurs low in the landscape profile, with water often lying on the soil surface. It is often found between Grampians Shallow Sand Heathland and Wet Heathland. This EVC often forms broad patches surrounding smaller depressions of Wet Heathland.

Damp Heathland is normally treeless although Rough-barked Manna Gum *E. viminalis* ssp. cygnetensis can sometimes occur. Shrubs form a dense heathland, with Slender Sheoke Allocasuarina misera, Silver Banksia Banksia marginata, Common Heath Epacris impressa, Woolly-style Heath E. lanuginosa, Yellow Hakea Hakea nodosa, Dagger Hakea Hakea teretifolia, Prickly Tea-tree Leptospermum continentale, Totem-poles Melaleuca decussata, Slender Honey-myrtle M. gibbosa, Mealy Honey-myrtle M. squamea, Scented Paperbark M. squarrosa, Pink Swamp-heath Sprengelia incarnata andGolden Spray Viminaria juncea often being present. Slender Dodder-laurel Cassytha glabella entwines itself through the shrub layer.

The ground layer is often dense with restionaceous species, similar to those in Sand Heathland and Wet Heathland. These include Slender Twine-rush Leptocarpus tenax, Square Twig-sedge Baumea tetragona, Red-fruit Saw-sedge Gahnia sisberiana, Lepidosperma sp. and Schoenus spp. Austral Grass-tree Xanthorrhoea australis and Xanthorrhoea ?caespitosa can also be present.

Ground herbs include Swamp Selaginella Selaginella uliginosa and ?Pratia/Lobelia sp.

PORTLAND - WIMMERA VEGETATION DESCRIPTIONS

EVC 3 Damp Sands Herb-rich Woodland

Grassy or bracken-dominated eucalypt woodland or forest with large range of herbs including several annuals. Occurs on moderately fertile, relatively well-drained, sandy or loamy topsoils over heavier subsoils (duplex soils). Often associated with limestone or shallow aeolian deposits, not on volcanic substrates except rarely where overlain by shallow sand deposits. Soils are generally moist in winter and dry in summer, which promotes geophytic and annual species. Previously widespread and locally extensive within the study area but now largely cleared. Recorded from all bioregions in study area.

Glenelg Plain Damp Sands Herb-rich Woodland

Floristics: Dominated by Eucalyptus baxteri ± Eucalyptus viminalis. Acacia mearnsii is characteristic of this community. Rich in geophytes and grasses when intact.

Structure: Woodland to open-forest 20-25 m tall.

Habitat: Moderately fertile, relatively well-drained soils, usually

derived from limestone

Nearest relative: Heathy Herb-rich Woodland, which is intermediate with Heathy Woodland.

Comments: Many remnants degraded by loss of species and weed invasion. Invasion by Coast/Sallow Wattle Acacia longifolia, primarily due to lack of fire, is a major management issue in southern areas including Lower Glenelg National Park. Most of the pine plantations in the region were established on land supporting this EVC.

Goldfields Damp Sands Herb-rich Woodland Floristics: Dominated by Eucalyptus viminalis with an open understorey of Banksia marginata (tree form), Acacia mearnsii, Acacia melanoxylon. Pteridium esculentumand Brachyloma daphnoides are prominent in the ground-layer with more open areas dominated by grasses, geophytes and annuals. The groundlayer is generally weedy. Structure: Woodland 15-20 m tall.

Habitat: Sand lunettes.

Nearest relative: Heathy Woodland.

Grampians Damp Sands Herb-rich Woodland

Floristics: Dominated by Eucalyptus viminalis and E. ovata. Acacia mearnsii and/or

A. melanoxylon form a secondary tree stratum. The understorey is open and generally supports scattered heathy shrubs, dense Pteridium esculentum or Microlaena stipoides. Structure: Woodland to open-forest.

Habitat: Loamy sands associated with creeks and some areas of outwash sands.

Nearest relative: Grampians Herb-rich Foothill Forest Comments: Described by Tumino and Roberts (1998).

Victorian Volcanic Plain Damp Sands Herb-rich Woodland

Floristics: Dominated by *Eucalyptus viminalis* \pm *E. baxteri* \pm *E.ovata. Pteridiumesculentum* is typically conspicuous, often with Gahnia radula and Xanthorrhoea minor in understoreys which are rich in herbs and grasses when intact.

Structure: Woodland 12-25 m tall.

Habitat: Relatively well-drained sites on shallow typically reddish sands of at least moderate fertility overlying Quaternary basalt. Nearest relatives: Plains Grassy Woodland, Herb-rich Foothill Forest, Lowland Forest.

Warrnambool Plain Damp Sands Herb-rich Woodland

Floristics: Dominated by Eucalyptus viminalis ± E. ovata ± Allocasuarina verticillata, rich in geophytes and grasses when intact.

Structure: Woodland or open-forest (5-)10-20 m tall, stunted where exposed to salt-laden wind 500 m from coast. Trees are typically low-branching and spreading.

Habitat: Relatively well-drained sites of moderate fertility, strongly associated with limestone soils including sinkhole (karst) terrain but also on well-drained paludal soils.

Nearest relative: Herb-rich Foothill Forest.

Wimmera Damp Sands Herb-rich Woodland

Floristics: Dominated by Eucalyptus viminalis ssp. cygnetensis ± Eucalyptus camaldulensis \pm Banksia marginata (tree form), rich in geophytes, annual herbs and grasses when intact. Bracken is often a feature of disturbed sites.

Structure: Woodland or open-forest 10-20 m tall, stunted where moisture availability is low. Trees are typically low-branching and spreading.

Habitat: Relatively well-drained sites of moderate fertility, strongly associated with Quaternary aeolian and lunette sand deposits. Nearest relative: Shallow Sands Woodland. Comments: Damp Sands Herb-rich Woodland reaches its low-

rainfall limit in the southern Wimmera where it is often restricted to

a narrow band on the sheltered eastern edge of aeolian sand dunes. It is well represented in public land blocks but is subject to high burning frequencies, resulting in Bracken-dominated sites. High quality examples require better protection.

EVC 6 Sand Heathland

Generally treeless heath with occasional scattered trees. Occurs in a variety of sandy situations including deep aeolian sand dunes, outwash sands and on shallow sand sheets covering plains and floodplains. Soils are infertile and dry, particularly in summer. Relatively widespread and common within parts of the study area. Some areas are being developed for pine plantations within the Glenelg Plain. Recorded from four bioregions (Glenelg Plain, Goldfields, Grampians, Wimmera).

Glenelg Plain Sand Heathland

Floristics: Dominated by shrubs such as Leptospermum myrsinoides, Banksia marginata, Leptospermum continentale, Astroloma conostephioides. Allocasuarina mackliniana. Common ground species include Hypolaena fastigiata, Lepidosperma congestum, Gonocarpus tetragynus, Argentipallium obtusifolium Structure: Heathland <2 m tall. Habitat: Quaternary dunefields. Nearest relatives: Heathy Woodland, Damp Heathland.

Goldfields Sand Heathland

Floristics: Dominated by Xanthorrhoea australis with shrubs such as Brachyloma daphnoides, Banksia marginata, B. ornata. An unusual feature is the prominence of *Triodia scariosa*, which is more typical of semi-arid environments. Hypolaena fastigiata and Lepidosperma congestumare prominent ground-covers. Structure: Low heathland Habitat: Deep sand dunes. Nearest relative: Heathy Woodland Comments: Restricted environment associated with outwash sands. probably reworked into dunes by wind action.

Grampians Sand Heathland

Floristics: Dominated by low shrubs including Leptospermum myrsinoides and Banksia marginata, the ground-layer consists of various sedges such as Hypolaena fastigiata, Lepidosperma spp. and herbs.

Structure: Heathland to low open-woodland; trees are uncommon and if Present are often small and spindly. Habitat: Free-draining outwash sands, generally flat in profile, covering

broad areas.

Nearest relative: Damp Heathland.

Comments: This EVC was mapped as a small area to the north of Rocklands Reservoir. The floristics of the area have changed since construction of the dam and the EVC is now bounded on one side by Seasonally Inundated Shrubby Woodland fringing the reservoir (this explains the presence of *Eucalyptus camaldulensis* in the quadrat - see below).

Wimmera 1 Sand Heathland Floristics: Dominated by Leptospermum myrsinoides, Banksia ornata, Astroloma conostephioides, Allocasuarina mackliniana. Common ground species include Hypolaena fastigiata, Lepidosperma carphoides, L. congestum Lepidobolus drapetocoleus. Trioda scariosa is an occasional but striking presence within this heathland. Grasses, herbs and geophytes form a sparse ground-cover.

Structure: Heathland 0.5-1 m tall, occasionally with scattered mallee-form trees

Habitat: Quaternary dunefields.

Nearest relative: Heathy Woodland.

Comments: Boundaries between this EVC and Heathy Woodland may have been influenced by altered fire regimes.

Wimmera 2 Sand Heathland

Floristics: Dominated by Leptospermum continentale and a range of small shrubs and sedges.

Structure: Closed heath to 0.5 m tall to low open-woodland to 5 m tall. Trees, if present are generally of poor form and multi-stemmed.

Habitat: Broad gently-sloping outwash basins between aeolian sand dunes, sites may be poorly drained and soils may be waterlogged in winter due to a clay layer

40-60 cm beneath the sand. Nearest relative: Damp Heathland

Comments: Very restricted EVC in the study area that is poorly understood in terms of its ecology and biogeography.

EVC 8 Wet Heathland

Heathland (or scrub if long unburnt) dominated by dense shrubs. Occurs on infertile sites subject to prolonged waterlogging in winter and drought in summer. Infertile sites that are wetter in summer support Riparian Scrub or wetland vegetation. Recorded from one bioregion (Glenelg Plain).

Wet Heathland

Floristics: Dominated by shrubs such as Melaleuca squarrosa, Leptospermum continentale, Hakea nodosa, Allocasuarina paludosa, Melaleuca squamea and sedge Gymnoschoenus sphaerocephalus.

Structure: Closed heathland, or closed-scrub (> 2 m tall) when long unburnt.

Habitat: Relatively infertile sites subject to prolonged waterlogging in winter and drought in summer. Restricted to areas of relatively high winter rainfall.

Nearest relative: Damp Heathland. Comments: Delineation between this EVC and Damp Heathland, which are clearly different at their extremes, may be somewhat arbitrary as there appears to be a floristic continuum.

EVC 10 Estuarine Wetland

Treeless sedge-dominated wetland vegetation in estuaries. Vegetation is determined by fluctuating salinity, which varies in time from occasionally fresh to brackish or occasionally saline according to river flood and marine tide events. Soils are heavy silts and clays. Quadrats are recorded from the Warrnambool Plain within the study area but this EVC occurs or originally occurred in all estuaries within the study area (Glenelg Plain, Victorian Volcanic Plain at Portland, Warrnambool Plain) .

Lower Estuary Estuarine Wetland Floristics: Dominated by sedge Gahnia filum comprising a small number of salt-tolerant (halophytic) herbs. Structure: Sedgeland 1.5 m tall.

Habitat: Outer (landward) zones of large estuaries, subject to fluctuating salinity including occasional freshwater/brackish floods and tidal inundation.

Nearest relative: Coastal Salt Marsh.

Comments: The stand at Curdies Inlet is one of the largest in south-east Australia (J. Yugovic pers. obs.) and requires detailed survey. Small stands of *Estuarine Flats* Coastal Tussock Grassland occur within this area but are below mapping threshold.

Upper EstuaryEstuarine Wetland

Floristics: Dominated by Juncus kraussii, comprising a range of moderately salt-tolerant and some typically freshwater species. Phragmites australis is scattered throughout the community. Structure: Rushland 1.0 m tall.

Habitat: Upper reaches of estuary, less saline than for Estuarine

Wetland (Community 1). Nearest relative: Estuarine Wetland (Community 1).

Comments: Estuarine vegetation within the study area requires further survey.

EVC 13 Brackish Sedgeland

Sedgeland with grassy or herbaceous ground-layer. Sedges present are usually indicative of saline sites, but ground-layer is depauperate with few if any true halophytic species. Often on apparently calcareous paludal deposits. While potentially frequently or seasonally inundated, it is suspected that sites may drain rapidly. Probably previously uncommon within study area, currently very few relatively intact examples. Recorded from one bioregion within study area (Dundas Tablelands).

Brackish Sedgeland Floristics: Dominated by Gahnia filum, Baumea juncea, Leptocarpus brownii and/or Distichlis distichophylla. Austrodanthonia spp. and a large number of ephemeral herbs can be conspicuous in more intact sites. **Structure:** Sedgeland 0.5–2 m in height.

Habitat: Primarily calcareous to slightly saline swamp deposits. Nearest relative: Seasonally Inundated Shrubby Woodland.

EVC 16 Lowland Forest

Eucalypt forest with large range of shrubs and herbs, on relatively fertile, moderately well-drained soils in areas of relatively high rainfall. Many occurrences are on basalt or on shallow aeolian deposits with basalt within the root zone of trees; also on limestone and other substrates. Replaces Herb-rich Foothill Forest along increasing rainfall gradients. Restricted to the south of the study area and still largely extant which is unusual for an extensive pre-1750 EVC in the region. Recorded from three bioregions within the study area (Glenelg Plain, Victorian Volcanic Plain, Warrnambool Plain)

Glenelg Plain Lowland Forest

Floristics: Dominated by a range of eucalypts including Eucalyptus willisii, E. baxteri, E. obliqua and to a lesser extent E. viminalis. Occasional taller shrubs or small trees such as Acacia melanoxylon, Pomaderris racemosa, Exocarpos cupressiformis. Typically there is a moderately dense layer of ericoid-leaved shrubs, such as A. verticillata, Leptospermum continentale and Coprosma quadrifida, over a ground-cover of heathy subshrubs, bracken and a variety of herbs, grasses and climbers. Structure: Open-forest.

Habitat: Occurs on undifferentiated Tertiary sediments and on the margins of Quaternary aeolian deposits and Tertiary sediments where loamy soils have developed. Soils are well drained and relatively fertile. Nearest relative: Herb-rich Foothill Forest.

Victorian Volcanic Plain Lowland Forest

Floristics: Dominated by *Eucalyptus obliqua* $\pm E$. *willisii* $\pm E$. *aromaphloia* $\pm E$. *baxteri*. Understorey usually rich in shrubs. Forest Wire-grass Tetrarrhena juncea, characteristic of this EVC elsewhere in Victoria, is conspicuously absent but does not occur in far south-west Victoria. Depth of aeolian sand sheet where present over basalt influences floristics, with more heath elements on deeper sand.

Structure: Forest (20-)25-30 m tall, trees characteristically tall and straight. Habitat: Relatively fertile, moderately well-drained soils; on basalt or shallow aeolian deposits over basalt. Occurs in higher rainfall areas e.g. faultbounded Normanby Platform on which the Cobboboonee State Forest is situated.

Nearest relative: Herb-rich Foothill Forest.

Warrnambool Plain Lowland Forest

Floristics: Dominated by Eucalyptus obliqua ± E. viminalis. Understorey usually has high shrub cover, especially from Acacias, largely depending on fire regime; Forest Wire-grass Tetrarrhena juncea is usually prominent. Structure: Forest c. 30 m in height. Habitat: Moderately well-drained limestone soils.

Nearest relative: Herb-rich Foothill Forest.

EVC 18 Riparian Forest Eucalypt forest found along sheltered, permanent creeks and rivers. Dominated by tall eucalypts, this EVC also has an open to sparse secondary tree layer of wattles and scattered dense patches of shrubs, ferns, grasses and herbs. The soil is fertile alluvium, regularly inundated and permanently moist. This produces multi-layered, species-rich vegetation. Weed levels are typically high due to fertile conditions and regular flood disturbance. Narrow ecological range within the study area and therefore naturally rare. Recorded from three bioregions within study area (Glenelg Plain, Victorian Volcanic Plain, Warrnambool Plain). Also occurs in the Grampians (Tumino and Roberts 1998).

Glenelg Plain Riparian Forest Floristics: Dominated by Eucalyptus ovata with a secondary tree layer of Acacia melanoxylon. Patches of tall shrubs include Leptospermum lanigerum, Pomaderris aspera, Coprosma quadrifida. More exposed ground is blanketed with ferns, grasses, sedges and herbs.

Structure: Open-forest.

Habitat: Alluvial flats along sheltered permanent streams. Nearest relative: Swamp Scrub.

Comments: Most remnants degraded by weed invasion but still support a high diversity of native species many of which are restricted to this or other riparian EVCs.

Victorian Volcanic Plain Riparian Forest

Floristics: Dominated by *Eucalyptus ovata* $\pm E$. *viminalis* with a secondary tree layer of *Acacia melanoxylon*. Shrubs include *Leptospermum lanigerum*, Pomaderris aspera, Coprosma quadrifida. Soft Tree-fern Dicksonia antarctica is sometimes present. More exposed ground supports ferns, grasses, sedges and herbs.

Structure: Open-forest 30 m tall; closed-scrub where fire-damaged with eucalypt mortality.

Habitat: Alluvial flat along sheltered permanent stream.

Nearest relative: Swamp Scrub.

Comments: The example along the Fitzroy River is regenerating from severe fire and supports a dense scrubby understorey. The example along Brucknell Creek falls into two bioregions technically. There are grounds for combining this community with *Warrnambool Plain* Riparian Forest.

Warrnambool Plain Riparian Forest

Floristics: Dominated by Eucalyptus viminalis. Acacia melanoxylon, Pomaderris aspera. Leptospermum lanigerum and Coprosma quadrifida are prominent in the mid-storey. The ground-layer is rich in grasses, sedges and other herbs

Structure: Forest.

Habitat: Alluvium along permanent stream.

Nearest relative: Swamp Scrub.

EVC 19 Riparian Shrubland

Treeless shrubland or with sparse eucalypts, on rocky substrates with a variety of sedges, grasses and herbs, many at low frequencies. Occurs along perennial streams in gorge tracts, mainly on basalt but sometimes also limestone geologies. Formerly relatively restricted, now mostly cleared. Recorded from two bioregions within study area (Victorian Volcanic Plain, Warrnambool Plain).

Riparian Shrubland

Floristics: Typically dominated by Leptospermum lanigerumand/or Callistemon sieberi, with Hymenanthera dentata and Bursaria spinosa. Major ground-layer species include Carex appressa and Poa labillardierei. Eucalyptus camaldulensis occasionally present.

Structure: Shrubland 2-4 m, to open-woodland 10-20 m.

Habitat: Rocky stream banks along perennial streams subject to flood events

Nearest relative: Escarment Shrubland, Riparian Woodland.

EVC 20 Heathy Dry Forest

Open-forest dominated by a variety of eucalypts, mainly Eucalyptus macrorhyncha, E. polyanthemos and E. tricarpa, with an understorey dominated by narrow and ericoid-leaved shrubs. Occurs on ridgetops and upper slopes of low hills and lower slopes of more prominent ranges. Shallow stony soils derived from Ordivician and Cambrian sediments create growing conditions of low fertility and poor water availability. Four floristic communities of this EVC are described by Muir *et al.* (1995) although many of the quadrats used in this analysis are not included in their work. Recorded from the Goldfields and Wimmera bioregions. Also occurs in the Grampians (Tumino and Roberts 1998).

Goldfields Heathy Dry Forest

Floristics: Dominated by Eucalyptus macrorhyncha and E.

polyanthemos ± E. goniocaylx. Prominent shrubs include Acacia pycnantha, Astroloma conostephioides, Brachyloma spp., Dillwynia cinerascens. Tussock grasses Joycea pallida and Poa sieberiana are prominent ground-covers.

Structure: Open-forest.

Habitat: Ridgetops and upper slopes of low hills and lower slopes of more prominent ranges.

Nearest relative: Box Ironbark Forest.

Wimmera Heathy Dry Forest Floristics: Dominated by Eucalyptus macrorhyncha and E. tricarpa ± E. goniocaylx. Prominent shrubs include Acacia pycnantha, A. genistifolia, Astroloma conostephioides, Brachyloma spp., Dillwynia cinerascens. Tussock grasses Joycea pallida and Poa sieberiana are prominent in this species-rich community.

Structure: Open-forest.

Habitat: Ridgetops and upper slopes of low hills. Nearest relative: Box Ironbark Forest.

EVC 22 Grassy Dry Forest Eucalypt woodland or open-forest on moderately fertile soils derived from Ordivician shales and sandstones. Generally little or Ground-layer often sparse and dominated by no shrub layer. tussock grasses. Most remnants appear to be disturbed by past clearing and grazing. Recorded from two bioregions within study area (Goldfields, Grampians) but there are no available quadrat data from the study area to enable determination of floristic communities. Floristic communities of this EVC are described by Tumino and Roberts (1998) and Muir et al. (1995).

Grassy Dry Forest Floristics: Dominated by variety of eucalypts including Eucalyptus macrorhyncha, E. goniocalyx,

E. polyanthemos, E. melliodora, E. rubida. Shrub layer often absent or consists of sparse low shrubs such as Daviesia leptophylla, Acacia myrtifolia, Ozothamnus obcordatus. Groundlayer dominated by tussock grasses such as Poa sieberiana, Joycea pallida.

Structure: Woodland or open-forest 6-15 m tall. Trees are typically relatively young regrowth. Habitat: Steep to gentle slopes and ridges. Nearest relative: Grassy Woodland.

EVC 23 Herb-rich Foothill Forest

Grassy or bracken-dominated eucalypt forest or woodland with large range of herbs. Occurs on relatively fertile, moderately welldrained soils, often on basalt, in areas of relatively moderate to high rainfall. Replaces Damp Sands Herb-rich Woodland along increasing rainfall gradients or with change to (richer) basalt soils; on basalt gradually replaced by Lowland Forest along increasing rainfall gradients, by Plains Grassy Woodland along decreasing rainfall gradients. Previously widespread and locally extensive in the south of the study area, now largely cleared. The term 'foothill' is consistent with the statewide EVC typology (NRE in prep.) although this EVC is not restricted to foothills. Recorded from three bioregions (Glenelg Plain, Victorian Volcanic Plain, Warrnambool Plain).

Glenelg Plain Herb-rich Foothill Forest

Floristics: Dominated by Eucalyptus ovata ± E. viminalis. Tussock-grass Poa labillardierei and fern Adiantium aethiopicum

are prominent in the understorey. **Structure:** Forest or woodland c. 20 m in height.

Habitat: Moderately well-drained sites, often associated with sheltered, relatively damp gullies.

Nearest relatives: Damp Sands Herb-rich Woodland, Creekline Herb-rich Woodland.

Comments: Little is known of the pre-1750 vegetation of the isolated basalt section of Cape Bridgewater which may have been a form of Herb-rich Foothill Forest with coastal elements; according to Gibbons and Downes (1964) it was 'probably a scrub of coastal tea-tree [Melaleuca lanceolata] with manna gum'.

Victorian Volcanic Plain 1 Herb-rich Foothill Forest

Floristics: Dominated by Eucalyptus obliqua ± E. ovata ± E. viminalis. Structure: Forest 15–20 m in height. Habitat: Moderately well-drained basalt soils. Nearest relative: Victorian Volcanic Plain Herb-rich Foothill Forest (Community 2). Comments: Many remnants degraded by loss of species and weed invasion. Further survey required at Framlingham to resolve floristic communities.

Victorian Volcanic Plain 2 Herb-rich Foothill Forest

Floristics: Dominated by *Eucalyptus obliqua* $\pm E$. *ovata* $\pm E$. *viminalis*. Structure: Forest (20–)25–30(– 40) m in height. Habitat: Moderately well-drained basalt soils. Nearest relative: Lowland Forest. Comments: Occurrence beside the Surrey River (D38000) is unusual with tall (40 m) trees and a relatively mesic understorey.

Warrnambool Plain Herb-rich Foothill Forest

Floristics: Dominated by Eucalyptus obliqua \pm E. ovata \pm E. willisii. Structure: Forest (15–)20–25 m in height. Habitat: Moderately well-drained limestone or aeolian soils. Nearest relative: Damp Sands Herb-rich Woodland. **Comments:** Relationship with Damp Sands Herb-rich Woodland needs further investigation.

EVC 28 Rocky Outcrop Shrubland Shrubland associated with rock outcrops, generally in mosaic with Rocky Outcrop Herbland. Subject to microclimatic extremes, being typically damp to wet in winter and dry in summer. There is generally insufficient soil to support tree growth. Described from the Grampians by Tumino and Roberts (1998). This study identified additional areas on the northern tip of the Black Range, Mt Talbot, Mt Arapiles and on the Dundas Tablelands; quadrat data were collected from the Grampians and Black Range in this study. Recorded from two bioregions (Grampians, Dundas Tablelands).

Rocky Outcrop Shrubland

Floristics: Eucalypt overstorey is occasionally absent. Trees are sparse and spindly when present and include Eucalyptus alaticaulis, E. baxteri and/or E. goniocaylx. Common shrubs include Ozothamnus obcordatus, Dodonaea viscosa ssp. cuneata, Leptospermumspp., Callitris rhomboidea, Calytrix tetragona. Common herbs include Drosera peltata ssp. auriculata, Centrolepis spp., Calandrinia calyptrata. Structure: Open-shrubland.

Habitat: On sandstone or, less frequently, on granitic rock outcrops. Nearest relative: Rocky Outcrop Herbland. Comments: A relatively intact EVC due to the naturally stressful environment.

EVC 30 Wet Forest

Tall eucalypt forest with tree ferns in sheltered fern gully. Moisture and fertility levels are relatively high, while light levels on the ground are relatively low. Isolated occurrence, related to Wet Forest in the Otway Ranges but lacking several key species. Recorded from Glenelg Plain bioregion.

Glenelg Plain Wet Forest

Floristics: Dominated by Eucalyptus ovata with Acacia melanoxylon forming a mid-storey. Tree ferns Dicksonia antarctica and Todea barbara, and ground ferns such as Polystichum proliferum, Blechnum wattsii and Blechnum nudumare prominent.

Structure: Forest 30-40 m tall, tree ferns form open to closed stratum in gully

Habitat: Deep, sheltered gully. Geology map indicates limestone, but basalt boulders are common in streambed; basalt would increase nutrient levels within system.

Nearest relative: Riparian Forest. Comments: Similar to Riparian Forest but considered a form of Wet Forest due to mesic understorey (B. Peel, NRE pers. comm.). Supports only occurrence of fern ally Tmesipteris obliqua in far south-west Victoria, epiphytic on Dicksonia (14 plants confined to 100 m section). Also supports rare grass Agrostis rudis.

EVC 47 Valley Grassy Forest

Grassy eucalypt forest on lower slopes with more fertile soils. Soils are loams to sandy loams with a high organic content and often on eastern or southern slopes. The tall open nature of this community made it both productive and easily accessible to timber harvesting. One additional quadrat was recorded during this study. Recorded from the Grampians One additional bioregion.

Grampians Valley Grassy Forest Floristics: Dominated by Eucalyptus macrorhyncha with a few scattered shrubs in the understorey. Overstorey is atypical compared to that described from within Grampians National Park (Tumino and Roberts 1998). Ground-layer dominated by rich array of grasses, herbs and sedges.

Structure: Woodland to forest 15-25 m tall. Habitat: Gentle outwash slopes. Nearest relative: Hills Herb-rich Woodland. Comments: This EVC is described by Tumino and Roberts (1998).

EVC 48 Heathy Woodland

Eucalypt-dominated woodland lacking a secondary tree layer and generally supporting a diverse array of narrow or ericoid-leaved shrubs except where frequent fire has reduced this to a dense cover of bracken. Geophytes and annuals can be quite common but the ground cover is normally fairly sparse. Spans a variety of geologies but is generally associated with nutrient poor soils including deep sands (aeolian or outwash) and Tertiary sand/clay which have been altered to form quartzite gravel (Muir et al. 1995, Turnino and Roberts 1998). Remains widespread although depleted as the relatively poor soils are not attractive for agriculture. More recently has been cleared to establish pine plantations. Recorded from all bioregions except Warrnambool Plain and Dundas Tablelands.

Glenelg Plain Heathy Woodland

Floristics: Dominated by *E. baxteri* and/or *E. willisii*. Heathy shrubs prominent in understorey. Abundant *Leptospermum* myrsinoides is very characteristic of this community. Structure: Woodland 10-15 m tall over shrubby understorey. Habitat: Relatively infertile, well-drained sandy soils associated with aeolian deposits or deeply weathered Bridgewater Limestone. Nearest relatives: Sand Heathland, Heathy Herb-rich Woodland. Comments: Many remnants are intact due to natural resistance to weed invasion, but too frequent burning may lead to overdominance by bracken and reduced diversity.

Goldfields Heathy Woodland

Floristics: Dominated by Eucalyptus goniocaylx and E. leucoxylon \pm E. macrorhyncha \pm

E. melliodora \pm E. willisii over a dense heath layer. Structure: Open-woodland with a relatively dense heathy understorey.

Habitat: Gently undulating plains, rises and low hills. On Tertiary sands (often with a thin covering of clay) and sandstone (often locally altered to quartzite gravel) (Muir et al. 1995). Nearest relative: Heathy Dry Forest.

Grampians 1 Heathy Woodland

Floristics: Dominated by Eucalyptus arenacea $\pm E$. goniocalyx. Callitris rhomboidea frequently reaches canopy height. Prominent shrub layer dominated by shrubs such as Allocasuarina muelleriana, Calytrix tetragona, Leptospermum myrsinoides. Litter and bare ground are the most common components of the woodland floor although *Hypolaena fastigiata* is generally prevalent and annual herbs and geophytes are common. Structure: Woodland 10-20 m tall.

Habitat: Well drained deep loamy sands on gentle outwash slopes. Nearest relative: Lateritic Woodland.

Comments: Occurs in the lowest rainfall areas of the Grampians and this in association with deep sand increases the effective aridity of this environment. Quadrat D14107 was considered unclassified by Tumino and Roberts (1998).

Grampians 2 Heathy Woodland Floristics: Eucalyptus obliqua and E. arenacea are often codominant with dense, low, twisted canopies forming a distinctive feature of this community. The diverse understorey is dominated by narrow, ericoid-leaved shrubs while *Xanthorrhoea australis* is prominent. Grasses and herbs are common in this species-rich . community.

Structure: Woodland 10-15 m tall.

Habitat: Lower slopes where laterites have formed on a sedimentary geology and on rises within broader areas of Shallow Sands Woodland and Plains Grassy Woodland.

Nearest relative: Lateritic Woodland.

Comments: Described from 10 quadrats in Tumino and Roberts (1998).

Grampians 3 (Mount Arapiles) Heathy Woodland Floristics: Dominated by Eucalyptus goniocalyx with occasional E. leucoxylon also present. Dense heathy understorey dominated by Calytrix tetragona, Astroloma conostephioides, Brachyloma daphnoides, Hibbertia sericea. Coarse sands and outcropping rocks are sparsely covered by Gonocarpus elatus, Wahlenbergia gracilenta and a range of other annuals and geophytes. Structure: Woodland to 12 m tall. Habitat: Sandy slopes of Mt Arapiles. Nearest relative: Rocky Outcrop Shrubland.

Comments: An outlier of the Grampians Bioregion.

Victorian Volcanic Plain Heathy Woodland Floristics: Dominated by E. baxteri and/or E. willisii and generally rich in species.

Structure: Woodland 10-20 m tall over shrubby understorey.

Habitat: Relatively infertile, moderately well-drained soils associated with aeolian deposits often overlying basalt with varying thickness. Less welldrained than Glenelg Plain Heathy Woodland as indicated by more Gahnia

radula and less Leptospermum myrsinoides. Nearest relatives: Damp Heathy Woodland, Lowland Forest. Comments: Variable unit with tendency from typical Heathy Woodland (e.g. Glenelg Plain Heathy Woodland) to Damp Heathy Woodland according to drainage

Wimmera Sand Sheet Heathy Woodland

Floristics: Dominated by Eucalyptus arenacea and only rarely with other trees. Tall understorey shrubs or small trees are rare. Common shrubs include *Brachyloma daphnoides*, *Astroloma conostephioides*, *Calytrix* tetragona, Banksia ornata, B. marginata, Leptospermum myrsinoides, Xanthorrhoea minor. Ground cover is generally sparse but Hypolaena fastigiata is often prominent, while Austrostipa mollis is the most common grass.

Structure: Woodland 8-15 m tall. Habitat: Deep aeolian sands.

Nearest relative: Sand Heathland.

Wimmera Western Goldfields Heathy Woodland

Floristics: Dominated by Eucalyptus goniocalyx and E. leucoxylon ± E. macrorhyncha ±

E. melliodora \pm E. tricarpa. The understorey is a mixture of shrubs typical of the three adjacent bioregions with prominent species including Acacia pycnantha, A. genistifolia, Hibbertia humifusa, Astroloma conostephioides, Lissanthe strigosa. The ground cover is rich in orchids, lilies and other aeophytes.

Structure: Woodland 10-20 m tall.

Habitat: Gently undulating plains, low rises and low hills covered with Tertiary sands which generally have been converted to quartzite gravel. Nearest relative: Box Ironbark Forest.

EVC 50 Coastal Heathland

Low heathland on exposed coastal bluffs. The vegetation includes coastal and hinterland elements and is stunted by wind and salt-pruning. Unlike other heathlands in the region, fire may not be required for maintenance of this community. Recorded from one bioregion within study area (Glenelg Plain).

Coastal Heathland

Floristics: Dominated by shrubs including Spyridium parvifolium, Pultenaea stricta, Leptospermum continentale, Correa reflexa, Banksia marginata, Pultenaea prolifera.

Structure: Low shrubland 10-20 cm high. Shrubs are stunted by wind and salt.

Habitat: Windswept edges of coastal bluff.

Nearest relative: Damp Heathland.

Comments: Similar vegetation occurs east of the study area on bluffs above Two Mile Bay, Port Campbell National Park (Meredith et al. 1996). Quadrat D09018 appears ecotonal.

EVC 53 Swamp Scrub

Closed-scrub on frequently wet sites usually dominated by Leptospermum lanigerum. Largely confined to alluvial deposits along streams or paludal deposits in basins, occasionally associated with seepages on valley walls. Previously locally extensive but now almost entirely cleared and drained. Recorded from four bioregions within study area (Dundas Tablelands, Glenelg Plain, Victorian Volcanic Plain, Warrnambool Plain).

Dundas Tablelands 1 Swamp Scrub

Floristics: Dominated by Leptospermum obovatum Conspicuous ground-layer species include Goodenia humilis, Villarsia umbricola, Amphibromus recurvatus, Juncus spp.

Structure: Closed-scrub to 4 m height, with occasional emergent Eucalyptus camaldulensis.

Habitat: Shallow gradient drainage basin on alluvium.

Nearest relative: Seasonally Inundated Shrubby Woodland.

Dundas Tablelands 2 Swamp Scrub Floristics: Dominated by Leptospermum lanigerum rich in large sedges, grasses and rhizomatous herbs.

Structure: Closed-scrub to 5 m height, with occasional emergent Eucalyptus ovata.

Habitat: Upper catchments of spring-fed permanent streams where a downstream constriction has lead to a build-up of organically-rich alluvial sediment forming a distinctly flat-bottomed 'U-shaped' valley. Soils are fine silts which are inundated during the wetter months and stay moist for most of the year.

Nearest relative: Sandy Stream Woodland

Glenelg Plain Swamp Scrub

Floristics: Dominated by Leptospermum lanigerum Melaleuca squarrosa or rarely by Melaleuca squamea ± emergent/overhanging Eucalyptus ovata. Structure: Open to closed-scrub ± emergent eucalypts.

Habitat: Poorly-drained sites with high nutrient and water availability. Nearest relative: Riparian Scrub (which occurs on less fertile sites).

Comments: Quadrat D38023 (Moleside Creek) is atypical and represents a small shaded rocky section (below mapping threshold) set in what is otherwise Riparian Scrub along creek.

Victorian Volcanic Plain Swamp Scrub

Floristics: Dominated by Leptospermum lanigerum \pm emergent/overhanging Eucalyptus ovata with understorey species adapted to damp shady conditions.

Structure: Open to closed-scrub \pm emergent eucalypts. Habitat: Poorly-drained sites with high nutrient and water availability.

Nearest relative: Riparian Forest (which occurs on better drained sites along permanent streams).

Warrnambool Plain Swamp Scrub

Floristics: Dominated by Leptospermum lanigerum± emergent/overhanging Eucalyptus ovata

Structure: Open to closed-scrub 5-15+ m tall ± emergent eucalvots.

Habitat: Streams or swamps on alluvial or paludal deposits. Nearest relative: Riparian Forest. Comments: Merges into Riparian Forest along Brucknell Creek

(Ralph Illidge Sanctuary).

EVC 55 Plains Grassy Woodland Grassy eucalypt woodland with inter-tussock spaces potentially supporting a large range of herbs, mostly with perennial rootstocks, but occasionally with higher component of annual species. Occurs on fertile, sometimes seasonally waterlogged, mostly silty, loamy or clay topsoils, but occasionally sandy, with heavy subsoils. Mostly on volcanic and more fertile Tertiary or Quaternary soils on terrain of low relief. Previously widespread and extensive over a large proportion of the study area but now largely reduced to narrow strips along roadsides and stands of veteran trees over pasture within paddoocks. The floristic affiliations of grassy woodland vegetation around the periphery of parts of the Grampians, and previously mapped as Plains Grassy Woodland, requires further investigation. Recorded from all bioregions within study area except Warrnambool Plain.

Dundas Tablelands Plains Grassy Woodland

Floristics: Dominated by Eucalyptus camaldulensis ± E. ovata, Allocasuarina verticillata (where trees still present). In relatively intact sites, ground-layer dominated by Themeda triandra with a range of associated herbs.

Structure: Woodland, mostly 20-30 m tall. Most remnant understorey confined to roadsides, and many remnants are now treeless.

Habitat: Plains and gentle slopes, including more fertile Tertiary cappings and stream flats. Nearest relatives: Plains Grassy Woodland / Damp Sands Herb-

rich Woodland Complex, Plains Grassland.

Glenelg Plain Plains Grassy Woodland Floristics: Dominated by Eucalyptus camaldulensis (presumed) over a range of grasses and herbs dominated by Themeda triandra.

Structure: Woodland to open-woodland. Cleared areas have a grassland structure. Habitat: Quaternary paludal deposits.

Nearest relative: Damp Sands Herb-rich Woodland.

Goldfields 1 Plains Grassy Woodland

Floristics: Remnants dominated by a variety of trees including Eucalyptus melliodora,

E. leucoxvlon and E. camaldulensis although the latter is presumed to be the norm in the original form of this community. Other trees or shrubs such as Banksia marginata, Allocasuarina luehmannii and Acacia pycnantha were possibly more prevalent but now occur only as scattered individuals. Relatively intact remnants have a very species-rich ground cover dominated by grasses, herbs, geophytes and forbs.

Structure: Open-woodland. Habitat: Broad flat to undulating plains generally associated with larger watercourses. Soils derived from Quaternary fluvial gravel, sand and silt

Nearest relative: Plains Grassland.

Goldfields 2 Plains Grassy Woodland

Floristics: Originally dominated by Eucalyptus camaldulensis (± E. melliodora north-east of the Grampians) but now essentially cleared, with a wide range of grasses, particularly Themeda triandra, and small herbs with perennial rootstocks. Modified treeless remnants are dominated by Themeda triandra. Structure: Open-woodland 12-25 m tall, now usually a tussock grassland mostly less than 0.5 m in height (derived from former woodland).

Habitat: Lower slopes and plains, on fertile loam to clay-loam soils, often with buckshot.

Nearest relative: Plains Grassland

Grampians Plains Grassy Woodland

Floristics: Originally dominated by Eucalyptus camaldulensis but clearing has changed many stands to grassland dominated by Themeda triandra, Calocephalus citreus and other grasses and herbs. Structure: Originally woodland/open-woodland. Habitat: Plains and undulating lower slopes. Nearest relative: Shallow Sands Woodland.

Victorian Volcanic Plain Plains Grassy Woodland

Floristics: Dominated by Eucalyptus camaldulensis in lower rainfall areas, replaced by E. ovata, E. viminalis and Acacia melanoxylon above approximately 700 mm annual rainfall, with grassy ground-layer and herb-rich in relatively intact remnants. Ground-layer varies with management history, roadside remnants mostly dominated by Themeda triandra, previously grazed remnants usually dominated by Austrostipa spp. and Austrodanthonia spp. or introduced grasses. Microlaena stipoides can be prevalent under denser canopies.

Structure: Woodland, (6-)10-30 metres tall. Many roadside remnants currently treeless.

E. ovata is relatively fire-sensitive and was easily displaced from agricultural land

Habitat: Quaternary basalt soils, extending to some drier Quaternary paludal or fertile Tertiary soils.

Nearest relatives: Plains Grassland, Stony Knoll Shrubland.

EVC 56 Floodplain Riparian Woodland

Amphibious and aquatic herb and sedge-dominated eucalypt woodland with occasional tall shrubs also present. Occurs along major rivers of the plains, often where extensive floodplains develop on fertile sand, silt or silty loam alluvial soils. Sites may be inundated by water for part of the year and ponding may occur during the drier months. Billabongs and old anabranches are common. High volume seasonal flows may be common. Formerly widespread in the study area along all major creeks and rivers, now greatly reduced in area due to clearing for agriculture. Remnant areas are subject to high levels of disturbance from grazing, timber cutting, recreational vehicles and weed invasion. This EVC could in places be considered a mosaic of Riparian Woodland and various wetland EVCs but the delineation of any such wetlands would mostly be difficult due to subtle microtopographic change. Virtually extinct with few on no remaining occurrences to sample. Recorded from four bioregions (Dundas Tablelands, Glenelg Plain, Victorian Volcanic Plain, Wimmera).

Floodplain Riparian Woodland

Floristics: Typically dominated by Eucalyptus camaldulensis, can include E. viminalis and

E. ovata at higher rainfalls, and including treeless wetland areas. Groundlayer variable, woodland areas typically dominated by Poa labillardierei, variously with Carex spp., Phragmites australis, Persicaria spp., and aquatics in wetter situations.

Structure: Woodland to grassland, sedgeland or herbland.

Habitat: Alluvial soils of high fertility. Nearest relative: Creekline Grassy Woodland, Riparian Woodland, Aquatic Herbland (billabongs).

EVC 61 Box Ironbark Forest

Recorded predominantly from the Goldfields bioregion but with a minor occurrence in the Wimmera. This EVC is described by Muir et al. (1995) as Box Ironbark Forest (Western Goldfields).

Goldfields Box Ironbark Forest

Floristics: Dominated by a variety of trees, most commonly Eucalyptus leucoxylon. Taller shrubs include Acacia pycnantha, A. genistifolia, A. paradoxa, common subshrubs include Lissanthe strigosa and Astroloma spp. Ground-cover comprises a variety of grasses and herbs while at one site the vulnerable, prostrate subshrub Dodonaea procumbens was common

Structure: Open-forest

Habitat: Undulating rises to low hills with shallow, nutrient poor, stony soils derived from Ordivician sediments. Nearest relative: Heathy Dry Forest.

Wimmera Box Ironbark Forest

Floristics: Dominated by a variety of trees, most commonly *Eucalyptus leucoxylon*. Taller shrubs include *Acacia pycnantha* and *A. genistifolia* while common subshrubs include Lissanthe strigosa and Brachloma daphnoides. The ground cover supports a variety of grasses and herbs. Structure: Open-forest.

Habitat: Undulating rises to low hills with shallow, nutrient poor, stony soils derived from Ordivician sediments.

Nearest relative: Heathy Dry Forest.

EVC 67 Alluvial Terraces Herb-rich Woodland

Woodland on broad alluvial plains and along ephemeral drainage lines. Soils are generally poorly drained duplex soils with sandy loam overlying a heavier clay subsoil. A striking feature is the high species-richness of the ground-layer and the low biomass of this cover, particularly in summer. Now rare and generally degraded by agricultural clearing and grazing by stock. The analysis here contains only three quadrats from this significantly depleted community. Muir et al. (1995) include over 20 quadrats (including

two used in this analysis) and provide a description of this EVC. The delineation of this EVC across Victoria is unclear and requires further investigation. Recorded from four bioregions within the study area (Dundas Tableland, Goldfields, Grampians, Wimmera).

Goldfields Alluvial Terraces Herb-rich Woodland

Floristics: Dominated by *Eucalyptus melliodora* \pm *E. goniocalyx*. An open to sparse shrub layer of *Acacia pycnantha* and *A*. paradoxa occurs over a patchy, often sparse but species-rich ground cover dominated by annual grasses and herbs. Structure: Open-woodland.

Habitat: Alluvial plains and the alluvial terraces of minor ephemeral drainage lines.

Nearest relatives: Plains Grassy Woodland, Valley Grassy Forest.

Grampians Alluvial Terraces Herb-rich Woodland

Floristics: Dominated by Eucalyptus aromaphloia and Eucalyptus melliodora with an open understorey of Acacia retinodes. Scattered sub-shrubs include Astroloma spp., Brachyloma daphnoides, Grevillea alpina, Hibbertia spp. The ground often appears quite bare and supports a range of annuals and geophytes

Structure: Woodland to open-forest 20-30 m tall. Habitat: Ephemeral drainage lines and broad flood plains. Nearest relative: Plains Grassy Woodland. Comments: Disturbance from flooding provides a significant

opportunity for weed invasion; the number of introduced species is usually high. This floristic community is described by Tumino and Roberts (1998).

EVC 68 Creekline Grassy Woodland Eucalypt-dominated woodland with herbaceous ground-layer. mostly grassy/sedgy to Occurs on low-gradient ephemeral to intermittent drainage lines, typically on fertile colluvial/alluvial soils, on a wide range of suitably fertile geological substrates. These minor drainage lines can include a range of graminoid and herbaceous species tolerant of waterlogged soils, and are presumed to have sometimes resembled a linear wetland or system of interconnected small Formerly widespread in narrow bands within suitable ponds. habitat, now almost entirely cleared or eroded as a consequence of altered hydrology. Recorded from three bioregions within the study area (Dundas Tablelands, Goldfields, Victorian Volcanic Plain).

Creekline Grassy Woodland Floristics: Dominated by *Eucalyptus camaldulensis* rarely with *E. ovata*, major ground-layer species include *Poa labillardierei*, Microlaena stipoides, Juncus spp., Cyperus spp., Carex spp. Structure: Woodland/open-woodland 12-15 m tall, trees are generally well-formed and straight growing. Habitat: Ephemeral creeks. Nearest relatives: Riparian Woodland, Sandy Stream Woodland.

EVC 71 Hills Herb-rich Woodland Grassy or herb-dominated eucalypt woodland, often with no shrub layer. Soils are generally shallow but fertile, and outcropping rock is not uncommon. This seasonally dry environment is favourable for both annual and perennial grasses and herbs. The environment varies from relatively flat ground to ridge tops on sedimentary sandstones to undualting rounded granite hills. Regarded as one of the most species-rich temperate communities in the world (Tumino and Roberts 1999). Recorded from four bioregions within study area (Dundas Tablelands, Grampians, Goldfields, Wimmera).

Dundas Tablelands Hills Herb-rich Woodland

Floristics: Dominated by Eucalyptus goniocalyx and Eucalyptus melliodora. Shrubs are largely absent and the ground-layer may be variously grassy (on deeper soils) or dominated by annual herbs where outcropping occurs.

Structure: Woodland 10–12 m tall on outcropping areas and 12– 15 m tall in areas with deeper soils. Trees are typically low-branching and spreading with a DBH of 1.0–1.3 m in rocky areas. Habitat: Relatively well-drained sites of moderate fertility, strongly associated with shallow granite-like soils. Nearest relative: Plains Grassy Woodland.

Goldfields Hills Herb-rich Woodland Floristics: Dominated by Eucalyptus goniocaylx and E. melliodora ± E. aromaphloia. Occasional shrubs include Brachyloma daphnoides, Acacia meansi, A. paradoxa. The ground cover is best observed in spring and consists af a species-rich carpet of annuals and herbs. The fern Cheilanthes austrotenuifolia and the herb Gonocarpus elatus are often prominent. Structure: Woodland 8–15 m tall. Habitat: Rocky sites including areas of Parilla Sand.

Nearest relative: Grassy Woodland.

Grampians Hills Herb-rich Woodland

Floristics: Dominated by Eucalyptus goniocalyx and/or Eucalyptus melliodora ± Eucalyptus obliqua ± Eucalyptus aromaphloia.

Shrubs are largely absent (although sometimes present as low ground covers) and the ground-layer is variously dominated by perennial and annual herbs and grasses.

Structure: Woodland 12–15 m tall on outcropping areas and 12–15 m tall in areas with deeper soils. Trees may be low-branching and spreading in rocky areas or well-formed and straight-growing on deeper soils. Habitat: Relatively well-drained sites of moderate fertility, strongly associated with shallow granite sandy soils. Nearest relative: Plains Grassy Woodland.

Wimmera Hills Herb-rich Woodland

Foristics: Dominated by Eucalyptus goniocalyx and E. melliodora with a low, sparse shrub layer of Ozothamnus obcordatus and Brachyloma daphnoides. Species-rich ground cover dominated by Hydrocotyle laxiflora, Gonocarpus elatus, Siloxerus multiflorus. Structure: Woodland 5-10 m tall. Habitat: Low rolling hills. Nearest relative: Wimmera Low Rises Grassy Woodland.

EVC 83 Swampy Riparian Woodland

Woodland or shrubland over sedgy to grassy-herbaceous ground-layer. Occurs on fertile but poorly drained alluvial soils on streams traversing terrain of very low gradients. Previously extremely rare and localised in the study area, now almost entirely cleared. Recorded from two bioregions within study area (Glenelg Plain, Victorian Volcanic Plain). Remnants on Victorian Volcanic Plain (e.g. Muston Creek near Caramut, Muddy Creek south-east of Hamilton) extremely degraded, not sampled.

Swampy Riparian Woodland

Floristics: Dominated by *Eucalyptus ovata*, with a sparse shrub layer of *Leptospermum lanigerum* and a grassy-herbaceous to sedgy ground-layer, with major species at the sampled site including Pentapogon quadrifidus, Cyperus lucidus, Pratia pedunculata, Triglochin striata, Acaena novaezelandiae.

Structure: Woodland 6-15+ m tall, stature varying with degree of waterlogging.

Habitat: Occurs on fertile but poorly drained alluvial soils on streams. Nearest relative: Riparian Woodland / Riparian Forest, Plains Swampy Woodland / Swamp Scrub.

EVC 93 Broombush Mallee

Tall shrubland dominated by eucalypts and broombush with an understorey consisting of narrow, ericoid-leaved shrubs. The ground is largely bare with leaf litter although grasses and other herbs are present. The harsh, infertile lateritic soil has prolific ironstone nodules at or close to the surface which reduce infiltration of water. Recorded from a few locations in the Wimmera, this EVC has a very limited distribution within the study area and is generally associated with more arid environments to the north. Recorded from the Wimmera bioregion within study area.

Wimmera Broombush Mallee Floristics: Dominated by Melaleuca uncinata and Eucalyptus viridis. Smaller shrubs include

M. wilsonii, Micromyrtus ciliata, Lissanthe strigosa. Grasses, herbs and annuals form a sparse ground cover.

Structure: Tall shrubland.

Habitat: Lateritic soils within but not on the dunefields of the Wimmera plain. Nearest relative: Heathy Woodland.

Comments: Very few weeds were observed in this environment.

EVC 103 Riverine Grassy Chenopod Woodland Grassy and low chenopod-dominated eucalypt woodland or forest with large range of herbs including several annuals. Occurs on fertile, silty clay-loams associated with alluvial terraces of major rivers in the north of the study area. Sites are associated with recent Quaternary swamp deposits and may be occasionally inundated during flood events. Clay soils are generally waterlogged in winter and dry and cracking in summer. Previously locally extensive within study area along major rivers in the Wimmera with <500 mm annual rainfall. Now largely cleared and almost extinct. Recorded from one bioregion (Wimmera).

Wimmera Riverine Grassy Chenopod Woodland

Floristics: Dominated by Eucalyptus largiflorens and Eucalyptus microcarpa, rich in perennial and annual herbs and low-growing chenopods. Structure: Woodland or open-forest 10–15 m tall, trees may be straight and well-formed in well drained areas or stunted and multi-branched in heavily waterlogged areas.

Habitat: Silty clay loams on alluvial terraces of major Wimmera rivers in areas

with <500 mm annual rainfall.

Nearest relative: Plains Grassy Woodland.

EVC 124 Grey Clay Drainage Line Herbland/Sedgeland Vegetation of variable floristics and structure along slightly mineralised drainage lines, including a range of habitats such as shallow ephemeral to seasonal wetland on flats, dwarf herbland on stream banks in association with tussock grassland, and sedge-lined ponds with aquatics. Occurs on very heavy grey-black clay soils. Generally lacking woody species, but occasionally with small populations of remnant Leptospermum lanigerum Variously dominated by grasses, sedges and herbs, a number of which are

indicative of mineralisation. Formerly rare and localised within study area, now almost entirely cleared. Recorded from one bioregion within study area (Victorian Volcanic Plain).

Grey Clay Drainage Line Herbland/Sedgeland

Floristics: Dominated by various mixtures of grasses (Poa labillardierei, Agrostis spp., Distichlis distichophylla), sedges/rushes (Eleocharis acuta, Schoenus nitens, locally with Carex spp., Schoenoplectus spp., Bolboschoenus caldwellii, Juncus kraussii), herbs (notably small somewhat salt-tolerant species, e.g. Selliera radicans, Wisonia rotundifolia, Pratia irrigua, Ranunculus diminutis, Triglochin striata) and aquatic herbs (e.g. locally in sedge-lined pools with Triglochin procera and Potamogeton pectinatus).

Structure: Tussock grassland (to 1 m height), sedgeland (variable, from a few centimetres to 1-2 metres tall in localised bands, or herbland (mostly 0.02-0.2 m tall), possibly formerly including openshrubland 2-3 metres tall.

Habitat: Slightly mineralised drainage lines on very heavy greyblack clay soils.

Nearest relatives: Creekline Tussock Grassland, Brackish Drainage line Herbland/Sedgeland.

EVC 125 Plains Grassy Wetland

Primarily grassy (to sedgy-herbaceous) vegetation of ephemeral to seasonal wetlands on fertile soils of volcanic and sedimentary plains, sometimes with scattered or fringing eucalypts or lignum shrubs. The grassy/sedgy-herbaceous ground-layer comprises various balances of true aquatics and species tolerant of intermittent to seasonal inundation. The vegetation ranges from extremely species-poor to species-rich on some verges or shallower more ephemeral sites. Occurs in seasonally wet depressions on plains, typically associated with heavy paludal soils. Previously widespread and common in suitable habitat but now largely cleared and remnants mostly under threat. Recorded from two bioregions within study area (Victorian Volcanic Plain, Wimmera)

Victorian Volcanic Plain 1 Plains Grassy Wetland

Floristics: Dominated by grasses (principally Glyceria australis, Austrodanthonia duttoniana, Poa labillardierei, Amphibromus nervosus), with sedges and herbs (notably Eleocharis acuta, Juncus holoschoenus, Eryngium vesiculosum, Lobelia pratioides) often conspicuous. Sites range from low to high species-richness. Outer fringes and more ephemeral sites can support a wide range of graminoid and herbaceous species tolerant of intermittent inundation. The relationship between mapping and classification is complicated by the linking of quadrats from the wet cores of drier systems with sites from drier margins of wetter systems. Structure: Open-grassland, mostly 0.5-1.0 m in height. Habitat: Shallow seasonally wet depressions and poorly defined drainage systems, on heavy grey-black clay soils. Nearest relative: Red Gum Wetland

Victorian Volcanic Plain 2 Plains Grassy Wetland

Floristics: Dominated by Glyceria australis, often with Eleocharis acuta, consistently very species-poor. Most of the few associated species are typically aquatic or very inundation-tolerant herbs. Some sites appear to be always species-poor, others reveal increased floristic diversity following seasonal retreat of wetland inundation

Structure: Open-grassland.

Habitat: Seasonally wet depressions and poorly defined drainage systems, with very heavy grey-black clay soils, prone to turbidity during inundation.

Nearest relative: Other Plains Grassy Wetland communities, Plains Sedgy Wetland.

Comments: The more floristically diverse outer verges of most remnants are degraded by loss of species and weed invasion.

Wimmera 1 Plains Grassy Wetland

Floristics: Dominated by Eleocharis acuta and grasses, usually Eragrostis infecunda ± Amphibromus nervosus, Danthonia duttoniana and Agrostis avenacea var. avenacea, ± Eucalyptus largiflorens and Allocasuarina luehmannii, with moderate to high species-richness, and typically including a range of herbs tolerant of inundation.

Structure: Grassland/herbland, mostly 0.3-1 m in height, or openwoodland to 15 m.

Habitat: Seasonally inundated depressions on fertile heavy soils. Nearest relative: Red Gum Wetland.

Wimmera 2 Plains Grassy Wetland

Floristics: Dominated by mixtures of Austrodanthonia duttoniana, Amphibromus nervosus, Juncus flavidus, Eleocharis acuta, Schoenus tesquorum Species-richness is moderate to high, and a wide range of herbs is typically present. Structure: Grassland mostly less than 1 m in height.

Habitat: Seasonally wet heavy soils in shallow depressions and poorly defined drainage systems on fertile plains. Nearest relative: Red Gum Wetland.

EVC 132 Plains Grassland

Tussock grassland, sometimes with scattered woody plants, typically rich in (usually perennial) herbs when intact. Occurs on fertile, usually heavy loam or clay soils, sometimes seasonally waterlogged or collecting small ephemeral pools in gilgai depressions. Mostly on basalt derived soils, but extending to some sedimentary soils, especially in lower rainfall areas. Previously widespread and locally extensive in the north of the study area but now largely extinct and restricted to poor-quality sites along some road Recorded from two bioregions (Victorian Volcanic Plain, reserves. Wimmera).

Victorian Volcanic Plain 1 Plains Grassland Floristics: Dominated by *Themeda triandra*, with low diversity of associated grasses and small herbs (mean number of native species 15). Structure: Closed tussock grassland (mostly less than 0.5 m in height),

sometimes with scattered woody plants (to 20 m). Some sites potentially derived from woodland.

Habitat: Fertile, basaltic, loamy to silty or clay-loam topsoils over heavy subsoils, sometimes seasonally waterlogged.

Nearest relatives: Plains Grassland / Plains Grassy Woodland Complex, Plains Grassy Woodland

Comments: Floristic classification is at least in part a reflection of the management history of the respective sites, where diversity has been reduced by sward closure, grazing and weed invasion in some instances.

Victorian Volcanic Plain 2 Plains Grassland

Floristics: Dominated by *Themeda triandra*, sometimes as co-dominant with *Poa* spp., *Austrodanthonia* spp. or *Austrostipa* spp., originally in part with scattered woody plants, primarily species of *Eucalyptus, Acacia, Bursaria, Hymenanthera, Allocasuarina*, with a low to moderate diversity of associated grasses and small herbs with perennial rootstocks (mean total number of native species 25). This community may include prior Stony Knoll Shrubland.

Structure: Tussock grassland mostly less than 0.5 m in height, sometimes with scattered woody plants (to 20 tall, mostly much smaller). Some sites potentially derived from former shrubland or woodland (Stony Knoll Shrubland).

Habitat: As well as to some extent reflecting disturbance, floristics also indicate an affiliation with more freely draining red loamy-soils of more elevated rocky crests and low stony knolls.

Nearest relatives: Plains Grassland / Plains Grassy Woodland Complex, Plains Grassy Woodland, Plains Grassland / Stony Knoll Shrubland Mosaic. Comments: Floristic classification is at least in part a reflection of the management history of the respective sites, where diversity has been influenced by possible tree removal, the extent and duration of sward closure, grazing and weed invasions. Most remnants are degraded by loss of species and weed invasion.

Victorian Volcanic Plain 3 Plains Grassland

Floristics: Dominated by *Themeda triandra*, sometimes as co-dominant with *Poa* spp., *Austrodanthonia* spp. or *Austrostipa* spp., possibly in part originally with at least scattered woody plants, primarily species of Eucalyptus and Acacia, with a moderate to high diversity (mean total native species 43) of associated grasses and small herbs with perennial rootstocks.

Structure: Tussock grassland mostly less than 0.5 m tall. Some sites possibly former woodland.

Habitat: Fertile soils derived from basalt. Floristics suggest that while most sites are on loamy to silty or clay-loam topsoils over heavy subsoils and can be seasonally waterlogged, some sites are on drier red loamy soils. Nearest relative: Plains Grassland / Plains Grassy Woodland Complex,

Plains Grassy Woodland. Comments: Floristic classification is at least in part a reflection of the management history of the respective sites, where diversity has been influenced by the extent and duration of sward closure, grazing and weed invasions. Most relatively species-rich remnants on roadsides and, where still regularly burnt, rail reserves. Most remnants subject to on-going degradation by loss of species and weed invasion.

Wimmera Plains Grassland

Floristics: Dominated by a number of grasses, herbs and small shrubs, particularly members of the Chenopodiaceae, ± Allocasuarina luehmannii. Structure: Open to closed-grassland to low open-herbland or shrubland with very occasional trees at low frequencies.

Habitat: Areas experiencing <500 mm per annum on grey/red duplex claysoils derived from Quaternary swamp deposits and Tertiary sands, silts and clays.

Nearest relative: Plains Grassy Woodland.

EVC 133 Limestone Pomaderris Shrubland Shrubland on exposed limestone cliff above Glenelg River. Recorded only from the Glenelg Plain bioregion within the study area (also known from eastern Victoria).

Glenelg Plain Limestone Pomaderris Shrubland

Floristics: Dominated by Pomaderris halmaturina with emergent Allocasuarina verticillata with a range of shrubs, grasses and other herbs. The fern Pteris tremula is largely confined to shady microsites such as crevices

Structure: Shrubland 2-3 m tall with emergent trees to 5 m tall. Habitat: Rocky limestone cliff and cliff top. Nearest relative: Escarpment Shrubland.

Comments: Degraded by weed invasion at Lookout but improves to the south. Similar to Escarpment Shrubland elsewhere along the Glenelg River but at present considered to be Limestone Pomaderris Shrubland (B. Peel, NRE, pers. comm.). Further survey of escarpment vegetation along the river is required for resolution.

EVC 136 Sedge Wetland Sedge-dominated seasonal wetland, usually of low diversity in central areas, but richer on verges and in some more ephemeral forms of the EVC. Frequently on soils of high organic content, in depressions within sandy terrain. Scattered distribution within higher rainfall areas. While reduced by draining and clearing, this is to a far less extent than in the case of seasonal wetlands on more fertile soils. Several communities are likely to be present within this EVC according to degree and duration of inundation. Recorded from three bioregions within the study area (Dundas Tablelands, Glenelg Plain, Victorian Volcanic Plain).

Group 1 Sedge Wetland

Floristics: Dominated by Chorizandra australis and Baumea articulata, with aquatic herbs including Myriophyllum spp. and Villarsia reniformis; drier verges dominated by Lepidosperma longitudinale with a wider range of small sedges and herbs. Structure: Sedgeland 1-3 m tall, with aquatic herbs sometimes providing substantial cover in wetter versions of the EVC. Habitat: Organic soils, in wetland basins on or adjacent to edges of lower fertility sandy soils, with higher sand content around verges. Central areas remain wet on a semi-continuous basis, fringes are typically intermittently wet.

Nearest relatives: Aquatic Herbland, Plains Sedgy Wetland.

Group 2 Sedge Wetland

Floristics: Dominated by Lepidosperma longitudinale, with fringing verge of Melaleuca squarrosa and Restio tetraphyllus. Structure: Sedgeland, 1-2 m tall, with taller scrub verge. Habitat: Seasonal wetland within highest rainfall forest areas on south-west verge of the volcanic plain, on organic soils. Nearest relatives: Plains Sedgy Wetland, Aquatic Herbland. Comments: Remnants minimal, inadequately known.

EVC 155 Bird Colony Succulent Herbland Succulent herbland on coastal sand, restricted to Short-tailed Shearwater *Puffinus tenuirostris* (mutton bird) colonies. Succulent herbland is the climax vegetation of many seabird colonies in southern Australia and New Zealand (Yugovic 1998). Recorded from one bioregion within study area.

Bird Colony Succulent Herbland Floristics: Dominated by succulent herb Tetragonia implexicoma. Other prominent succulent herbs are Rhagodia candolleana, Carpobrotus rossii. Introduced grasses and other herbs are frequent, especially in gaps created by bird disturbance. Structure: Closed herbland 0.1 m in height.

Habitat: Nutrient enriched sandy substrates associated with shearwater breeding colonies. Nearest relative: Coastal Tussock Grassland.

Comments: The 'Pea Soup' colony is on the mainland which is a rare phenomenon; this EVC is almost entirely restricted to islands throughout its range.

EVC 160 Coastal Dune Scrub

Scrub or shrubland on coastal sand dunes subject to strong saltladen winds. Occurs extensively along the coast wherever sand dunes, as opposed to rocky cliffs and bluffs, are present. More protected, less saline and largely consolidated dunefields further inland support(ed) Calcarenite Dune Woodland. Recently stabilised sections of the Discovery Bay and Bridgewater Bay dunes support this EVC. Recorded from two bioregions within the study area (Glenelg Plain, Warrnambool Plain).

Coastal Dune Scrub

Floristics: Dominated by Leucopogon parviflorus and/or Acacia longifolia var. sophorae with a range of salt-tolerant species requiring good drainage.

Structure: Scrub or shrubland 2-3 m tall.

Habitat: Unconsolidated coastal sand dunes.

Nearest relative: Coastal Headland Scrub

Comments: Mapping of this EVC and Coastal Headland Scrub was in part based on geological mapping—verification required in areas without access. European grass Ammophila arenaria, previously planted as a sand binder, is a major threat to this vegetation type.

EVC 161 Coastal Headland Scrub

Scrub or shrubland on coastal cliffs and bluffs subject to strong salt-laden winds and salt spray. Occurs extensively along rocky sections of the coast. Further survey and analysis is required to determine relationships between communities of this EVC in Victoria. Recorded from all coastal bioregions within the study area (Glenelg Plain, Victorian Volcanic Plain, Warrnambool Plain).

Glenelg Plain Coastal Headland Scrub Floristics: Dominated by Leucopogon parviflorus, Pultenaea canaliculata, Lepidosperma gladiatumwith a range of other salt and wind tolerant species.

Structure: Low shrubland 0.5-1.0+ m.

Habitat: Rocky coastal cliffs and bluffs exposed to strong salt-laden winds and salt spray, drainage poor compared to Coastal Dune Scrub. Nearest relatives: Coastal Dune Scrub, Spray-zone Coastal Shrubland. **Comments:** Wind-blown sand overlying rock results in vegetation resembling Coastal Dune Scrub; the two EVCs can intergrade with depth of sand over short distances.

Warrnambool Plain Coastal Headland Scrub

Floristics: Dominated by Leucopogon parviflorus with a range of other salt and wind tolerant species.

Structure: Low shrubland 0.5+ m.

Habitat: Rocky coastal cliffs and bluffs exposed to strong salt-laden winds and salt spray, drainage poor compared to Coastal Dune Scrub. **Nearest relatives:** Coastal Dune Scrub, Spray-zone Coastal Shrubland. Comments: Wind-blown sand overlying rock results in vegetation resembling Coastal Dune Scrub; the two EVCs can intergrade with depth of sand over short distances. Forms a mosaic with Coastal Tussock Grassland in areas and may have occupied areas now supporting this EVC before grazing and burning associated with European colonisation.

EVC 163 Coastal Tussock Grassland

Tussock grassland \pm emergent shrubs on coastal cliffs and bluffs or estuaries. Soils are saline and, on cliffs and bluffs, also exposed to strong salt-laden winds, thus precluding tree growth. Comprises two floristic communities in different ecological situations although both dominated by the same grass Poa poiformis. Recorded from one bioregion within study area (Warrnambool Plain) but likely to have also occurred in estuaries of the other coastal bioregions (Glenelg Plain, Victorian Volcanic Plain).

Headland Coastal Tussock Grassland Floristics: Dominated by tusock grasses *Poa poiformis* and *Themeda triandra*, with the shrub *Leucopogon parviflorus* as a common associate. Structure: Closed-grassland or open-shrubland.

Habitat: Rocky coasts with at least some soil development.

Nearest relative: Coastal Headland Scrub.

Comments: Except for narrow strip along cliff tops, likely to have extended inland at the expense of Coastal Headland Scrub with European land use.

Estuarine Flats Coastal Tussock Grassland Floristics: Dominated by Poa poiformis, comprising a small number of salttolerant (halophytic) herbs such as Distichlis distichophylla. Structure: Grassland 1.0 m tall.

Habitat: Sand deposits (cheniers) on estuarine flats and on outer (landward) zone of estuaries. Subject to fluctuating salinity but rarely if ever flooded by tides.

Nearest relative: Estuarine Wetland.

Comments: Stands observed at Curdies Inlet are below mapping threshold but the area requires detailed survey.

EVC 164 Creekline Herb-rich Woodland

Woodland associated with soaks and intermittent creek flats. Dominated by Eucalyptus ovata with a grassy understorey including herbs adapted to occasional waterlogging. Surrounded by EVCs of significantly drier occasional waterlogging. Surrounded by EVCs of significantly drier environments. Loam or clay loam soils with a high water holding capacity and usually moist. Naturally restricted. Recorded from two bioregions (Glenelg Plain, Goldfields).

Goldfields Creekline Herb-rich Woodland

Floristics: Dominated by Eucalyptus ovata ± E. camaldulensis ± E aromaphloia, with open secondary tree layer of Acacia meansii. Open shrub layer dominated by Leptospermum continentale with dense, species-rich ground cover of Pentapogon quadrifidus, Schoenus apogon and other grasses and herbs.

Structure: Woodland/open-woodland.

Habitat: Soaks and ephemeral streams with a low gradient and broad floodplain.

Nearest relative: Creekline Grassy Woodland.

Comments: Floristically distinct from the other community in this EVC and linked by similar environments.

EVC 175 Grassy Woodland Variable woodland variously dominated by *Eucalyptus leucoxylon, E. microcarpa, E. melliodora, E. camaldulensis, E. goniocalyx* or *E. viminalis.* There may be a shrub layer of species such as Acacia brachybotrya, A. montana, A. mearnsii, A. paradoxa, Myoporum spp., Dodonaea viscosa or *Cassinia arcuata.* There is a diverse ground-layer of grasses and herbs. Occurs on sites with moderate fertility such as alluvial flats, undulating hills and, in the Dundas, on tabletop slopes, on a variety of geologies including Tertiary marine and fluvial sediments and Cretaceous sediments. Previously widespread and locally extensive but now largely cleared. Remnants are generally heavily grazed. Recorded from five bioregions (Wimmera, Goldfields, Dundas Tablelands, Victorian Volcanic Plain,

Warrnambool). There are not sufficient remnants/available data to describe most of these forms at present.

Goldfields Low Rises Grassy Woodland Floristics: Generally dominated by an open tree layer of

Eucalyptus microcarpa \pm E. melliodora with an open shrub layer of Acacia pycnantha \pm A. verniciflua \pm A. microcarpa. Rich in grasses

and geophytes when intact. Structure: Open-woodland 20-25 m tall with an open shrub layer 2-3 m tall, grassy herb-rich ground cover.

Habitat: Occurs on gently undulating terrain. Soils generally derived from a variety of substrates including marine and fluvial

sediments. Nearest relative: Box Ironbark Forest.

Wimmera Low Rises Grassy Woodland Floristics: Generally dominated by an open tree layer of

Eucalyptus leucoxylon and/or E. microcarpa \pm E. goniocalyx \pm E. melliodora. Often with an open shrub layer. Rich in grasses and geophytes when intact.

Structure: Open-woodland 20-25 m tall ± an open shrub layer 2-3 m tall, grassy herb-rich ground cover. Habitat: Occurs on sites of moderate fertility and water availability

such as the floodplains of minor creeks and gently undulating terrain. Soils generally derived from a variety of substrates including marine and fluvial sediments.

Nearest relative: Plains Grassy Woodland.

Comments: Within the study area Low Rises Grassy Woodland occurs on the low hills between the Wimmera plains proper and the Goldfields Bioregion boundary.

EVC 179 Heathy Herb-Rich Woodland

Eucalypt woodland or open-forest generally with a bracken-dominated understorey. Wattles, such as *Acacia melanoxylon*, *A. mearsii*, *A. verticillata*, *A. paradoxa* and, less frequently, *A* retinodes are generally present. The understorey comprises a range of heathy shrubs and subshrubs, grasses and herbs. Occurs on Quaternary aeolian deposits with relatively well-drained sandy soils often with limestone at depth. Soil and ecological characteristics are intermediate between Damp Sands Herb-rich Woodland and Heathy Woodland but as this vegetation type often occupies large areas and appears to include species which distinguish it from these EVCs, it is considered to be a pure EVC rather than a complex. Recorded from two bioregions in study area (Glenelg Plain, Wimmera), also occurs in the Grampians National Park (Turnino and Robert 1998).

Glenelg Plain Heathy Herb-rich Woodland

Floristics: Dominated by Eucalyptus baxteri ± Eucalyptus viminalis with an understorey in which Leptospermum continentale, Xanthorrhoea minor, X. caespitosa Pteridium esculentum are prominent. Includes species of heathy habitats such as Leptospermum myrsinoides and Hypolaena fastigiata as well as species typical of more fertile habitats such as Themeda triandra, Hypericum gramineum and Wurmbea dioica. Structure: Woodland 15-20 m tall.

Habitat: Moderately fertile sandy substrates in the vicinity of, but not on. limestone

Nearest relatives: Heathy Woodland, Damps Sands Herb-rich Woodland.

Comments: Frequently occurs on aeolian sand deposits near limestone; trees roots are likely to reach the underlying limestone and redistribute nutrients to the otherwise nutrient-poor surface soil layers, resulting in this intermediate vegetation type.

Wimmera Heathy Herb-rich Woodland Floristics: Dominated by Eucalyptus arenacea or E. viminalis, generally with an understorey dominated by Acacia paradoxa, Astroloma conostephioides, Brachyloma daphnoides. Groundlayer supports a variety of herbs and grasses.

Structure: Woodland c. 10 m tall.

Habitat: Quaternary aeolian sands on the southern margins of this bioregion.

Nearest relatives: Heathy Woodland, Damp Sands Herb-rich Woodland.

Comments: High fire frequencies may distort the floristics of this community.

EVC 191 Riparian Scrub

Closed-scrub along damp drainage lines in relatively infertile environments, usually set in Heathy Woodland. More fertile but similarly wet environments support Swamp Scrub. Recorded from one bioregion within the study area (Glenelg Plain).

Riparian Scrub

Floristics: Dominated by Melaleuca squarrosa. The scrambling fern Gleichenia microphylla is also very characteristic of this

community. Structure: Closed-scrub.

Habitat: Drainage lines within relatively infertile habitats such as heathy woodlands

Nearest relative: Swamp Scrub.

Comments: When long unburnt (which rarely happens), Wet Heathland can resemble this EVC.

EVC 193 Rocky Outcrop Herbland Herbland associated with rock outcrops, generally in mosaic with Rocky Outcrop Shrubland. Subject to microclimatic extremes, being typically damp to wet in winter and dry in summer. There is generally insufficient soil to support tree growth. Described from the Grampians by Tumino and Roberts (1998). Recorded from two bioregions in the study area (Dundas . Tablelands, Grampians).

Rocky Outcrop Herbland Floristics: In the Grampians, trees are rare although scattered spindly specimens of Eucalyptus goniocalyx or E. baxteri can occur. Scattered shrubs such as Calytrix tetragona, Leptospermum turbinatum, Ozothamnus obcordatus may also be present. Most prominent life forms are grasses, forbs and other geophytes (Tumino and Roberts 1998).

Structure: Open-herbland.

Habitat: Associated with skeletal soils of rock outcrops, most frequently with north and west aspects.

Nearest relative: Rocky Outcrop Shrubland.

EVC 195 Seasonally Inundated Shrubby Woodland

Shrub-dominated eucalypt woodland with a range of sedges and grasses and herbs including a number of annuals. Occurs on moderately fertile, poorly-drained, shallow sand or silty topsoils over heavier clay subsoils of Quaternary swamp deposits and broad, seasonal drainage lines and Often associated with recent outwash flats between sand dunes. Soils are generally inundated or waterlogged in winter and baked hard in summer, which promotes sedges and annual species. Formerly locally extensive within the north and west of the study area but now largely cleared and degraded by grazing. Still relatively common in some areas. Recorded from three bioregions within study area (Grampians, Glenelg Plain, Wimmera).

Glenelg Plain Seasonally Inundated Shrubby Woodland

Floristics: Dominated by Eucalyptus leucoxylon ± Eucalyptus viminalis ssp. cygnetensis \pm Eucalyptus ovata \pm Eucalyptus fasciculosa, with a shrubby understorey, rich in grasses and herbs.

Structure: Woodland (10-)12-15 m tall, trees are generally well formed and straight-growing.

Habitat: Seasonally waterlogged depressions between aeolian sand dunes in areas with

<600 mm annual rainfall on shallow, coarse red-yellow sandy topsoils above an impervious clay subsoil which is baked hard in summer.

Nearest relative: Plains Sedgy Woodland.

Comments: Examples with Eucalyptus fasciculosa are a high priority for protection.

Grampians Seasonally Inundated Shrubby Woodland

Floristics: Dominated by Eucalyptus leucoxylon ± E. melliodora with an understorey of often dense but separate clumps of shrubs such as Callistenon rugulosus, Melaleuca gibbosa, Calytrix tetragona, Leptospermumspp., Hakea rugosa, H. rostrata. Prominent ground covers include Lepyrodia muelleri, Schoenus apogon, Leptocarpus brownii. Structure: Woodland to open-woodland.

Habitat: Broad drainage lines and flats that are inundated for extended periods over winter.

Nearest relative: Lateritic Woodland, Alluvial Terraces Herb-rich Woodland. **Comments:** This EVC is described by Tumino and Roberts (1998) as two floristic communities including *Plains* and *Valley* Seasonally inundated Shrubby Woodland, although quadrat D14109 is classified as Shallow Sands Heathland.

Wimmera 1 Seasonally Inundated Shrubby Woodland Floristics: Dominated by Eucalyptus leucoxylon above a low shrub layer of Melaleuca gibbosa ± Melaleuca brevifolia, rich in geophytes, annual herbs, sedges and grasses.

Structure: Woodland 12-15 m tall, trees are generally well-formed and straight-growing.

Habitat: Seasonally waterlogged depressions between aeolian sand dunes in areas with <600 mm annual rainfall on shallow, coarse red-yellow sandy topsoils above an impervious clay subsoil which is baked hard in summer. Nearest relative: Plains Sedgy Woodland.

Wimmera 2 Seasonally Inundated Shrubby Woodland Floristics: Dominated by Eucalyptus camaldulensis above a tall shrub layer of Callistemon rugulosus and Melaleuca spp., rich in sedges and annual species, with large amount of bare ground.

Structure: Open-woodland 12-15 m tall, trees are generally well-formed and straight-growing.

Habitat: Upper level floodplains of the Wimmera River at the outwash/plains interface in areas with <600 mm annual rainfall. Occupies areas that are inundated for extended periods during winter on fine silty clay soils that are baked hard in summer.

Nearest relative: Plains Sedgy Woodland.

EVC 198 Sedgy Riparian Woodland

Forest or woodland with sedge-dominated understorey, on flats along creeks and drainage lines in moderately fertile habitats. Often occurs along streams and drainage lines within Lowland Forest. Watercourse within flats may be poorly defined. Recorded from three bioregions within study area (Grampians, Victorian Volcanic Plain, Warrnambool Plain).

Grampians Sedgy Riparian Woodland

Floristics: Dominated by Eucalyptus ovata or less frequently E. obliqua with a sparse understorey of smaller trees (Acacia melanoxylon, A. mearnsii) and tall shrubs (Melaleuca squarrosa, Leptospermum lanigerum A. retinodes, Banksia marginata). The ground cover is dominated by a variety of sedges such as Carex appressa, Lepidosperma elatius, Cyperus lucidus. See following table and Tumino and Roberts (1998). Structure: Woodland to forest.

Habitat: Riparian flats and frequently flooded creek banks. Nearest relative: Riparian Scrub.

Comments: Described by Tumino and Roberts (1998).

Victorian Volcanic Plain Sedgy Riparian Woodland Floristics: Dominated by Eucalyptus ovata and Acacia

melanoxylon with Leptospermum continentale and usually Lepidosperma longitudinale (sometimes L. elatius, L. laterale, and/or Gahnia trifida). Species-richness is moderate to high, and a large number of herbs can be present, most of which are tolerant of waterlogged soils.

Structure: Woodland 8–30+ m tall.

Habitat: Flats prone to waterlogging on clay-loam soils of high fertility on high rainfall volcanic plains. Nearest relative: Plains Swampy Woodland.

Warrnambool Plain Sedgy Riparian Woodland Floristics: Dominated by Eucalyptus ovata sedges Lepidosperma laterale, Carex gaudichaudiana and Carex sp. are prominent in the understorey. Although recorded as *Lepidosperma laterale*, this species may be *Lepidosperma elatius*. Structure: Forest c. 20 m tall.

Habitat: Drainage lines within forest with intermittent flow. Nearest relative: Lowland Forest.

Comments: Site too small to be mapped at 1:100 000.

EVC 200 Shallow Freshwater Marsh

Wetlands which, while still shallow, are more deeply inundated and for longer periods than Freshwater Meadow (EVC 680). While this hydrological regime delimits a range of possible wetland EVCs, only on a very local scale does it imply a particular EVC with any certainty. On the volcanic plains and more fertile Tertiary soils, shallow freshwater marsh is usually indicative of Plains Sedgy Wetland, or poorly characterised species-poor variants of Plains Grassy Wetland in drier areas. It can also refer to sites supporting Swamp Scrub along impeded drainage lines in higher rainfall areas of plains. In relevant sections of the Wimmera Plains, Shallow Freshwater Marsh is usually indicative of Red Gum Wetland. In drier areas of the plains (both sedimentary and volcanic), Shallow Freshwater Marsh includes small areas of a range of restricted wetland types, including Cane-grass Wetland, Lignum - Canegrass Wetland, Lignum Swamp, Brackish Wetland or Brackish Sedgeland. On less fertile sandy country, it typically indicates Sedge Wetland, or, rarely, Brackish Sedgeland (e.g. Casterton area). On floodplains, Shallow Freshwater Marsh has typically been treated as part of Floodplain Riparian Woodland (Floodplain Wetland).

EVC 203 Stony Rises Woodland

Eucalypt woodland on stony rises (highly irregular terrain on recent basalt flows). Soils are fertile and well-drained but shallow or skeletal. Limited soil development outside of rock-cracks and dry summers promote annuals and deep-rooted perennials. Recorded from the Victorian Volcanic Plain.

Stony Rises Woodland

Floristics: Dominated by Eucalyptus viminalis and Acacia melanoxylon. Prominent understorey species include Pteridium esculentum, Poa ensiformis, Cassinia longifolia, Senecio pinnatifolius, Acaena novae-zelandiae. Annual weeds are common.

Structure: Woodland 20 m tall.

Habitat: Basalt stony rises. Irregular, rough, rocky surface with hummocks, hollows and shady microsites, relatively good drainage, limited soil development.

Nearest relative: Damp Sands Herb-rich Woodland (this does not occur on basalt).

EVC 264 Sand Ridge Woodland Grassy or low shrub-dominated pine-box woodland with large range of annual herbs. Occurs on moderately fertile, deep (>1.5 m) well-drained, sandy soils. Often associated with aeolian deposits including lunettes in association with larger rivers and

wetlands. Soils are generally moist in winter and dry in summer, which promotes geophytic and annual species. Previously restricted in the north of study area but now largely cleared and degraded by rabbit grazing and weed invasion. Recorded from one bioregion (Wimmera) within study area.

Wimmera Sand Ridge Woodland

Floristics: Dominated by *Calitris gracilis* \pm *Eucalyptus melliodora* \pm *Eucalyptus leucoxylon*, rich in grasses, annual herbs and geophytes, low heathy shrubs may be locally common.

Structure: Woodland 12-15 m tall, trees are generally evenly-spaced and well-formed.

Habitat: Source-bordering dunes composed of deep (>1.5 m) sandy soil in areas of 400-500 mm rainfall per annum

Nearest relative: Damp Sands Herb-rich Woodland.

EVC 279 Heathland Thicket

Heathland recorded only from the Grampians bioregion where it is relatively rare and restricted. Often occurs within depressions surrounded by broader areas of Sand Heathland and just enters the present study area. Described from the Grampians by Tumino and Roberts (1998).

Grampians Heathland Thicket Floristics: Not well-defined but includes dense Melaleuca decussata with occasional Leptospermum scoparium As the shrubs are very dense, the ground cover is often bare with occasional moss cover (Tumino and Roberts 1998)

Structure: Heathland (height not stated Tumino and Roberts 1998). Habitat: Depressions or drainage lines within Sand Heathland .. Nearest relative: Seasonally Inundated Shrubby Woodland. Comments: Floristic composition and ecology need further definition.

EVC 280 Floodplain Thicket Woodland or scrub found on floodplains within the Glenelg and Wannon catchments. Broad alluvial flats give rise to a multitude of interlinking channels and it is within these channels that Floodplain Thicket occurs. Floristic variations within this EVC are likely to result from variations in the frequency and length of time of inundation. Soils vary from black alluvial clays to pale grey silty clays. Recorded from two bioregions within the study area (Dundas Tablelands, Grampians).

Grampians and Dundas Tablelands Floodplain Thicket

Floristics: Dominated by Eucalyptus camaldulensis. Shrubs such as Melaleuca decussata,

M. gibbosa, M. squarrosa, Leptospermum lanigerumand L. continentale form a dense thicket over a range of sedges and herbs. See Tumino and Roberts (1998).

Structure: Woodland to scrub.

Habitat: Riparian zones and seasonal floodways. Nearest relative: Seasonally Inundated Shrubby Woodland.

EVC 282 Shrubby Woodland Eucalypt woodland with an often dense shrubby understorey. Ground cover variously dominated by restionaceous and sedge species or grasses and forbs. Soils generally duplex with sandy loam overlying heavy clay subsoil. Restricted to valley floors of all major catchments within the Grampians bioregion. Recorded from the Grampians bioregion and described by Tumino and Roberts (1998).

Grampians Shrubby Woodland Floristics: Dominated by Eucalyptus camaldulensis with E. melliodora as a subdominant

± *E. ovata. Acacia mearnsii*, or less frequently *A. melanoxylon*, occurs as an understorey tree. The dense shrub layer is dominated by *Banksia* marginata, Leptospermum spp. and small shrubs such as Astroloma conostephioides and Brachyloma daphnoides. The ground-layer is dominated by Microlaena stipoides and is rich in forbs.

Structure: Woodland.

Habitat: Occurs on Pliocene-Pleistocene sediments with duplex soils.

Nearest relative: Heathy Woodland. EVC 283 Plains Sedgy Woodland Woodland in shallow depressions associated with broad plains or floodplains. Shrubs and understorey trees are generally absent with sedges predominating in the ground layer. Soils are poorly drained, cracking clays which can seasonally form shallow freshwater marshes. This EVC has undergone timber harvesting, draining for agriculture and grazing (mainly in the Wimmera), although relatively intact examples can still be found. Recorded from the Wimmera and Grampians bioregions.

Grampians Plains Sedgy Woodland Floristics: Dominated by by a variety of eucalypts and occasionally with scattered Allocasuarina spp. Shrubs such as Hakea spp., Acacia pycnantha, Leptospermum myrsinoides and Allcasuarina paludosa may be present, but only as scattered individuals. Chorizandra enodis is the only consistant species to occur as a ground cover with numerous other sedges, grasses and herbs also common.

Structure: Woodland.

Habitat: Slight depressions and poorly drained areas.

Nearest relative: Sedge-rich Wetland.

Comments: Many remnants relatively intact. Plains Sedgy Woodland within the Grampians Bioregion is described by Tumino and Roberts (1998).

Wimmera 1 Plains Sedgy Woodland

Floristics: Dominated by Eucalyptus leucoxylon ± E. camaldulensis ± E. fasciculosa

± Allocasuarina luehmannii. Sparse shrub cover often present, includes Hakea rugosa, Acacia paradoxa. Dense ground cover of Chorizandra enodis. Annuals, herbs and grasses common, often with many species at low frequencies. Structure: Woodland.

Habitat: Seasonally inundated shallow depressions on broad plains.

Nearest relative: Seasonally Inundated Shrubby Woodland. Comments: Despite the visual impression given by the two-way table, this is the most species-rich floristic community of this EVC in the bioregion. Further sampling is required to adequately define the communities in this EVC. This appears to be the driest version.

Wimmera 2 Plains Sedgy Woodland

Floristics: Dominated by *Eucalyptus leucoxylon* \pm *E. microcarpa* \pm *E. leucoxylon.* Sparse shrub cover often present, includes *Hakea rugosa, Melaleuca* spp., *Callistemon rugulosus*. Dense ground cover of Chorizandra enodis. Annuals, herbs and grasses common, often with many species at low frequencies. Species indicative of wet environments include Villarsia reniformis, Isolepis spp., *Juncus* spp., *Eryngium* spp. **Structure:** Woodland.

Habitat: Seasonally inundated shallow depressions on broad plains.

. Nearest relative: Seasonally Inundated Shrubby Woodland. **Comments:** Further sampling is required to adequately define the communities in this EVC. This appears to be a wetter floristic community than Community 1.

Wimmera 3 Plains Sedgy Woodland

Floristics: Dominated by Eucalyptus camaldulensis ± E. leucoxylon ± E. largiflorens

 \pm E. microcarpa \pm E. melliodora \pm Allocasuarina luehmannii. Sparse shrub cover occasionally present including Hakea spp. Dense ground cover of Chorizandra enodis. Annuals, herbs and grasses common. Species indicative of a wet, frequently inundated environment include Centipeda cunninghamii, Agrostis avenacea, Juncus spp., Isolepis spp., Potamogeton tricarinatus Structure: Woodland.

Habitat: Seasonally inundated shallow depressions surrounded by aeolian dunes

Nearest relative: Some forms of Red Gum Wetland

Comments: Appears to be the wettest version of this EVC in the bioregion.

EVC 285 Dry Creekline Woodland

Shrub-dominated eucalypt woodland with a range of sedges and herbs. Occurs along small, narrow, ephemeral streams flowing north and west from the Grampians towards drier regions to the north. Streams are largely dry in summer and often contain coarse alluvial sand deposits derived from a variety of different parent geologies but notably Carboniferous granites and sandstones. Previously restricted in the study area, extant examples are subject to grazing, particularly on flatter slopes. Generally low timber production value. Recorded from one bioregion (Grampians) within study area.

Grampians Dry Creekline Woodland Floristics: Dominated by a variety of eucalypts, often from adjoining EVCs. Common species include Eucalyptus arenacea, Eucalyptus goniocalyx, Eucalyptus obliqua, Eucalyptus viminalis ssp. cygnetensis. Shrubs are prominent and sedges may be present in streambeds, grasses and herbs are generally in low numbers

Structure: Woodland to open-forest 10-15 m tall, depending on site conditions and adjoining EVCs.

Habitat: Small, ephemeral streams with relatively steep gradients (10-20°) draining north and west on coarse granitic or sandstonederived sands.

Nearest relative: Sedgy Riparian Woodland. Comments: This EVC is better represented in the Grampians National Park and Black Range State Park. Also described by Tumino and Roberts (1998).

EVC 291 Cane Grass Wetland

Open-grassland, typically very species-poor except on outer verges, often with monospecific (or virtually so) cane-grass dominated centres. On very heavy grey clay soils, prone to turbidity when inundated and extreme cracking when dry. Previously rare and localised within the study area, few relatively intact remnants persist. Recorded from one bioregion within study area (Wimmera), although it does occur on the Victorian Volcanic Plain near but outside the study area boundary, and prior restricted occurrences within the study area are possible.

Cane Grass Wetland

Floristics: Dominated by Eragrostis infecunda, typically very species-poor except around outer verges. Where present in more central areas, associated species are often annuals such as Agrostis avenacea var.

avenacea or herbaceous aquatics such as Potamogeton tricarinatus. Often fringed by Muehlenbeckia florulenta, occasionally with scattered eucalypts. Structure: Open-grassland.

Habitat: Seasonally to intermittently (mostly) shallowly inundated depressions, typically with heavy grey clay soils.

Nearest relative: Lignum Cane Grass Swamp (in relation to more speciesrich outer fringes only) and some variants of Plains Grassy Wetland.

EVC 292 Red Gum Wetland

Eucalypt woodland with sedgy or grassy-herbaceous ground-layer, comprising various balances of true aquatics and species tolerant of intermittent to seasonal inundation. Occurs in seasonally wet depressions on plains, typically associated with heavy paludal soils, sometimes with gilgai development. Previously common in suitable habitat but now largely cleared. Recorded from two bioregions within study area (Grampians, Wimmera).

Grampians Red Gum Wetland

Floristics: Dominated by *Eucalyptus camaldulensis* with a sparse shrub cover of *Melaleuca squamea*. Ground cover is dominated by *Carex* tertecaulis, Isolepis fluitans, Myriophyllum simulans and a variety of other sedges and semiaquatic plants.

Structure: Woodland. Habitat: Drainage lines, swampy depressions and seasonally inundated areas.

Nearest relative: Aquatic Herbland.

Comments: Grampians Red Gum Wetland was described by Tumino and Roberts (1998) but the single quadrat within the present study area was classified as Valley Seasonally Inundated Shrubby Woodland by Tumino and Roberts (1998).

Wimmera 1 Red Gum Wetland

Floristics: Dominated by *Eucalyptus camaldulensis*, with ground-layer typically dominated by aquatic herbs (including *Myriophyllum* spp., *Villarsia reniformis*, *Potamogeton tricarinatus*), at least in wet central areas. A range of inundation-tolerant herbs, sedges and grasses is often also present, principally on drier verges which are quite species-rich, and floristics can resemble Plains Grassy Wetland.

Structure: Woodland to open-woodland, trees to 30+ m, primarily over a strata of aquatic herbs and inundation tolerant herbs, sedges and grasses. Habitat: Seasonal wetland (sometimes with more consistently wet centres) in depressions on heavy soils within fertile plains. Nearest relative: Red Gum Wetland / Aquatic Herbland Mosaic, Plains

Grassy Wetland, Plains Sedgy Wetland.

Comments: Includes FFG listed community Red Gum Swamp (Community No. 1).

Wimmera 2 Red Gum Wetland

Floristics: Dominated by Eucalyptus camaldulensis and Allocasuarina luehmannii, \pm E. leucoxylon, E. melliodora and E. microcarpa, ground strata sedgy (notably with Chorizandra enodis and Lepidosperma congestum), with sparse shrubs and a very diverse range of waterlogging tolerant grasses, geophytes and herbs, many at low frequencies.

Structure: Woodland or open-woodland (12-25+ m) or low sedgeland (0.2-0.5 m) to open-shrubland (1-2 m) in wetter portions.

Habitat: Shallow seasonal/intermittent wetland on pale grey-pink hardsetting gritty silt soils with heavy subsoils, on shallow depressions within shallower sand sheet areas.

Nearest relative: Plains Sedgy Woodland, Seasonally Inundated Shrubby Woodland, Plains Grassy Wetland.

Wimmera 3 Red Gum Wetland

Floristics: Dominated by Eucalyptus camaldulensis with relatively speciesrich ground-layer typically dominated by inundation tolerant grasses, herbs and nardoo. Main species include *Eragrostis infecuda*, *Agrostis avenacea* var. avenacea, Eryngium vesiculosum, Marsilea drummondii, Brachyscome basaltica and Craspedia paludicola. This drier version of the EVC has strong floristic affinities with Plains Grassy Wetland.

Structure: Woodland or open-woodland, generally to 20-30 m tall. Habitat: Seasonally wet depressions on fertile heavy soils Nearest relative: Plains Grassy Wetland.

EVC 295 Riverine Grassy Woodland Grass-dominated eucalypt woodland or forest with occasional tall shrubs and trees also present. Occurs on extensive floodplains with fertile sand, silt or silty loam alluvial soils. Sites are generally infrequently flooded. Formerly restricted in the study area to downstream areas of the Wimmera River floodplain, now substantially reduced by clearing for agriculture and foristically and structurally simplified by grazing. Remnant areas are subject to high levels of disturbance from grazing, timber cutting, recreational vehicles and weed invasion. Recorded from one bioregion (Wimmera) within study area.

Wimmera Riverine Grassy Woodland

Floristics: Dominated by *Eucalyptus camaldulensis*, high cover of grasses (eg. *Austrodanthonia* spp.) and numerous herbs (eg. *Wahlenbergia* spp., *Senecio quadridentatus*, *Rumex brownii*). See following table (in part).

Structure: Woodland or open-forest 12-15 m tall, trees are generally well-formed, straight-growing and single-stemmed. Habitat: Infrequently flooded sites within primary alluvial floodplain of the Wimmera River in areas with <400 mm annual rainfall. Soils are generally sandy or silty loams. Nearest relative: Riverine Grassy Chenopod Woodland.

EVC 298 Riverine Sedgy Forest

Tussock-grass and sedge-dominated eucalypt woodland or forest with occasional tall shrubs and trees also present. Smaller areas of treeless wetland and floodway vegetation (amphibious and/or aquatic herbs) are also often present. Occurs where extensive floodplains develop on fertile sand, silt or silty loam alluvial soils transported by regular flood events. Sites may be inundated by water for part of the year and permanent billabongs and old anabranches are common. Formerly restricted in the study area to downstream areas of the Wimmera River floodplain, now substantially reduced by clearing for agriculture and conversion of areas to irrigation farming. Remnant areas are subject to high levels of disturbance from grazing, timber cutting, recreational vehicles and weed invasion. Recorded from one bioregion within study area.

Wimmera Riverine Sedgy Forest Floristics: Dominated by Eucalyptus camaldulensis, with a high cover of tussock-grasses, sedges (e.g. Carex spp., Cyperus spp., Isolepis spp.) and rushes and a range of aquatic/amphibious herbs (e.g. Centipeda cunninghamii, Calotis scapigera, Crassula helmsii, Triglochin spp., Myriophyllum spp.). Structure: Open-forest or woodland 12–18 m tall, trees are

generally well formed, straight-growing and single-stemmed. Habitat: Seasonally or regularly-flooded alluvial floodplains of the Wimmera River in areas with <400 mm annual rainfall. Soils are generally sandy or silty (sometimes gravelly) loams. Numerous billabongs, floodways and old anabranches are a feature. Nearest relative: Floodplain Riparian Woodland.

EVC 636 Brackish Lake Mosaic

Mosaic of wetland EVCs in which deeper central areas support Brackish Aquatic Herbland (see table below). Verges support a more species-rich herbland or sedgeland in which Bolboschoenus caldwellii, Schoenus nitens, Schoenoplectus pungens, Cyperus gymnocaulos and Eleocharis spp. are prominent. Brachish Wetland 656 sometimes occurs in this mosaic, but other poorly understood EVCs are also present. Typically fringed by *Eucalyptus camaldulensis*-dominated woodland. The floristic composition of the verge is influenced by factors such as salinity, exposure, aspect and steepness (see Permanent Open Freshwater 682). Always rare in study area, current examples mostly with increased salinity due to hydrological alteration. Recorded from one bioregion (Victorian Volcanic Plain).

Brackish Lake Mosaic (Brackish Aquatic Herbland component) Floristics: This component dominated by Myriophyllum

verrucosum, with M. muelleri, sometimes with Triglochin procerum and Lilaeopsis polyantha.

Structure: Herbland (aquatic) to sedgeland, submergent to weakly emergent.

Habitat: Inundated depressions, including along poorly defined drainage lines. Floristic composition indicates the presence of salinity, but not at levels which greatly restrict species-richness. Nearest relatives: Brackish Wetland, Estuarine Wetland, Grey Clay Drainage Line Herbland/Sedgeland.

EVC 640 Creekline Sedgy Woodland

Sedge and rush-dominated eucalypt woodland with amphibious herbs along creek-banks and adjacent wet flats. Occurs along smaller intermittent creeks on the floodplains of larger rivers in lower rainfall areas in the north of the study area. Previously widespread and locally extensive but now largely cleared and degraded. Recorded from one bioregion within study area (Wimmera).

Creekline Sedgy Woodland

Floristics: Dominated by *Eucalyptus camaldulensis* ± *E. microcarpa*, major ground-layer species include *Carex tereticaulis*, *Carex appressa*, *Juncus* spp., *Cyperus gunnii* and a range of amphibious herbs.

Structure: Woodland or open-woodland 12-15 m tall, trees are generally well-formed, straight growing and single-stemmed. Habitat: Coarse sand and stony alluvial soils along ephemeral creeks with very low gradients within Plains Grassy Woodland. Annual rainfall is <600 mm per annum. Nearest relative: Creekline Grassy Woodland Comments: May be endemic to Wimmera bioregion. Very few

high quality examples exist although further survey of all public land water frontages is required to accurately determine this.

EVC 641 Riparian Woodland

Woodland dominated by Eucalyptus camaldulensis over tussock grass Poa labillardierei dominated understorey, beside permanent

streams, typically on narrow alluvial deposits. Tall shrubs may be present and amphibious herbs may occur in occasional ponds and beside creeks. While flooding may be common, sites are rarely inundated for lengthy periods. High volume seasonal flows may be common. Formerly widespread along major creeks and rivers on the plains within the study area, now greatly reduced in area due to clearing for agriculture. Remnant areas are subject to high levels of disturbance from grazing, timber cutting, recreational vehicles and weed invasion. Recorded from four bioregions (Wimmera, Glenelg Plain, Dundas Tablelands, Victorian Volcanic Plain).

Glenelg Plain and Dundas Tablelands Riparian Woodland Floristics: Dominated by Eucalyptus canaldulensis, relatively intact understoreys dominated by Poa labillardierei.

Structure: Woodland to 30 m in height.

Habitat: Narrow alluvial deposits along permanent streams.

Nearest relative: Plains Grassy Woodland.

Comments: The Glenelg Plain and Dundas Tablelands are considered to share the same riparian woodland system. Almost all stands of remnant E. camaldulenis have introduced understoreys due to stock grazing, superphosphate application and other disturbances. Remnants with predominantly indigenous understoreys are often degraded by loss of species and weed invasion. This environment is prone to weed invasion due to high nutrient levels, flood disturbance and streams dispersing weed species.

Victorian Volcanic Plain Riparian Woodland Floristics: Dominated by Eucalyptus camaldulensis, typically with Poa labillardierei, sedges and instream aquatics sometimes conspicuous in more intact sites

Structure: Woodland 10-30 m tall.

Habitat: Alluvial soils on verges of permanent streams, including instream ponds.

Nearest relative: Creekline Grassy Woodland, Floodplain Riparian Woodland.

Wimmera Riparian Woodland

Floristics: The quadrats presented here were taken within ponded areas and represent the wettest end of the floristic continuum within Riparian Woodland. They were dominated by Eucalyptus camaldulensis and were rich in amphibious and aquatic herbs, sedges, rushes and grasses. Most of the community has an understorey dominated by Poa labillardierei when undisturbed.

Structure: Woodland to open-forest 12-18 m tall. Trees are generally well

formed and straight-growing. **Habitat:** Fertile alluvial soils along major rivers and streams subject to lengthy periods of seasonal inundation.

Nearest relative: Floodplain Riparian Woodland.

EVC 642 Basalt Shrubby Woodland

Eucalypt-dominated woodland with grassy/shrubby understorey, presumed originally quite species-rich. Occurs on fertile, mostly loamy basalt soils at higher rainfalls. Previously extensive in south-eastern section of the Volcanic Plain, but now almost entirely cleared. Recorded from one bioregion within study area (Victorian Volcanic Plain).

Basalt Shrubby Woodland

Floristics: Dominated by Eucalyptus ovata and Acacia melanoxylon ± E. viminalis. The understorey apparently included a shrubby component (most common remnant species Leptospermum continentale, Acacia verticillata). Major ground-layer species include Themeda triandra, Poa morrisii, Stipa pubinodis, Pteridium esculentum. A range of other grasses and small dicot herbs present in more intact sites.

Structure: Woodland 10-25 m tall, varing with site qualities such as exposure and wetness.

Habitat: Well-drained to seasonally damp fertile soils in higher rainfall areas of volcanic plain.

Nearest relative: Plains Grassy Woodland, Damp Sands Herb-rich Woodland, Herb-rich Foothill Forest.

EVC 643 Brackish Drainage Line Herbland/Sedgeland Usually sedgeland or herbland, structurally variable, with a range of variously salt-tolerant herbs, but samphires only minor component if present, occurs on heavy clay and organic/alluvial soils along salinised minor drainage lines. Previously rare and localised within study area, now mostly cleared. Recorded from two bioregions within study area (Dundas Tablelands, Victorian Volcanic Plain).

Brackish Drainage Line Herbland/Sedgeland

Floristics: Potentially co-dominated by a wide range of somewhat salttolerant species, including sedges and rushes/reeds (Eleocharis acuta, Bolboschoenus caldwellii, Schoenoplectus pungens, Juncus krausii, Phragmites australis), smaller grasses (Distichlis distichophylla) and herbs

(e.g. Selliera radicans, Triglochin striata, Pratia irrigua, Mimulus repens, Wilsonia rotundifolia). Structure: Sedgeland or herbland, sometimes reedbed, mostly 0.2-1 m in

heiaht.

Habitat: Frequently saturated heavy clay and organic/alluvial soils along salinised minor drainage lines, mostly on basaltic or fertile Tertiary terrain. Nearest relative: Estuarine Wetland, Inland Saltmarsh, Brackish Wetland.

EVC 644 Cinder Cone Woodland

Woodland with grassy understorey associated with tuff (volcanic ash) volcanoes. Poorly understood and almost extinct. Recorded from one bioregion within study area (Victorian Volcanic Plain).

Cinder Cone Woodland

Floristics: Dominated by Eucalyptus viminalis and/or E. ovata, with a grassy or bracken-dominated understorey in which Poa labillardierei is prominent, at least on southern aspects. Floristics poorly known due to lack of unmodified remnants. Structure: Woodland.

Habitat: Ash deposits on the Tower Hill volcano and possibly nearby.

Nearest relatives: Scoria Cone Woodland, Plains Grassy Woodland.

Comments: The best known surviving remnant (D27985) lacks tree cover; it has a south aspect, further research is needed to infer the original vegetation on other aspects. Relationship with Scoria Cone Woodland is unclear and there may not be sufficient remnants of these EVCs in Victoria to clarify this.

EVC 647 Plains Sedgy Wetland Primarily sedgy-herbaceous vegetation of ephemeral to seasonal wetlands on fertile soils of volcanic and sedimentary plains, sometimes with scattered or fringing eucalypts or teatree/paperbark shrubs in higher rainfall areas. A range of aquatic herbs can be present, and species-richness is mostly relatively low to moderate, but higher towards drier margins. Occurs in seasonally wet depressions on plains, typically associated with silty peaty or heavy clay paludal soils. Plains Sedgy Wetland typically occurs in sites of most sustained and deeper inundation than Plains Grassy Wetland. Previously widespread and relatively common in restricted suitable habitat, but now largely cleared and remnants mostly under threat. Recorded from two bioregions within study area (Dundas Tablelands, Victorian Volcanic Plain).

Dundas Tablelands Plains Sedgy Wetland Floristics: Dominated by the sedges Baumea arthrophylla and Eleocharis acuta, and herbs such as Villarsia reniformis, Isolepis fluitans, Myriophyllum crispatum, Goodenia humilis and Centella cordifolia. Except on ephemerally wet fringes, grasses are a relatively minor component, the major species being Agrostis avenacea var. perennis and Amphibromus recurvatus. **Structure:** Sedgeland, open-sedgeland or herbland (height ranging from mostly shortly emergent herbland to sedgeland 0.3–1 m tall). **Habitat:** Seasonally inundated depressions on tablelands, soils silty/peaty within relatively fertile Tertiary geologies on terrain of locally low relief.

Nearest relative: Plains Grassy Wetland, Aquatic Herbland.

Victorian Volcanic Plain Plains Sedgy Wetland

Floristics: Variuosly dominated by Carex tereticaulis, Amphibromus sinuatus and aquatic herbs (notably Stellaria angustifolia, Isolepis fluitans, Myriophyllum spp., Triglochin procerum, Neopaxia australasica). In higher rainfall versions such as Annya Forest, *Juncus procerus* and *Carex appressa* may be the largest graminoids present. These variants, with a somewhat similar but less-rich aquatic flora, are presumed to represent an undescribed additional community.

Structure: Open-sedgeland (to 1.5 m) to mat-forming or weakly emergent aquatic herbland.

Habitat: Occurs in seasonally wet depressions on plains, typically associated with silty peaty paludal soils over heavy clays. Nearest relative: Plains Grassy Wetland, Aquatic Herbland.

EVC 648 Saline Lake Verge Herbland/Sedgeland

Variously sedgeland, herbland or grassland vegetation occuring on the fringes of saline semi-permanent to permanent wetlands. On lower rainfall volcanic plains and fertile Tertiary or Quaternary soils of sedimentary origin, these wetland types are typically fringed by low vegetation dominated by salt-tolerant grases and herbs, or low vegetation dominated by salt-tolerant grases and herbs, or succulent chenopods. Central wet areas usually support a herbland dominated by fine-stemmed submerged aquatic monocots. These EVCs have generally been combined and mapped as Saline Lake Mosaic. Soils are generally heavy grey clays, sometimes with a shallow sandy covering, and are intermittently inundated to moist for most of the year. Scattered within the study area but now largely modified by grazing and hydrological alteration. Recorded from two bioregions within the study area (Wimmera, Victorian Volcanic Plain).

Saline Lake Verge Herbland/Sedgeland Floristics: Dominated by Puccinellia stricta var. perlaxa,

Sarcocornia quinqueflora and/or Distichlis distichophylla. A range of salt tolerant herbs, sedges and small grasses can also be present on the upper edges of this zone or in less saline examples. Muehlenbeckia florulenta was sometimes also present in this zone. Structure: Grassland or herbland, sometimes (partially) openshrubland, mostly

(0.05-)0.2-0.6 m in height.

Habitat: Verges of salinised water bodies, associated with heavy soils or superficial sandy overlays.

Nearest relative: Inland Saltmarsh, Brackish Wetland.

EVC 649 Stony Knoll Shrubland Shrubland or non-eucalypt woodland with grassy understorey on low stony rises (knolls) on basalt flows. Soils are fertile and well-drained but shallow. Limited soil development and dry summers promote annuals and deeprooted perennials in the vegetation. Extremely little remains of this ecosystem. Recorded from two bioregions (Dundas Tablelands, Victorian Volcanic Plain).

Stony Knoll Shrubland

Floristics: Originally dominated by shrubs including *Bursaria spinosa*, Acacia verticillata and *Hymenanthera dentata* with grassy or (in southern parts) bracken-dominated understorey in which Themeda triandra and Austrostipa spp. were prominent. Trees Allocasuarina verticillata, Acacia mearnsii, Banksia marginata and Acacia implexa were variously present. Structure: Grassland to 1 m in height/open-shrubland 1-2 m in height/woodland 5-10 m in height.

Habitat: Rocky basalt rises, more weathered than for Stony Rises Woodland, with friable red loam soils in spaces between rocky paving. Nearest relative: Plains Grassland / Plains Grassy Woodland Complex. Comments: The few remnants have undergone loss of sensitive species and weed invasion. Near the coast, coastal shrubs such as Leucopogon parvifolius and Adriana quadripartita are present; further research may indicate another floristic community, but these species may have spread inland following a reduction in fire frequency. Further variation in original floristics according to rainfall across the range of this EVC is anticipated.

EVC 651 Plains Swampy Woodland

Eucalypt woodland with ground-layer dominated by tussock grassses and/or sedges, rich in herbs when relatively intact. Occurs on poorly drained, seasonally waterlogged heavy soils, primarily on paludal deposits on the volcanic plains but extending to suitable substrates within landscapes of sedimentary origin. Previously of scattered distribution, mainly in higher rainfall areas. Almost entirely cleared. (Glenelg Plain, Victorian Volcanic Plain). Recorded from two bioregions

Plains Swampy Woodland

Floristics: Dominated by Eucalyptus ovata, occasionally E. camaldulensis. Acacia melanoxylon also frequently present. Shrubs, if present, include Ozothamnus ferrugineus, Leptospermum continentale, Allocasuarina paludosa (in highest rainfall areas). Sedges are frequently conspicuous, most commonly Carex spp., but also including Gahnia trifida and Schoenus tesquorumat Annya. Grasses (notably Poa spp.) tolerant of waterlogging and a range of herbs occur in relatively intact sites.

Structure: Woodland (6-)10-20 m tall, stunted in most waterlogged sites, with sedgy-grassy understorey, shrubbier in highest rainfall situations. Habitat: Seasonally waterlogged flats, mainly on heavy soils of paludal oriain.

Nearest relative: Plains Grassy Wetland, Plains Grassy Woodland.

EVC 652 Lunette Woodland

Eucalypt woodland with unknown prior floristics but presumed to be grassy/herbaceous. Defined by landform and remnant trees. Occurs on generally fertile, relatively well-drained, clay-loam soils. Previously widespread within the north of the study area on lunettes but now largely cleared and intact areas are extremely rare. Recorded from four bioregions (Dundas Tablelands, Goldfields, Victorian Volcanic Plain, Wimmera).

Lunette Woodland

Floristics: Dominated by Eucalyptus camaldulensis and Eucalyptus melliodora

Structure: Woodland to open-forest 12-15 m tall, often with a very open understorey, trees are well-formed and generally single-stemmed. Habitat: Low (to a few metres) and spreading source-bordering lunettes composed of fine silty clay-loams in areas of 500–600 mm annual rainfall. Nearest relative: Plains Grassy Woodland.

EVC 653 Aquatic Herbland Herbland of permanent to semi-permanent wetlands, dominated by sedges (especially on shallower verges) and/or aquatic herbs. Occurs on fertile paludal soils, typically heavy clays beneath organic accumulations. Previously widespread within restricted areas of suitable habitat across the study area but now greatly reduced through draining and use for agriculture. Recorded from five bioregions (Dundas Tablelands, Glenelg Plain, Victorian Volcanic Plain, Warrnambool Plain, Wimmera).

Aquatic Herbland

Floristics: Dominated by Eleocharis sphacelata, Triglochin procerumand Myriophyllum spp., sometimes with other aquatics such as Potamogeton tricarinatus and Villarsia reniformis also conspicuous.

Structure: Sedgeland or herbland, with submerged and floating to (mostly less than 0.5 m) emergent aquatic species.

Habitat: Deeper, more continuously inundated wetlands, with heavy clay soils beneath organic layers.

Nearest relatives: Plains Sedgy Wetland, wetlands within Floodplain Riparian Woodland and Riparian Woodland.

Comments: Reasonably resilient flora capable of invading suitable artificial waterbodies

EVC 654 Creekline Tussock Grassland

Tussock grassland, with herbaceous component in inter-tussock spaces. Occurs along poorly defined ephemeral to intermittent drainage lines, sometimes on alluvial flats, typically on heavy dark soils derived from volcanic substrates. Can include a range of graminoid and herbaceous species tolerant of waterlogged soils and presumed to have sometimes resembled a linear wetland or system of interconnected small ponds. Formerly widespread in narrow bands within suitable habitat, now almost entirely cleared. Recorded from one bioregion within study area (Victorian Volcanic Plain).

Creekline Tussock Grassland

Floristics: Treeless, dominated by Poa labillardierei, presumably sometimes replaced by sedges and herbs in wetter situations. Structure: Grassland to 1 m, with very small-scale areas of sedgeland or herbland.

Habitat: Poorly-drained soils of high fertility along low gradient drainage lines

Nearest relative: Creekline Grassy Woodland.

EVC 655 Lignum Cane Grass Swamp

Lignum-dominated shrubland with Cane-grass dominated predominantly grassy-herbaceous associated flora of low to medium species-richness. Most associated species are to some extent halophytic. Occurs on brackish heavy soils. Previously extremely localised within study area, substantially further reduced by agricultural activities. Recorded from one bioregion (Victorian Volcanic Plain) within study area, but likely to have included at least minor occurrences in suitable habitat in low rainfall parts of the Wimmera

Lignum Cane Grass Swamp

Floristics: Dominated by *Muehlenbeckia florulenta* in association with *Eragrostis infecunda*, low to moderate species-richness, including herbs indicative of salinity (e.g. Pratia irrigua, Wilsonia rotundifolia, Triglochin striata, Agrostis spp.).

Structure: Shrubland to open-shrubland 1.5-2.5 m in height.

Habitat: Intermittently to seasonally inundated, on salinised heavy grey clay soils on flats in wetland basins, isolated occurrences within lower rainfall basaltic terrain.

Nearest relative: Cane Grass Wetland. Brackish Wetland.

EVC 656 Brackish Wetland

Sedgeland or herbland, occasionally grassland, dominated by salttolerant species, but samphires typically with low cover, if present. Typically occurs on heavy, at least seasonally shallowly inundated to waterlogged soils, on a range of geologies. Previously rare and localised within study area, now mostly degraded by grazing, nutrient runoff and other disturbances. Recorded from two bioregions within study area (Victorian Volcanic Plains, Wimmera).

Victorian Volcanic Plains Brackish Wetland

Floristics: Variously dominated or co-dominated by a wide range of sedges or rushes including *Bolboschoenus caldwellii, Gahnia* filum, Juncus kraussii, Schoenoplectus pungens, and/or herbs including Mimulus repens, Triglochin striata, Lilaeopsis polyantha, sometimes also *Triglochin procerum*.

Structure: Sedgeland mostly to 1-2 m height, or herbland to 0.2 m heiaht.

Habitat: Inundated depressions, including along poorly defined drainage lines. Floristic composition indicates the presence of salinity, but not at levels which greatly restrict species-richness. Nearest relative: Brackish Lake, Estuarine Wetland, Grey Clay Drainage Line Herbland/Sedgeland.

Wimmera Brackish Wetland

Floristics: Dominated by Juncus kraussii and Gahnia filum, with Wilsonia rotundifolia, Lawrencia squamata and introduced annual grasses.

Structure: Sedgeland/herbland.

Habitat: Seasonally wet salinised flats

Nearest relative: Brackish Drainage Line Herbland/Sedgeland, Inland Salt Marsh.

EVC 657 Freshwater Lignum Shrubland

Lignum-dominated shrubland with predominantly grassy-herbaceous associated flora. Occurs on fertile heavy soils, mostly grassyon the fringe of other wetland types. Recorded from two bioregions within study area (Wimmera, Victorian Volcanic Plain).

Freshwater Lignum Shrubland

Floristics: Dominated by Muehlenbeckia florulenta, with Austrodanthonia duttoniana common at the least degraded remnant examined.

Structure: Shrubland 1.5-3 m in height.

Habitat: Non-saline wetland verges in lowest rainfall areas, sometimes in association with low stony exposures and possible ground-water seepage. Nearest relative: Plains Grassy Wetland.

EVC 659 Plains Riparian Shrubby Woodland Shrub-dominated eucalypt woodland with large range of grasses, sedges and perennial herbs. Occurs on moderately fertile, relatively well-drained, sandy alluvial topsoils over heavier subsoils. Associated with Quaternary alluvial deposits along narrow, seasonal streams in low-rainfall (500-600 mm) plains areas. Sites are characterised by a naturally incised channel to 1 m deep with adjoining sand piles deposited during peak flows. Previously restricted within the study area and currently reasonably well represented throughout its narrow range. Generally high timber production value and easy accessibility. Recorded from one bioregion (Wimmera) within study area.

Plains Riparian Shrubby Woodland

Floristics: Dominated by Eucalyptus camaldulensis and Eucalyptus microcarpa, high cover of tall shrubs including Acacia retinodes var.

retinodes \pm Callistemon rugulosus and high proportion of sedges and rushes. Structure: Woodland 12-15 m tall, trees are generally well-formed and

straight growing.

Habitat: Seasonal creeks containing large deposits of coarse sand alluvium in areas of 500-600 mm annual rainfall. May be subject to high flows during wetter months and summer storm events but are mostly dry during summer. Nearest relative: Shrubby Woodland.

Comments: May be endemic to Wimmera bioregion.

EVC 663 Black Box Lignum Woodland Eucalypt-dominated shrubby woodland to open-woodland or shrubland, on inundation-prone heavy grey soils in lowest rainfall areas. Can be rich in herbaceous species. Previously very rare and localised with study area, no relatively intact examples known from study area. Recorded from one bioregion within study area (Wimmera).

Black Box Lignum Woodland Floristics: Dominated by Eucalyptus largiflorens, with Muehlenbeckia florulenta and a grassy-herbaceous/sedgy ground-layer. Frequent associates include Eragrostis infecunda, Pratia concolor, Austrodanthonia duttoniana, Eleocharis acuta, Marsilea drummondii. Structure: Woodland 4-12 m in height, to open-woodland or shrubland

mostly 1-2(-4) m in height. Habitat: Heavy grey clay soils in depressions or floodways prone to

seasonal inundation Nearest relative: Some lower rainfall variants of Plains Grassy Wetland.

EVC 664 Limestone Ridge Woodland

Acacia woodland with dense sedgy understorey on limestone ridges with limited soil development. The rarity or absence of eucalypts, which is probably due to high soil alkalinity, is of considerable ecological interest. Recorded from one bioregion within study area (Glenelg Plain).

Glenelg Plain Limestone Ridge Woodland Floristics: Dominated by Acacia pycnantha, understorey with abundant Lepidosperma canescens. Other prominent species include Austrostipa flavescens, Acrotriche affinis, Leucopogon parviflorus. Eucalypts mostly absent.

Structure: Woodland c. 8 m in height over dense sedgy understorey c. 0.5 m in height.

Habitat: Limestone ridges with shallow brown sandy loam to 30 cm deep, probably highly alkaline and thus unsuitable for local eucalypts. Shallow soils appear to result in Acacia falling over frequently. Nearest relative: Limestone Woodland.

Comments: Apparent natural rarity/absence of eucalypts is of considerable ecological interest.

EVC 665 Coastal Mallee Scrub

Mallee eucalypt scrub confined to Cape Nelson. The multi-stemmed habit of Coast Gum Eucalyptus diversifolia is a feature of this distinctive community which combines coastal and heath elements. Soil salinity and alkalinity determine the characteristics of this ecosystem which also occurs in South Australia, Cape Nelson being an isolated occurrence. Recorded from one bioregion (Glenelg Plain).

Coastal Mallee Scrub

Floristics: Dominated by Eucalyptus diversifolia ± Melaleuca lanceolata, shrubs include Acacia longifolia var. sophorae, Leucopogon parviflorus, Spyridium vexilliferum Acacia myrtifolia. Prominent ground-layer species include Lepidosperma canescens, Dianella revoluta, Austrostipa flavescens. Combines a few heathy elements such as Astroloma conostephioides (which is lime-tolerant) with coastal elements. Diversity is higher near gaps in the canopy and along the edges of Cape Nelson Road.

Structure: Open to closed-scrub c. 4 m in height, rarely much taller. Habitat: Shallow alkaline sandy soils over limestone, salt spray influences salt levels in system. E. diversifolia is one of the few eucalypts in Victoria adapted to grow on alkaline soils.

Nearest relative: Coastal Headland Scrub.

Comments: Eucalyptus diversifolia is restricted in Victoria to Cape Nelson where it is the dominant eucalypt.

EVC 670 Limestone Woodland

Eucalypt woodland or various scrubs on red sandy soils derived from limestone or sand stripped from limestone and redeposited. The vegetation is strongly influenced by relatively high nutrient levels and alkalinity, with Heathy Woodland developed on the interspersed and more weathered acid grey/white sands. The dunes supporting Heathy Woodland have been more mobile in prehistoric times although they are derived from the same parent material-Quaternary Bridgewater Formation limestone, and appear to partially cover the red soil surface. Recorded from one bioregion within study area.

Glenelg Plain 1 Limestone Woodland Floristics: Dominated by Eucalyptus baxteri with dense to sparse Acacia pycnantha depending on time since fire. Shrubs Melaleuca lanceolata, Pomaderris halmaturina, Leucopogon parviflorus, Astroloma conostephioides are prominent. Ground-layer diverse, includes Dianella brevicaulis, Senecio pinnatifolius. Structure: Woodland/open-woodland c. 15 m in height, locally

dense Acacia shrub stratum, sparse ground-layer.

Habitat: Red sandy soil (terra rossa)

Nearest relative: Limestone Ridge Woodland.

Comments: 1:25,000 mapping is required to further resolve the Limestone Woodland / Heathy Woodland mosaic. Relationships between this community and other lime-based EVCs/communities on the Glenelg Plain requires further research.

Glenelg Plain 2 Limestone Woodland

Floristics: Dominated by *Eucalyptus leucoxylon* \pm *E. fasciculosa* with an open heathy, shrubby or sedgy understorey. Common associates include Astroloma humifusum Hakea spp., Leptospermum continentale, Acacia mearnsii, Acacia pycnantha, Banksia marginata.

Structure: Woodland or open-forest 10-25 m tall. Trees are

typically single-stemmed and straight-growing. Habitat: Known only from Quaternary aeolian dune fields where the underlying limestone is either exposed or only covered by a thin layer of sand. Soils supporting this woodland are typically reddish sandy terra rossa loams and outcropping limestone common. Nearest relative: Shallow Sands Woodland.

EVC 671 Limestone Rise Grassland

Unsampled vegetation type dominated by grasses and herbs. Occurs on shallow soils with limestone parent material close to the surface and often outcropping. Soils are generally wet in winter and dry in summer, which promotes geophytic and annual species. Appears to be naturally rare within Victoria but may be more common in South Australia. All known remnants appear to be disturbed by past grazing and are weed invaded. Recorded from one bioregion within study area (Glenelg Plain).

Glenelg Plain Limestone Rise Grassland

Floristics: Original vegetation probably dominated by grasses such as Poa labillardierei, Themeda triandra, Austrodanthonia spp. When intact it would have been rich in geophytes and other herbs. Structure: Grassland with scattered Eucalyptus ovata, Leucopogon lanceolatus and Lomandra longifolia at its margins. Habitat: Only known from areas of Quaternary aeolian dune fields where the underlying limestone remains exposed. The soil supporting this grassland are typically reddish loams (terra rossa) or gray cracking clays. Limestone parent material relatively close to the surface and often outcropping.

Nearest relative: Limestone Rise Woodland.

EVC 673 Dune Soak Woodland

Sedge and shrub-dominated eucalypt woodland with a number of herbs and grasses adapted to seasonal waterlogging. Occurs on moderately fertile, poorly-drained, sandy or sandy loan topsoils over heavier subsoils. Often found at interface between Quaternary aeolian and swamp deposits. Soils are generally waterlogged in winter and stay moist (at least at depth) in summer. Formerly uncommon in study area, now rare following subsequent clearing for agriculture and degradation from grazing. Recorded from one bioregion within study area (Wimmera).

Dune Soak Woodland Floristics: Dominated by Eucalyptus ovata with shrub layer of mostly Leptospermum continentale and a ground-layer dominated by Lepidopserma longitudinale.

Structure: Woodland or open-forest 12-15 m tall. Trees are

typically low-branching and spreading. Habitat: Poorly-drained sites on sandy loams derived from former swamp deposits at edges of steep aeolian sand dunes. The underlying geology causes water to soak out from under the dunes where it collects in narrow depressions at the edge of the plain. Nearest relative: Damp Sands Herb-rich Woodland.

EVC 674 Sandy Stream Woodland

Reed, sedge or shrub-dominated woodland with a large range of amphibious herbs. Occupies the beds of seasonal creeks where large amounts of course sand have been deposited by past flows, often resulting in a distinctive 'U' shape to the drainage line. Sites periodically inundated through the wetter months and soils moist throughout the year. Unknown elsewhere in Victoria and restricted to moderately high rainfall areas (>600 mm) where coarse parent material available upstream (e.g. aeolian sand deposits) is carried down steep gradients and deposited material available as gradients flatten out. Most extant areas are degraded by grazing and weed invasion. Recorded from one bioregion within the study area (Dundas Tablelands).

Sandy Stream Woodland

Floristics: Dominated by Eucalyptus camaldulensis \pm Eucalyptus ovata, often with a distinctive shrub and reed layer of Leptospermum lanigerum L. obovatum, L. continentale, Acacia spp., Phragmites australis, Typha spp. Structure: Open-woodland 12-15 m tall above a shrub layer to 4 m. Habitat: Deep (to 30 cm) coarse sand deposits of Quaternary aeolian or Ordivician granite origin along seasonal streams. Nearest relative: Creekline Grassy Woodland.

EVC 676 Salt Paperbark Woodland

Low non-eucalypt woodland with herbaceous ground-layer dominated by halophytic chenopods and other succulent herbs with a range of annual grasses and herbs. Occurs on sandy soils with large salt concentrations on the leeward side of large permanent saline lakes and as a ring around smaller semi-permanent saline lakes. Previously widespread and locally extensive within the north of the study area but now cleared from large parts of its former range and subject to grazing on private land. Recorded from one bioregion within study area.

Wimmera Salt Paperbark Woodland Floristics: Dominated by (sometimes patchy) Melaleuca halmaturorum, with a ground-layer of halophytic herbs (conspicuously Sarcornia quinqueflora, Selliera radicans, Wilsonia rotundifolia, Apium annuum).

Structure: Woodland 4-8 metres tall, in mosaic with low herbland to 0.3 m in heiaht.

Habitat: Seasonally waterlogged heavy clay soils on saline flats and lake veraes.

Nearest relative: Inland Salt Marsh, Saline Lake Verge.

Comments: Mapped as part of mosaic with Inland Saltmarsh.

EVC 677 Inland Salt Marsh

Typically species-poor samphire dominated shrubland, or locally variously herbland or grassland. Previously very rare and localised within the study area, further reduced by agricultural activity. Occurs in seasonally or intermittently waterlogged shallow depressions on salinised heavy soils. Recorded from one bioregion within study area.

Wimmera Inland Salt Marsh

Floristics: Mostly dominated by *Halosarcia pergranulata* and/or *Sarcocornia quinqueflora*, with *Samolus repens*, *Selliera radicans*, *Distichlis distichophylla* and *Puccinellia stricta* var. *perlaxa* common conspicuous

associates or locally dominant/co-dominant.

Structure: Low open-shrubland, herbland or grassland, mostly less than 0.5 m in height.

Habitat: Occurs on salinised heavy grey clay soils in seasonally or intermittently waterlogged shallow depressions.

Nearest relative: Saline Lake Verge Herbland/Sedgeland, Salt Paperbark Woodland

EVC 679 Drainage Line Woodland Eucalypt-dominated woodland, ground-layer presumed to have been primarily grassy-herbaceous. Associated with ephemeral streams in a low rainfall landscape of very low relief and poorly defined drainage, often running between freshwater lakes. Previously very rare and localised within the study area, virtually totally cleared. Recorded from one bioregion within study area (Wimmera).

Drainage Line Woodland Floristics: Dominated by *Eucalyptus camaldulensis*, ground-layer presumed to have been primarily grassy-herbaceous, and including a range of species tolerant of waterlogging, but now difficult to determine prior floristics through lack of remnant vegetation. Structure: Woodland to 30 m.

Habitat: Ephemeral streams on alluvial soils within fertile plains areas. Nearest relative: Uncertain—possibly Creekline Grassy Woodland.

EVC 680 Freshwater Meadow

Wetlands shallowly inundated for only a few months each year. While this hydrological regime delimits a range of possible wetland EVCs, only on a very local scale does it imply a particular EVC with any certainty. On the volcanics and more fertile Tertiary soils, Freshwater Meadow is usually indicative of Plains Grassy Wetland. In relevant sections of the Wimmera Plains, it is usually indicative of Red Gum Wetland on more fertile soils, or Seasonally Inundated Shrubby Woodland / Sedge-rich Woodland on shallow sand sheets, with Dune Soak Woodland of very restricted occurrence south of Goroke. In the Casterton area, it can indicate Damp Heath, Wet Heath and/or Sedge Wetland.

EVC 681 Deep Freshwater Marsh

Semi-permanent wetlands, where at least central areas are inundated for in excess of 6 months each year and soils remain virtually continuously wet. Centres of wetlands in this category of wetland typically support Aquatic Herbland. Fringes are variously dominated by sedges, reeds or rushes, or shrubs, varying according to habitat type in which wetland is occurring. Each Each wetland descriptor refers to the deepest or wettest area of the respective wetland, hence Deep Freshwater Marsh typically represents mosaics of different vegetation types reflecting the inundation regime. The main EVCs occurring within Deep Freshwater Marsh are mosaics with Aquatic Herbland, variously including Red Gum Wetland, Plains Sedgy Wetland, Sedge Wetland, Swamp Scrub, Floodplain Riparian Woodland and rarely small areas of Brackish Wetland.

EVC 682 Permanent Open Freshwater

Permanent waterbodies often mapped as Freshwater Lake or Brackish Lake. Centres of this category of wetland can support Aquatic Herbland or open water apparently lacking macrophytic vegetation. A submerged herbland of *Vallisneria americana* is sometimes present. Character of verges varies with ecological position around respective waterbody. North to western sides can include a beach or steep bank associated with a levee, while on south to eastern banks, patches of sheltered shallows with Aquatic Herbland and sedges or reed beds can be present. An additional fringing community, usually with *Eucalyptus camaldulensis*, typically occurs in the zone between the shoreline and adjacent dryland vegetation types. Brackish lakes (i.e. slightly saline) can support a different flora, including a herbland of aquatics dominated by Myriophyllum muelleri, M. verrucosum, Lepilaena spp. and Ruppia spp. In sites considered 'saline', macrophyte diversity is greatly reduced, often to only a single species of Lepilaena or Ruppia. The verges of brackish lakes also floristically differ from those of freshwater lakes, including species indicative of some salinity, notably herbs (e.g. *Pratia irrigua, Wilsonia rotundifolia, Cressa cretica, Schoenus nitens, Sporobolus spp.*), often with *Cyperus gymnocaulos* and *Eragrostis infecunda*.

EVC 683 Semi-permanent Saline Saline wetlands where inundation is prolonged, and soil mostly remains continually wet, at least in central portion. On lower rainfall volcanic plains and fertile Tertiary soils, these wetland types are typically fringed by saltmarsh vegetation dominated by either Puccinellia stricta var. perlaxa or Sarcocornia quinqueflora. Central wet areas usually support a herbland dominated by Lepilaena spp. (Aquatic Meadow). In a localised section of the Wimmera, Salt Paperbark Woodland and/or Inland Saltmarsh can occupy flats around saltmarsh fringed salt pans. This category has often been mapped as Saline Lake.

EVC 684 Permanent Saline Descriptor denotes saline waterbodies where inundation, at least in their central portion, is continual. Peripheral vegetation is typically similar to that of semi-permanent saline wetlands in same area. Permanent water areas support a species-poor herbland dominated by Ruppia spp. or Lepilaena spp. (Aquatic Meadow). Both semi-permanent saline and permanent saline wetlands have mostly been treated as the same EVC (Saline Lake) during mapping, except where it was reasonable to attempt to distinguish drier verges or more seasonal wetland communities such as Brackish Wetland, Inland Saltmarsh / Salt Paperbark Woodland or Lignum Swamp.

EVC 704 Lateritic Woodland

Low woodland with a diverse shrubby understorey and supporting a wide variety of grasses and herbs, making it particularly species-rich. Occurs on gently undulating to flat ground with well-drained lateritic soils. In many areas remnants occur in areas favoured for gravel extraction. Recorded from four bioregions within the study area (Dundas Tablelands, Goldfields, Grampians, Wimmera).

Dundas Tablelands Lateritic Woodland

Floristics: Dominated by Eucalyptus leucoxylon with occasional Eucalyptus goniocalyx and Eucalyptus melliodora in some areas. Shrubs are usually low-growing and the ground-layer is usually dominated by annual herbs and graminoids.

Structure: Woodland to open-forest 12-15 m tall. Trees are typically straight and well-formed except where laterite is exposed. Habitat: Shallow, lateritic soils associated with well-drained sites of poor fertility associated with aeolian sand deposits. A thin layer of sand (to a few cm) present in some areas. Nearest relative: Shallow Sands Woodland.

Goldfields Lateritic Woodland

Floristics: Dominated by Eucalyptus viminalis and E. willisii with an understorey dominated by Xanthorrhoea australis, Leptospermum myrsinoides and Brachyloma daphnoides. Species-rich ground-layer includes Gahnia radula, Hypolaena

fastigiata, Lepidobolus drapetocoleus, Lepidosperma spp., Schoenus apoqon. Structure: Woodland 5-8 m tall. Habitat: Lateritic soils on the plains. Nearest relative: Heathy Woodland.

Grampians Lateritic Woodland Floristics: Dominated by Eucalyptus leucoxylon and E. melliodora. Shrub layer dominated by Brachyloma daphnoides, Leptospermum myrsinoides, Acacia pycnantha. Ground-layer is species-rich and dominated by Lepidosperma carphoides, Schoenus breviculmis, Baumea acuta. Structure: Woodland 20–30 m tall. Habitat: Plains to gently undulating topography adjacent to alluvial flats. Nearest relative: Heathy Woodland.

Wimmera Lateritic Woodland

Floristics: Dominated by *Eucalyptus leucoxylon* $\pm E$. *melliodora* $\pm E$. *microcarpa*. Sparse shrub layer includes Acacia pycnantha, Leptospermum myrsinoides, Acacia genistifolia, Astroloma conostephioides. Ground-layer rich in grasses and herbs. Structure: Woodland 15-25 m tall. Habitat: I ow rises with lateritic soils

Nearest relative: Wimmera Low Rises Grassy Woodland.

EVC 705 Basalt Creekline Shrubby Woodland Shrub-dominated low woodland, with a range of grasses and herbs shared with Plains Grassy Wetland. On heavy soils along low-gradient boggy drainage lines on relatively high rainfall volcanic plains. Previously widespread in narrow bands within suitable habitat but now virtually totally cleared. Recorded from one bioregion within study area.

Basalt Creekline Shrubby Woodland Floristics: Dominated by Eucalyptus ovata, with Acacia melanoxylon and a range of shrub species noted in degraded road verge remnants, including Leptospermum continentale, Acacia verticillata, Coprosma quadrifida, Ozothamnus ferrugineus. Low gradient drainage lines appear to have included a range of sedges, grasses and herbs, with a number of species shared with Plains Grassy Wetland.

Structure: Woodland, probably 6-15 m tall.

Habitat: Low gradient boggy drainage lines, with heavy clay soils of high fertility.

Nearest relative: Uncertain - perhaps Creekline Herb-rich Woodland, Creekline Grassy Woodland or Plains Swampy Woodland.

EVC 706 Limestone Rise Woodland

Shrubby woodland or open-forest on fertile flats with reddish, loamy soils and limestone relatively close to the surface, occasionally outcropping. Appears to be naturally rare within Victoria but may be more common South Australia. All known remnants appear to be disturbed by past clearing and grazing. Recorded from one bioregion within study area.

Glenelg Plain Limestone Rise Woodland

Floristics: Dominated by Eucalyptus ovata with scattered E. baxteri and Acacia melanoxylon. Leucopogon lanceolatus forms a prominent shrub layer over tussocks of Lomandra longifolia. Ground cover rich in geophytes and grasses when intact.

Structure: Woodland or open-forest 15-20 m tall. Trees are typically relatively young regrowth with a DBH of 1.2 m. A burnt out stump within the single quadrat taken for this EVC was estimated to be 3.6 m DBH suggesting the structure of this community was similar to mature Plains Grassy Woodland.

Habitat: Only known from areas of Quaternary aeolian dune fields where the underlying limestone is either exposed or only covered by a thin layer of sand. Soils supporting this woodland are typically reddish sandy loams (terra rossa soils).

Nearest relative: Herb-rich Foothill Forest.

EVC 707 Sedgy Swamp Woodland Eucalypt dominated woodland with sedgy ground-layer and a range of herbs tolerant of seasonal waterlogging. Occurs on seasonally wet flats on Quaternary sandy soils over heavier subsoils. Formerly restricted and localised, now more rare. Recorded from one bioregion within study area (Glenelg Plain).

Sedgy Swamp Woodland

Floristics: Dominated by *Eucalyptus camaldulensis* $\pm E$. *ovata*. Ground-layer typically dominated by *Lepidosperma longitudinale* with a range of herbs characteristic of seasonally wet sites. Structure: Woodland 10-20 m.

Habitat: Poorly drained soils of relatively low fertility in low-lying areas. Nearest relatives: Plains Swampy Woodland, Sedge Wetland.

EVC 708 Hypersaline Inland Saltmarsh

Low shrubland dominated by succulents (samphires), variously with a restricted range of salt-tolerant grasses and herbs locally prevalent. Occurs on seasonally wet salinised heavy soils in depressions on terrain of low relief. Previously very localised and restricted habitat within the study area, remnants largely modified by grazing and weed invasion. Recorded from one bioregion within study area.

Wimmera Hypersaline Inland Saltmarsh

Floristics: Dominated by Halosarcia pergranula, with Distichlis distichophylla, Puccinellia stricta and Triglochin striata major associated species.

Structure: Low shrubland, mostly under 0.5 m tall, sometimes with patches of herbland, grassland or open salt pan.

Habitat: Heavy salinised grey-clay soils on depressions in low lying terrain of poorly defined drainage, typically fringing salt lakes or salt pans

Nearest relative: Inland Saltmarsh, Saline Lake Verge Herbland/Sedgeland.

EVC 709 Scree Slope Woodland/Grassland

Woodland dominated by an open to moderately dense cover of native cypress-pines with an open shrub layer over a grassy ground-layer with small sandstone boulders. Soils are generally shallow and the exposed rocky conditions result in relatively dry well-drained conditions. Recorded from the Mt Arapiles outlier of the Grampians bioregion.

Scree Slope Woodland/Grassland

Floristics: Dominated by *Callitris gracilis* and *C. glaucophylla*, with an open shrub cover of *Dodonaea viscosa* and wattles. The ground cover is dominated by Themeda triandra and is rich in grasses, annual herbs and geophytes.

Structure: Woodland to grassland.

Habitat: Scree slopes at the base of cliffs.

Nearest relative: Rocky Outcrop Shrubland.

Comments: While the present structure of much of this EVC is woodland, it is suspected the pre-1750 structure is more likely to have been grassland. It is possible that most of the area mapped as Scree Slope Woodland/Grassland was either a grassland or more open-woodland pre-1750. This EVC occurs adjacent to Plains Grassy Woodland which was presumably burnt on a regular basis (every 5-10 years or more) by Aborigines, and does appear to generate enough biomass to carry a fire. As the Callitris species are fire sensitive, and no large mature individuals were observed, it is suggested that their cover and abundance has increased since European settlement. As this location is surrounded by Plains Grassy Woodland, they were probably present in areas relatively sheltered from fire, or as larger individuals capable of reducing the ground fuel load in their immediate vicinity, and have increase in numbers as fire became less frequent.

EVC 710 Damp Heathland Heathland, or scrub (>2 m tall) if long unburnt, developed on sites of intermittent waterlogging, typically wet in winter and dry in summer. Floristically and hydrologically intermediate between Sand Heathland on well-drained substrates and Wet Heathland on poorly drained substrates, but equally nutrient poor. Recorded from two bioregions (Glenelg Plain, Warrnambool Plain).

Group 1 Damp Heathland

Floristics: Dominated by Leptospermum continentale \pm Melaleuca squarrosa \pm Allocasuarina paludosa \pm Melaleuca gibbosa. Other prominent species include Banksia marginata, Hypolaena fastigiata, Xanthorrhoea caespitosa, Leptocarpus tenax, Calytrix tetragona, Patersonia fragilis, Lepyrodia muelleri. Emergent Eucalyptus ovata may be present.

and dry in summer, and with low nutrient availability. An impeding subsoil layer is frequently present.

Nearest relative: Damp Heathy Woodland. Comments: Boundaries between Damp Heathland and Wet Heathland are transitional; these cannot be represented in the mapping and arbitrary divisions have been necessary in places.

Group 2Damp Heathland

Floristics: Poorly defined group of two quadrats with little similarity to other Damp Heathlands in this bioregion; separation is preliminary pending more quadrat data collection. One site is dominated by Allocasuarina paludosa, the other by Leptospermum continentale.

Structure: Closed-heathland.

Habitat: Sites with intermittent waterlogging, typically wet in winter and dry in summer, and with low nutrient availability. An impeding subsoil layer is frequently present. **Nearest relative:** Damp Heathy Woodland.

EVC 717 Saline Lake Mosaic

Central deeper areas generally support species-poor Aquatic Meadow of Lepilaena spp. or Ruppia spp. when vegetated. Verges support a range of usually more species-rich herbland, grassland, shrubland or woodland communities, varying with the biogeographic context of the water body. The floristic composition of verges is also influenced by factors such exposure (to wind and wave action), aspect and steepness (see comments under Semipermanent Saline and Permanent Saline). Only locally common but widespread over study area, in very restricted areas of suitable

habitat. Current examples mostly modified by altered hydrology, grazing and weed invasion of verges. Examples occur at Stockdales Lane c. 4 km ESE of Mortlake, private land c. 3 km N of Woorndoo.

EVC 718 Freshwater Lake Mosaic Central deeper area supports Aquatic Herbland or open water. The verges support a range of more species-rich herbland, sedgeland and rushland communities. These are fringed by a range of vegetation communities, varying with the biogeographic context of the water body. The floristic composition of the verge is also influenced by factors such exposure (to wind and wave action), aspect and steepness (see comments under Permanent Open Freshwater. Only locally common, but widespread over study area in restricted suitable habitat. Current examples mostly modified by altered hydrology, grazing and weed invasion of verges. Examples are found at Lake Bolac.

EVC 783 Grassy Dry Forest / Heathy Woodland Complex

Woodland with sparse dry open grassy-herbaceous understorey, with patchy heathy component including grass-trees and ericoid shrubs. Occurs on relatively infertile shallow sandy to clay-loamy soils. Confined to small geographic area, but not substantially reduced by clearing. Recorded from one bioregion within study area (Grampians).

Grampians Grassy Dry Forest / Heathy Woodland Complex

Floristics: Dominated by Eucalyptus obliqua, sometimes with E. melliodora. Ground-layer sparse, often dominated by Xanthorrhoea caespitosa with sparse grasses (principally Austrodanthonia spp.) and herbs, to heathy (notably with patchy Leptospermum myrsinoides, Astroloma spp.). Structure: Woodland 8–18 m tall.

Habitat: Shallow Quaternary aeolian deposits over Devonian granitics. Nearest relative: Grassy Dry Forest, Heathy Woodland, Damp Sands Herbrich Woodland.

EVC 789 Hills Herb-rich Woodland/Grassy Dry Forest Complex

bucalypt woodland with primarily grassy-herbaceous and grass-tree dominated ground-layer. Majority of understorey species with perennial rootstocks, and with a greater cover and diversity of perennial grasses than might otherwise be anticipated within Hills Herb-rich Woodland. Occurs on relatively infertile granitic soils on hill slopes of the Victoria Valley. Previously localised to a small geographic area, currently not substantially reduced by clearing and extending from private land into adjacent National Park. Recorded from one bioregion within study area (Grampians).

Grampians Hills Herb-rich Woodland / Grassy Dry Forest Complex

Floristics: Dominated by Eucalyptus obliqua, with Xanthorrhoea australis, Austrodanthonia spp. and a wide range of associated grasses, herbs and semi-shrubs.

Structure: Woodland 8-15 m tall. Habitat: Well-drained sites on relatively steep hillslopes and crests on Devonian granite.

Nearest relative: Hills Herb-rich Woodland, Grassy Dry Forest,

EVC 792 Stony Rises Woodland/Stony Knoll Shrubland Complex

Woodland or shrubland, sometimes extremely stony with bracken or sparse grasses and herbs. Occurs on mostly skeletal but very fertile loam soils, restricted to narrow tongues along valley-filling lava flows. Previously rare and localised, substantially further reduced, current remnants largely substantially modified. Recorded from one bioregion within study area (Victorian Volcanic Plain).

Stony rises Woodland/Stony Knoll Shrubland Complex Floristics: Variously dominated by Eucalyptus viminalis, Acacia

melanoxylon, Acacia mearnsii, Hymenanthera spp. and Bursaria spinosa, with bracken or grassy-herbaceous dominated ground-layer (main grass genera in remnants Themeda and Austrodanthonia), including minor unclassified vegetation types such as ephemeral ponds with Schoenus apogon and Oxalis sp., and fern communities in collapsed lava tunnels. Structure: Woodland 3–20 m tall, shrubland 1–3 m, or otherwise mostly less than 1 m in height.

Habitat: Extremely restricted geological type, forming a rocky plain mostly with free draining skeletal loams. Specialized habitats created by collapsed lava tunnels

Nearest relatives: Stony rises Woodland, Stony Knoll Shrubland.

EVC 793 Damp Heathy Woodland Woodland with heathy understorey which becomes scrub (>2 m tall) if long unburnt in high rainfall areas. Developed on sites of intermittent waterlogging, typically wet in winter due to impeding layer in soil and dry in summer. Slightly better drained and thus drier than Damp Heathland, but equally nutrient poor. Recorded from two bioregions within study area (Glenelg Plain, Warrnambool Plain).

Glenelg Plain Damp Heathy Woodland

Floristics: Dominated by *Eucalyptus* ovata $\pm E$. *baxteri* $\pm E$. *viminalis*, *Leptospermum* continentale and Banksia marginata form a dense shrub layer. Dry elements include Leptospermum myrsinoides, Hypolaena fastigiata, Isopogon ceratophyllus, Astroloma conostephioides, Austrodanthonia spp.; wet elements include Baumea juncea, Gahnia radula, Allocasuarina paludosa, Lepidosperma longitudinale. Structure: Woodland to open-woodland 10-15 m in height.

Habitat: Sites with intermittent waterlogging, typically wet in winter and dry in summer, and with low nutrient availability. An impeding subsoil layer is frequently present. Nearest relative: Damp Heathland.

Warrnambool Plain Damp Heathy Woodland

Floristics: Dominated by Eucalyptus ovata $\pm E$. viminalis $\pm E$. willisii, with Leptospermum continentale, Acacia verticillata and Lepidosperma longitudinale conspicuous understorey species, along with a wide range of grasses, herbs, small shrubs and toughleaved monocots (e.g. Patersonia fragilis, Lepyrodia muelleri, Lepidosperma filiforme).

Structure: Woodland 10-20 m tall, sometimes only sparsely treed in wetter sites. **Habitat:** Poorly drained sandy soils of moderate to low fertility, formerly in a fine scale mosaic with Damp Sands Herb-rich

Woodland, Damp Heathland and wetlands.

Nearest relative: Damp Heathland, Damp Sands Herb-rich Woodland.

EVC 801 Basalt Shrubby Woodland/Plains Swampy Woodland Complex

Eucalypt dominated woodland with sedge-dominated grassy ground-layer. Occurs on heavy fertile seasonally wet basaltic soils, at least sometimes with loamy topsoils. Associated with the edges of wet flats and upper reaches of poorly defined gullies on terain of very low relief. Previously localised to suitable habitat in higher rainfall volcanics but now almost entirely cleared. Low timber production value. Recorded from one bioregion within study area. Not mapped—below mapping threshold size.

Basalt Shrubby Woodland/Plains Swampy Woodland Complex Floristics: Dominated by *Eucalyptus ovata* with *Acacia*

melanoxylon. Understorey dominated by sedges and grasses,

major species including Lepidosperma elatius, Poa tenera,

P. labillardierei, Notodanthonia semiannularis, Pratia pedunculata sl

Structure: Woodland 10-20 m tall.

Habitat: Edges of wet flats and upper reaches of poorly defined gullies on terrain of very low relief.

Nearest relative: Basalt Shrubby Woodland, Plains Swampy Woodland, Riparian Sedgy Woodland.

EVC 803 Plains Woodland

Grassy or sedgy woodland with large inter-tussock spaces potentially supporting a range of annual or geophytic herbs adapted to low summer rainfall. Overall biomass is low in comparison to Plains Grassy Woodland. Occurs on fertile, sometimes seasonally waterlogged, mostly silty, loamy or clay topsoils, but occasionally sandy, with heavy subsoils. Mostly on fertile Quaternary soils on terrain of low relief. Previously widespread and extensive over a large proportion of the north of the study area but now reduced to narrow strips along roadsides and creeklines. Some higher quality areas still occur on private land. Recorded from one bioregion within study area (Wimmera).

Plains Woodland

Floristics: Dominated by Eucalyptus microcarpa and Allocasuarina luehmannii \pm Eucalyptus leucoxylon \pm E. camaldulensis \pm E. largiflorens, rich in C3 grasses and annual and geophytic herbs

when intact.

Structure: Open-woodland or woodland 12–20 m tall, trees are generally well-formed and straight-growing. **Habitat:** Brown clay soils derived from former Quaternary swamp

deposits in areas receiving <600 mm rainfall per annum. Nearest relative: Wimmera Low Rises Grassy Woodland.

EVC 858 Calcarenite Dune Woodland

Woodland or scrub on stable, near-coastal calcareous dunefields. Much of the area originally occupied by this EVC appears to have been destabilised by European land use resulting in the development of extensive, unvegetated shifting sand dunes and sheets and the eventual development of Coastal Dune Scrub on restabilised sands in many affected areas. Grant's description (in Gibbons and Downes 1964) of wooded hills rising gently from the shores of Discovery Bay and Bridgewater suggest that this EVC extended almost to the coast. Recorded from one bioregion within study area.

Calcarenite Dune Woodland

Floristics: Usually dominated by Allocasuarina verticillata and/or Melaleuca lanceolata. Leucopogon parviflorus, Acacia longifolia var. sophorae and Lepidosperma gladiatumare prominent in the understorey. Structure: Open to closed scrub 8–15 m in height, depending on

dominant species.

Habitat: Near-coastal, deep calcareous sand deposits, now stable but wind-blown in prehistoric times (aeolian deposits). Nearest relative: Coastal Dune Scrub.

Comments: Further research is required to distinguish floristic communities within this unit although suitable remnants to facilitate this may no longer exist. There are indications that a woodland or scrub community with Melaleuca lanceolata over Themeda triandra may have occurred on the inland parts of this EVC but no intact remnants were located.

EVC 876 Spray-zone Coastal Shrubland

Stunted open-shrubland on extremely exposed tops of coastal cliffs. Recorded from Glenelg Plain bioregion but may also occur in Warrnambool Plain bioregion

Glenelg Plain Spray-zone Coastal Shrubland Floristics: Dominated by Leucophyta brownii, composed of a small number of salt and wind tolerant species, with Samolus repens prominent. Structure: Open-shrubland 30–40 cm high, vegetation cover is low (5–

10%). Habitat: Extremely exposed, wind-swept, rocky (calcarenite) sites subject to salt spray and runoff at crest of sea cliff. Soils are skeletal or virtually nonexistent.

Comments: Distinctive community. Supports vulnerable Ixodia achillaeoides spp. arenicola at Cape Duquesne.

EVC 882 Shallow Sands Woodland Woodland or open-forest on shallow sands which overlay drainage-impeding clays. Typically it occurs between the plains proper (which support Plains Woodland) and Quaternary aeolian dunefields (dominated by Grassv Heathy Woodland) which overlay these plains. Also occurs on broader areas of plains covered by shallow fluvial or aeolian sands. A sparse shrub layer of heathy, ericoid shrubs is generally present and relatively intact versions support a species-rich ground cover dominated by grasses, annuals and geophytes. The ground cover is often visually dominated by Lepidosperma congestum Extensively cleared for agriculture and remnants have been subject to timber production and grazing. Recorded from five bioregions within study area (Dundas Tablelands, Goldfields, Grampians, Wimmera, Glenelg Plain).

Dundas Tablelands Shallow Sands Woodland

Floristics: Dominated by Eucalyptus melliodora \pm Acacia mearnsii, understorey dominated by low-growing shrubs and numerous grasses, graminoids and other herbs.

Structure: Woodland to open-forest 15-18 m tall. Trees are straightgrowing and well-formed.

Habitat: Relatively well-drained sites of moderate fertility associated with metamorphic schists, gneiss and calc-silicate rocks. Nearest relative: Plains Grassy Woodland.

Glenelg Plain Shallow Sands Woodland

Floristics: Dominated by Eucalyptus ovata and Eucalyptus leucoxylon, rich in low shrubs, sedges, grasses, geophytes and annuals. Structure: Woodland 10-15 m tall. Trees are typically straight-growing and

well-formed. Habitat: Moderately well-drained sites on sandy soils derived from Tertiary marl and limestone; lower lying areas on shallow soils within aeolian sand deposits.

Nearest relative: Damp Sands Herb-rich Woodland.

Goldfields Shallow Sands Woodland

Floristics: Dominated by *Eucalyptus leucoxylon* \pm *E. melliodora* \pm *E. camaldulensis.* Allocasuarina verticillata may form an open secondary tree layer. A sparse cover of Astroloma conostephioides is present over a rich suite of ground flora dominated by Lepidosperma congestumor L. laterale. Structure: Open-woodland to open-forest.

Habitat: Restricted to sand sheets associated with Grampians outwash. Nearest relative: Plains Grassy Woodland, Low Rises Grassy Woodland, Alluvial Terraces Herb-rich Woodland.

Grampians Shallow Sands Woodland

Floristics: Dominated by *Eucalyptus leucoxylon* \pm *Eucalyptus melliodora* \pm *Allocasuarina verticillata,* rich in geophytes, sedges and grasses.

Structure: Woodland 10-15 m tall. Trees are typically straight-growing and well-formed.

Habitat: Moderately well-drained sites (some sites remaining wet for longer periods) on sandy soils up to 30 cm deep, overlying heavier soils of underlying Tertiary or Quaternary geology.

Nearest relative: Plains Sedgy Woodland.

Wimmera Shallow Sands Woodland

Floristics: Dominated by Eucalyptus leucoxylon ± Allocasuarina luehmannii ± Eucalyptus melliodora, rich in geophytes, sedges, grasses and a number of low shrubs.

Structure: Woodland 10-15 m tall. Trees are typically straight-growing and

well-formed. Habitat: Moderately well-drained and fertile sites (some sites remaining wet for longer periods) on sandy soils up to 30 cm deep, overlying heavier soils of underlying Tertiary or Quaternary geology.

Nearest relative: Wimmera Low Rises Grassy Woodland.

EVC 885 Damp Sands Herb-rich Woodland/Plains Grassy Woodland Complex

Woodland with primarily grassy-herbaceous ground-layer, variously with bracken or hard-leaved monocots and small shrubs. Occurs on relatively fertile sedimentary soils, often with buckshot. Formerly locally extensive,

particularly west of Coleraine, but now almost entirely cleared. Recorded from three bioregions within study area (Glenelg, Dundas, Warrnambool). Inadequately known.

Damp Sands Herb-rich Woodland/Plains Grassy Woodland Complex

Floristics: Dominated by Eucalyptus camaldulensis ± E. viminalis ssp. cygnatensis ±

E. ovata ± Allocasuarina verticillata and a range of Acacia spp., predominantly grassy understorey, usually dominated by *Themeda* triandra and/or Austrostipa pubinodis on roadside remnants, sometimes with Gahnia radula and Xanthorrhoea minor or small ericoid shrubs locally common in small roadside remnants. A wide range of geophytes and perennial herbs is present in more diverse

remnants, with strong floristic affinities with the flora of Plains Grassy Woodland. Structure: Woodland to 12-20 m tall.

Habitat: Relatively fertile well-drained loamy to sandy or gravelly sedimentary soils, often with buckshot.

Nearest relative: Plains Grassy Woodland, Damp Sands Herb-rich Woodland, Grassy Woodland.

EVC 894 Scoria Cone Woodland

Typically woodland or open-shrubland, grassy to brackendominated, with a range of herbs conspicuous. Occurred on the slopes of freely-draining scoria cones, but confined to spatter areas of more course boulder-forming flow sources, where it is otherwise replaced by Stony Rises Woodland. Soils can be skeletal but are very fertile. Previously localised and restricted habitat, now almost entirely cleared. Recorded from one bioregion within study area (Victorian Volcanic Plain).

Scoria Cone Woodland

Floristics: Often uncertain due to previous modification. Probably dominated by various associations of Eucalyptus viminalis, Acacia melanoxylon, Allocasuarina verticillata, Bursaria spinosa, Poa labillardierei, Pteridium esculentum. The vegetation appears to have been at least moderately herb-rich.

Structure: Grassland, shrubland or woodland (presumed to 15 m, mostly considerably less), reflecting local site conditions. Trees and larger shrubs were probably frequently stunted by harsh conditions and high water stress.

Habitat: Free-draining stony soils of scoria cones, especially spatter zones or more consolidated finer particles on cone slopes. Nearest relative: Stony Rises Woodland, Cinder Cone Woodland.

EVC 895 Escarpment Shrubland

Shrubland or scrub ± stunted emergent trees on rocky escarpments in steep valleys or gorges. Sites have moderate to high fertility, are well-drained but subject to regular summer drought due to shallow soils. Lichen-covered rock outcrops are common. Associated with limestone or basalt. Naturally rare and restricted in distribution. Little remains due to clearing and grazing except in Lower Glenelg National Park. Occurs in three bioregions within study area (Dundas Tablelands, Glenelg Plain, Victorian Volcanic Plain). Occurrences on Dundas Tablelands were not sampled

Glenelg Plain Escarpment Shrubland

Floristics: Dominated by range of shrubs including Dodonaea viscosa, Leucopogon lanceolatus, Melaleuca lanceolata, Pomaderris halmaturina. The rare small shrub Logania ovata is characteristic of this community. Stunted emergent trees may be present, especially Allocasuarina verticillata. An unusual stunted form of Eucalyptus obliqua occurs near the South Australian border (quadrat D38027).

Structure: Shrubland or scrub to 4 m tall ± emergent trees to 5 m tall.

Habitat: Rocky limestone escarpments in valleys or gorges. Nearest relative: Limestone Pomaderris Shrubland (characterised by abundant Pomaderris halmaturina).

Comments: Variable unit in need of further survey to determine floristic composition and relationships. Tentatively separated from Limestone Pomaderris Shrubland.

Victorian Volcanic Plain Escarpment Shrubland

Floristics: Dominated by shrubs including Bursaria spinosa, Hymenanthera dentata, Notelaea ligustrina, Rubus parvifolius ± emergent Acacia melanoxylon. Understorey includes Dianella callicarpa, Bulbine bulbosa, Lomandra longifolia, Senecio glomeratus.

Structure: Shrubland/scrub to 3 m tall.

Habitat: Rocky basalt escarpments in valleys or gorges. Nearest relative: Stony Knoll Shrubland.

EVC 897 Plains Grassland/Plains Grassy Woodland Complex

Open woodland, shrubland or tussock grassland, dominated by perennial grasses with a wide range of inter-tussock herbs and geophytes. On mainly heavy fertile basalt-derived soils. Previously locally extensive within drier parts of the volcanic plain, but now virtually totally cleared and mostly confined to modified

roadside remnants. Recorded from one bioregion within study area.

Victorian Volcanic Plain Plains Grassland/Plains Grassy Woodland Complex

Floristics: Formerly variously with Acacia melanoxylon, A. implexa, A. mearnsii, Allocasuarina verticillata, Banksia marginata (tree form) and sparse E. camaldulensis and/or

E. ovata, ground-layer dominated by tussock grasses (Themeda,

Austrodanthonia, Austrostipa, Poa), with a diverse range of geophytes and dicot herbs in inter-tussock spaces.

Structure: Variously open-woodland 3-12 m high, shrubland 1-3 m high, or tussock grassland generally less than 0.8 metres high.

Habitat: Mostly on heavy loam to clay loam/clay soils on lower rainfall areas of basalt plain, sometimes seasonally waterlogged or retaining water in small shallow gilgai depressions.

Nearest relative: Plains Grassland, Plains Grassy Woodland, Stony Knoll Shrubland.

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APPENDIX D: List of vascular flora considered for inclusion in the review of threatened species and disturbance in the West Comprehensive Regional Assessment

AROTS - A	ustralian rare or threatened species							
VROTS - V	ictorian rare or threatened species							
National rati	ng system follows Briggs and Leigh (1995); Victori	ian rating system follows Gullan, Cheal and Walsh (19)	90). Family Nama	ADOTS	VPOTS	EGD	FEG	Boot1050
Spechum	Name	Common Name	ramity Name	ARUIS	VRUIS	ESP	FFG	POSTI950
Thursday		ed en Brineite Flage						
Inreatened	plants for the western CRA Region to be assess	ed as Priority Flora						
0039	Acacia glandulicarpa	Hairy-pod Wattle	Mimosaceae	V	v	V	L	Y
0678	Allocasuarina luehmannii	Buloke	Casuarinaceae		v		L	Y
0217	Amyema linophylla ssp. orientale	Buloke Mistletoe	Loranthaceae		v			Y
0240	Aphanes australiana	Australian Piert	Rosaceae	V		V		Y
0296	Astelia australiana	Tall Astelia	Asteliaceae	V	v	V	L	Y
0300	Asterolasia phebalioides	Downy Star-Bush	Rutaceae	V	v	V	L	Y
0334	Atriplex stipitata	Kidney Saltbush	Chenopodiaceae		v			Y
0390	Bertya findlayi	Mountain Bertya	Euphorbiaceae	R	v			Y
0454	Brachyscome debilis	Weak Daisy	Asteraceae		v			Y
0525	Caladenia calcicola	Limestone Spider-orchid	Orchidaceae	V	е	V	L	Y
4343	Caladenia carnea var. ornata	Ornate Pink Fingers	Orchidaceae		v			Y
4347	Caladenia concolor	Crimson Spider-orchid	Orchidaceae	V	е	V	L	Y
4486	Caladenia formosa	Elegant Spider-orchid	Orchidaceae	V	v	V	L	Y
4351	Caladenia fragrantissima ssp. fragrantissima	Scented Spider-orchid	Orchidaceae	R	е			Y
4498	Caladenia fulva	Tawny Spider-orchid	Orchidaceae	Е	е	Е	L	Y
4348	Caladenia hastata	Mellblom's Spider-orchid	Orchidaceae	Е	е	Е	L	Y
3694	Caladenia lindleyana	Wine-lipped Spider-orchid	Orchidaceae	К	v			Y
4494	Caladenia reticulata s.s.	Veined Spider-orchid	Orchidaceae		v			Y
0338	Caladenia tensa	Rigid Spider-orchid	Orchidaceae	Е	е	Е		Y
1022	Caladenia valida	Robust Spider-orchid	Orchidaceae	R	е			Y

Specnum	Name	Common Name	Family Name	AROTS	VROTS	ESP	FFG	Post1950
0522	Caladenia versicolor	Candy Spider-orchid	Orchidaceae	V	v	V		Y
4691	Caladenia xanthochila	Yellow-lip Spider-orchid	Orchidaceae	Е	е	Е	L	Y
4372	Caleana sp. aff. nigrita (Horsham)	Grampians Duck-orchid	Orchidaceae		е			Y
0576	Callitris glaucophylla	White Cypress-pine	Cupressaceae		v			Y
0591	Calorophus elongatus	Long Rope-rush	Restionaceae		v			Y
0798	Comesperma polygaloides	Small Milkwort	Polygalaceae		v		L	Y
4649	Craspedia paludicola	Swamp Billy-buttons	Asteraceae		v			Y
2773	Cullen parvum	Small Scurf-pea	Fabaceae	Е	е	Е	L	Y
2776	Cullen tenax	Tough Scurf-pea	Fabaceae		е		L	Y
0896	Cyathea cunninghamii	Slender Tree-fern	Cyatheaceae	R	v		L	Y
4423	Daviesia laevis	Grampians Bitter-pea	Fabaceae	V	v	V		Y
1010	Deyeuxia imbricata	Bent-grass	Poaceae		v			Y
5086	Dianella callicarpa	Swamp Flax-lily	Phormiaceae		v			Y
4419	Dianella longifolia var. grandis	Pale Flax-lily	Phormiaceae		v			а
1045	Digitaria divaricatissima	Umbrella Grass	Poaceae		v			Y
4500	Dipodium campanulatum	Bell-flower Hyacinth-orchid	Orchidaceae	К	е			Y
1072	Discaria pubescens	Hairy Anchor Plant	Rhamnaceae	R	v		L	Y
1061	Diuris behrii	Golden Cowslips	Orchidaceae		v			Y
1082	Diuris palustris	Swamp Diuris	Orchidaceae		v		Ν	Y
1084	Diuris punctata var. punctata	Purple Diuris	Orchidaceae		v		L	Y
1090	Dodonaea procumbens	Trailing Hop-bush	Sapindaceae	V	v	V		Y
2237	Eremophila deserti	Turkey-bush	Myoporaceae		v			Y
4557	Eucalyptus aff. cypellocarpa (Anglesea)	Otway Grey Gum	Myrtaceae		v			Y
1244	Eucalyptus aggregata	Black Gum	Myrtaceae		е		L	Y
1271	Eucalyptus diversifolia ssp. megacarpa	Coast Gum	Myrtaceae		v			Y
1275	Eucalyptus fasciculosa	Pink Gum	Myrtaceae		v			Y
4484	Eucalyptus leucoxylon ssp. connata	Yellow Gum	Myrtaceae		v			Y
4455	Eucalyptus leucoxylon ssp. megalocarpa	Yellow Gum	Myrtaceae		е			Y
4270	Eucalyptus phenax	Green-leaf Mallee	Myrtaceae		v			Y
4468	Euphrasia collina ssp. muelleri	Purple Eyebright	Scrophulariaceae		е			Y

Specnum	Name	Common Name	Family Name	AROTS	VROTS	ESP	FFG	Post1950
4434	Gaultheria hispida	Snow-berry	Ericaceae		е			Y
5263	Genoplesium sp. aff. nudiscapum	Gellibrand Midge-orchid	Orchidaceae		е			Ν
1456	Glycine latrobeana	Clover Glycine	Fabaceae	V	V	V	L	Y
3742	Grammitis magellanica ssp. nothofageti	Beech Finger-fern	Grammitidaceae		v			Y
3743	Grevillea bedggoodiana	Enfield Grevillea	Proteaceae	R	v			Y
1535	Grevillea floripendula	Drooping Grevillea	Proteaceae	R	v		Ν	Y
3744	Grevillea infecunda	Anglesea Grevillea	Proteaceae	V	v	V		Y
4534	Grevillea montis-cole ssp. brevistyla	Langi Ghiran Grevillea	Proteaceae	R	v			Y
1553	Grevillea williamsonii	Mt. William Grevillea	Proteaceae	Е	е	Е		Y
1173	Haegiela tatei	Small Nut-heads	Asteraceae	К	v			Y
1582	Haloragis exalata ssp. exalata var. exalata	Square Raspwort	Haloragaceae		v			Y
4655	Helichrysum aff. rutidolepis (Lowland Swamps)	Pale Swamp Everlasting	Asteraceae		v			Y
1679	Hibbertia sessiliflora	Heathy Guinea-flower	Dilleniaceae		v			Y
2084	Huperzia varia	Long Clubmoss	Lycopodiaceae		v			Y
1773	Isolepis congrua	Slender Club-sedge	Cyperaceae		v		Ν	Y
1941	Leptorhynchos elongatus	Lanky Buttons	Asteraceae		е			Y
1942	Leptorhynchos gatesii	Wrinkled Buttons	Asteraceae	V	v	V	Ν	Y
1949	Leptorhynchos waitzia	Button Immortelle	Asteraceae		v			Y
2096	Maireana aphylla	Leafless Bluebush	Chenopodiaceae		v			Y
2317	Olearia pannosa ssp. cardiophylla	Velvet Daisy-bush	Asteraceae	R	v		L	Y
3903	Olearia suffruticosa	Clustered Daisy-bush	Asteraceae		v			Y
2578	Pneumatopteris pennigera	Lime Fern	Thelypteridaceae		v			Y
3944	Pomaderris halmaturina ssp. continentis	Glenelg Pomaderris	Rhamnaceae	R	v			Y
2706	Prasophyllum diversiflorum	Gorae Leek-orchid	Orchidaceae	Е	е	Е	L	Y
4565	Prasophyllum fitzgeraldii	Fitzgerald's Leek-orchid	Orchidaceae		е		Ν	Y
2709	Prasophyllum frenchii	Maroon Leek-orchid	Orchidaceae	V	е	V	Ν	Y
2702	Prasophyllum lindleyanum	Green Leek-orchid	Orchidaceae		v		Х	Y
4566	Prasophyllum occidentale	Western Leek-orchid	Orchidaceae		v			Y
2724	Prasophyllum subbisectum	Pomonal Leek-orchid	Orchidaceae	Е	е	Е	L	Y
3916	Pterostylis cheraphila	Floodplain Rustyhood	Orchidaceae	R	v		L	Y

Specnum	Name	Common Name	Family Name	AROTS	VROTS	ESP	FFG	Post1950
2825	Ptilotus erubescens	Hairy Tails	Amaranthaceae				L	Y
2849	Pultenaea graveolens	Scented Bush-pea	Fabaceae		v		L	Y
2882	Pultenaea williamsoniana	Williamson's Bush-pea	Fabaceae	R	v			Y
2915	Ranunculus undosus	Swamp Buttercup	Ranunculaceae		v			Y
2982	Rutidosis leptorhynchoides	Button Wrinklewort	Asteraceae	Е	е	Е	L	Y
3004	Santalum acuminatum	Sweet Quandong	Santalaceae		v			Y
3116	Senecio macrocarpus	Large-fruit Fireweed	Asteraceae	V	е	V	L	Y
4659	Senecio psilocarpus	Swamp Fireweed	Asteraceae		v			Y
3228	Sporobolus creber	Western Rat-tail Grass	Poaceae		v			Y
3315	Swainsona brachycarpa	Slender Swainson-pea	Fabaceae		v		L	Y
3328	Swainsona swainsonioides	Downy Swainson-pea	Fabaceae		е			Y
3335	Taraxacum cygnorum	Coast Dandelion	Asteraceae	V	е	V	Ν	Y
3341	Templetonia stenophylla	Leafy Templetonia	Fabaceae		v			Y
3369	Thelymitra benthamiana	Blotched Sun-orchid	Orchidaceae		v			Y
3383	Thelymitra circumsepta	Naked Sun-orchid	Orchidaceae		v			Y
3367	Thelymitra epipactoides	Metallic Sun-orchid	Orchidaceae	Е	е	Е	L	Y
5006	Thelymitra ixioides var. subdifformis	Green Sun-orchid	Orchidaceae		е			Y
3376	Thelymitra mackibbinii	Brilliant Sun-orchid	Orchidaceae	V	е	V		0
3378	Thelymitra matthewsii	Spiral Sun-orchid	Orchidaceae	V	v	V	L	Y
4005	Thelymitra merraniae	Merran's Sun-orchid	Orchidaceae		е		L	Y
4009	Thelymitra sp. aff. pauciflora (Anglesea)	Anglesea Sun-orchid	Orchidaceae		v			Y
3403	Tmesipteris elongata ssp. elongata	Slender Fork-fern	Psilotaceae		v			Y
Plants at low	vrisk in the Western CRA Region omitted from t	he list of Priority Flora						
0026	Acacia deanei	Deane's Wattle	Mimosaceae		r			Y
0034	Acacia farinosa	Mealy Wattle	Mimosaceae		k			Y
0064	Acacia nano-dealbata	Dwarf Silver Wattle	Mimosaceae		r			Y

Mimosaceae

Mimosaceae

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Coast Wirilda

Rock Wattle

4210

0082

Acacia retinodes var. uncifolia

Acacia rupicola

Specnum	Name	Common Name	Family Name	AROTS	VROTS	ESP	FFG	Post1950
0119	Acrotriche cordata	Coast Ground-berry	Epacridaceae		r			Y
4220	Agrostis avenacea var. perennis	Wetland Blown-grass	Poaceae		k			Y
0159	Agrostis rudis	Ruddy Bent	Poaceae		r			Y
0679	Allocasuarina grampiana	Grampians She-oak	Casuarinaceae		r			Y
3640	Allocasuarina mackliniana	Western She-oak	Casuarinaceae		k			Y
4203	Allocasuarina mackliniana ssp. hirtilinea	Western She-oak	Casuarinaceae		r			Y
4204	Allocasuarina mackliniana ssp. xerophila	Western She-oak	Casuarinaceae		k			Y
5096	Alternanthera sp. 1 (Plains)	Plains Joyweed	Amaranthaceae		k			а
3623	Amphibromus fluitans	River Swamp Wallaby-grass	Poaceae	V	k	V	Ν	Y
4248	Arthropodium sp. 3 (aff. strictum)	Small Chocolate-lily	Anthericaceae		k			Y
3627	Asperula charophyton	Elongate Woodruff	Rubiaceae	R	r			Y
0282	Asperula minima	Mossy Woodruff	Rubiaceae		r			Y
0293	Asplenium terrestre ssp. terrestre	Ground Spleenwort	Aspleniaceae		r			Y
3621	Atriplex australasica	Native Orache	Chenopodiaceae		k			Y
0326	Atriplex paludosa ssp. paludosa	Marsh Saltbush	Chenopodiaceae		k			Y
4257	Australina pusilla ssp. pusilla	Small Shade-nettle	Urticaceae		r			Y
4407	Austrodanthonia carphoides var. angustior	Short Wallaby-grass	Poaceae		k			Y
0966	Austrodanthonia induta	Shiny Wallaby-grass	Poaceae		k			Y
0970	Austrodanthonia monticola	Small-flower Wallaby-grass	Poaceae		r			Y
4179	Austrodanthonia setacea var. breviseta	Short-bristle Wallaby-grass	Poaceae		r			Y
0976	Austrodanthonia sp. (syn. Danthonia procera)	Tall Wallaby-grass	Poaceae		k			Y
3268	Austrostipa breviglumis	Cane Spear-grass	Poaceae	R	r			Y
3984	Austrostipa exilis	Heath Spear-grass	Poaceae		r			Y
3277	Austrostipa gibbosa	Spurred Spear-grass	Poaceae		r			Y
3985	Austrostipa hemipogon	Half-bearded Spear-grass	Poaceae		r			Y
3281	Austrostipa mundula	Neat Spear-grass	Poaceae		r			Y
3988	Austrostipa puberula	Fine-hairy Spear-grass	Poaceae		r			Y
3292	Austrostipa setacea	Corkscrew Spear-grass	Poaceae		r			Y
0345	Avicennia marina ssp. australasica	White Mangrove	Verbenaceae		r			Y
4258	Baeckea ramosissima ssp. prostrata	Rosy Baeckea	Myrtaceae		r			Y

Specnum	Name	Common Name	Family Name	AROTS	VROTS	ESP	FFG	Post1950
0365	Banksia saxicola	Rock Banksia	Proteaceae		r			Y
0372	Bauera sessiliflora	Grampians Bauera	Cunoniaceae		r			Y
0378	Baumea laxa	Lax Twig-sedge	Cyperaceae		r			Y
3165	Berula ? erecta	Water Parsnip	Apiaceae		k			Y
0399	Billardiera bignoniacea	Orange Bell-climber	Pittosporaceae		r			Y
0425	Boronia latipinna	Grampians Boronia	Rutaceae	R	r			Y
0435	Bossiaea cordigera	Wiry Bossiaea	Fabaceae		r			Y
0441	Bossiaea riparia	River Leafless Bossiaea	Fabaceae		r			Y
0442	Bossiaea rosmarinifolia	Grampians Bossiaea	Fabaceae		r			Y
0484	Brachyloma depressum	Spreading Brachyloma	Epacridaceae		r			Y
0474	Brachyscome readeri	Reader's Daisy	Asteraceae		r			Y
0513	Burnettia cuneata	Lizard Orchid	Orchidaceae	R	r			Y
0743	Caladenia australis	Southern Spider-orchid	Orchidaceae		k			Y
1019	Caladenia dilatata s.s.	Green-comb Spider-orchid	Orchidaceae		k			Y
0541	Caladenia flavovirens	Summer Spider-orchid	Orchidaceae		r			Y
4349	Caladenia magnifica	Magnificent Spider-orchid	Orchidaceae	К	k		L	Y
4476	Caladenia parva	Small Spider-orchid	Orchidaceae		k			Y
4448	Caladenia prolata	Fertile Caladenia	Orchidaceae		k			Y
0533	Caladenia venusta	Large White Spider-orchid	Orchidaceae	R	r		Х	Y
4449	Caladenia vulgaris	Common Caladenia	Orchidaceae		k			Y
0572	Callitriche palustris	Swamp Water-starwort	Callitrichaceae		k			Y
0505	Calochilus gracillimus	Slender Beard-orchid	Orchidaceae		k			Y
0617	Cardamine tenuifolia	Slender Bitter-cress	Brassicaceae		k			Y
0643	Carex iynx	Sedge	Cyperaceae		k			Y
0828	Correa aemula	Hairy Correa	Rutaceae		r			Y
4369	Correa backhouseana	Coast Correa	Rutaceae		r			Y
4390	Correa reflexa var. nummulariifolia	Bass Strait Correa	Rutaceae		r			Y
0840	Corybas fordhamii	Swamp Helmet-orchid	Orchidaceae		r			Y
4643	Craspedia canens	Grey Billy-buttons	Asteraceae		k			Y
0894	Cuscuta tasmanica	Golden Dodder	Cuscutaceae		k			Y

Specnum	Name	Common Name	Family Name	AROTS	VROTS	ESP	FFG	Post1950
0941	Cyphanthera anthocercidea	Large-leaf Ray-flower	Solanaceae	R	r			Y
0998	Daviesia pectinata	Thorny Bitter-pea	Fabaceae	R	r			Y
4425	Desmodium varians	Slender Tick-trefoil	Fabaceae		k			Y
1054	Dillwynia oreodoxa	Grampians Parrot-pea	Fabaceae		r			Y
0324	Dipodium pardalinum	Spotted Hyacinth-orchid	Orchidaceae		r			Y
1223	Eriostemon difformis ssp. difformis	Small-leaf Wax-flower	Rutaceae		r			Y
3704	Eucalyptus alaticaulis	Grampians Grey Gum	Myrtaceae		r			Y
1256	Eucalyptus brookeriana	Brooker's Gum	Myrtaceae		r			Y
1279	Eucalyptus froggattii	Kamarooka Mallee	Myrtaceae	R	r		L	Y
4491	Eucalyptus globulus ssp. globulus	Southern Blue Gum	Myrtaceae		r			Y
1290	Eucalyptus kitsoniana	Bog Gum	Myrtaceae	R	r			Y
4749	Eucalyptus serraensis	Grampians Stringybark	Myrtaceae		r			Y
4750	Eucalyptus verrucata	Mt Abrupt Stringybark	Myrtaceae		r			Y
4751	Eucalyptus victoriana	Victoria Range Stringybark	Myrtaceae		r			Y
4462	Eucalyptus viminalis ssp. cygnetensis	Rough-barked Manna-gum	Myrtaceae		r			Y
3721	Eucalyptus viridis ssp. wimmerensis	Wimmera Mallee-box	Myrtaceae		r			Y
1326	Eucalyptus yarraensis	Yarra Gum	Myrtaceae	R	k		Х	Y
1354	Exocarpos syrticola	Coast Ballart	Santalaceae		r			Y
1393	Gahnia microstachya	Slender Saw-sedge	Cyperaceae		r			Y
1406	Galium compactum	Compact Bedstraw	Rubiaceae		r			0
4502	Gastrodia vescula	Small Potato Orchid	Orchidaceae	К	k			Y
2040	Genoplesium ciliatum	Fringed Midge-orchid	Orchidaceae		k			Y
2705	Genoplesium despectans	Sharp Midge-orchid	Orchidaceae	К				Y
2727	Genoplesium pumilum	Green Midge-orchid	Orchidaceae		r		Х	Y
5344	Geranium sp. 3	Pale-flower Cranesbill	Geraniaceae		r			Y
1485	Gonocarpus mezianus	Hairy Raspwort	Haloragaceae		r			Y
1518	Goodia medicaginea	Western Golden-tip	Fabaceae		r			Y
3753	Gratiola pumilo	Dwarf Brooklime	Scrophulariaceae	К	k			Y
1530	Grevillea chrysophaea	Golden Grevillea	Proteaceae		r			Y
1531	Grevillea confertifolia	Grampians Grevillea	Proteaceae	R	r			Y

Specnum	Name	Common Name	Family Name	AROTS	VROTS	ESP	FFG	Post1950
1532	Grevillea dimorpha	Flame Grevillea	Proteaceae		r			Y
1533	Grevillea dryophylla	Goldfields Grevillea	Proteaceae		r			Y
1542	Grevillea microstegia	Mt Cassell Grevillea	Proteaceae	R	r			Y
1544	Grevillea montis-cole	Mount Cole Grevillea	Proteaceae	R	r			Y
4535	Grevillea montis-cole ssp. montis-cole	Mount Cole Grevillea	Proteaceae	R	r			Y
3745	Grevillea obtecta	Fryerstown Grevillea	Proteaceae	R	r			Y
1549	Grevillea repens	Creeping Grevillea	Proteaceae	R	r			Y
1551	Grevillea steiglitziana	Brisbane Range Grevillea	Proteaceae	R	r			Y
1664	Hibbertia cistiflora ssp. rostrata	Rock Rose Guinea-flower	Dilleniaceae		r			Y
1670	Hibbertia humifusa	Rising Star Guinea-flower	Dilleniaceae	R	r			Y
3767	Hovea corrickiae	Glossy Hovea	Fabaceae	R	r			Y
4583	Hypoxis vaginata var. brevistigmata	Yellow Star	Hypoxidaceae		k			Y
4575	lsoetes drummondii ssp. anomala	Plain Quillwort	Isoetaceae		k			Y
1771	Isolepis australiensis	Inland Club-sedge	Cyperaceae		k			Y
1788	Isolepis victoriensis	Victorian Club-sedge	Cyperaceae		k			Y
1789	Isolepis wakefieldiana	Tufted Club-sedge	Cyperaceae		r			Y
1945	Ixiolaena sp. (syn. Leptorhynchos panaetioides)	Woolly Buttons	Asteraceae		r			Y
4435	Juncus bassianus	Bass Rush	Juncaceae		k			а
1839	Juncus revolutus	Creeping Rush	Juncaceae		r			Y
1875	Lasiopetalum schulzenii	Drooping Velvet-bush	Sterculiaceae		r			Y
1878	Lastreopsis hispida	Bristly Shield-fern	Dryopteridaceae		r			Y
1894	Lemna trisulca	Ivy-leaf Duckweed	Lemnaceae		k			Y
1908	Lepidium pseudohyssopifolium	Native Pepper-cress	Brassicaceae		k			Y
1915	Lepidosperma canescens	Hoary Rapier-sedge	Cyperaceae		r			Y
4699	Lepidosperma gunnii	Slender Sword-sedge	Cyperaceae		k			Y
1963	Leptospermum turbinatum	Shiny Tea-tree	Myrtaceae		r			Y
3847	Leucopogon microphyllus	Hairy Beard-heath	Epacridaceae		r			Y
1988	Leucopogon microphyllus var. pilibundus	Hairy Beard-heath	Epacridaceae		r			Y
1986	Leucopogon neurophyllus	Mount William Beard-heath	Epacridaceae	R	r			Y
1994	Leucopogon thymifolius	Thyme Beard-heath	Epacridaceae		r			Y
Specnum	Name	Common Name	Family Name	AROTS	VROTS	ESP	FFG	Post1950
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4392	Leucopogon virgatus var. brevifolius	Common Beard-heath	Epacridaceae		r			Y
2006	Limonium australe	Yellow Sea-lavender	Plumbaginaceae		r			Y
2733	Lobelia beaugleholei	Showy Lobelia	Campanulaceae	R	r			Y
2032	Logania ovata	Oval-leaf Logania	Loganiaceae		r			Y
2057	Lotus australis	Austral Trefoil	Fabaceae		k			Y
2083	Lycopodiella serpentina	Bog Clubmoss	Lycopodiaceae		r			Y
2129	Marsilea mutica	Smooth Nardoo	Marsileaceae		k			Y
3855	Monotoca billawinica	Grampians Broom-heath	Epacridaceae	R	r			Y
3859	Monotoca glauca	Currant-wood	Epacridaceae		r			Y
2230	Muehlenbeckia horrida	Spiny Lignum	Polygonaceae		k			а
3899	Olearia stellulata	Starry Daisy-bush	Asteraceae		k			Y
2385	Oxalis magellanica	Snowdrop Wood-sorrel	Oxalidaceae		r			Y
2391	Oxalis thompsoniae	Fluffy-fruit Wood-sorrel	Oxalidaceae		k			Y
1623	Ozothamnus rogersianus	Nunniong Everlasting	Asteraceae		r			а
2403	Panicum decompositum	Australian Millet	Poaceae		k			Y
2447	Pelargonium littorale	Coast Stork's-bill	Geraniaceae		k			Y
4827	Picris squarrosa	Squat Picris	Asteraceae		r			Y
4533	Pimelea curviflora var. nov. aff. subglabrata	Curved Rice-flower	Thymelaeaceae		k			Y
2522	Pimelea hewardiana	Forked Rice-flower	Thymelaeaceae		r			Y
4822	Pimelea linifolia ssp. linoides	Slender Rice-flower	Thymelaeaceae		r			Y
2567	Platylobium alternifolium	Victorian Flat-pea	Fabaceae	R	r			Y
2570	Platylobium triangulare	Ivy Flat-pea	Fabaceae		k			Y
2592	Poa fax	Scaly Poa	Poaceae		r			Y
2593	Poa fordeana	Forde Poa	Poaceae		k			Y
4868	Poa labillardierei (Volcanic Plains form)	Blue Prickly Tussock-grass	Poaceae		k			Y
4869	Poa sp. aff. tenera (Red-sheath)	Red-sheath Tussock-grass	Poaceae		r			Y
2753	Prasophyllum constrictum s.s.	Tawny Leek-orchid	Orchidaceae		k			Y
4871	Prasophyllum pyriforme s.s.	Silurian Leek-orchid	Orchidaceae		k			Y
2739	Prostanthera decussata	Dense Mint-bush	Lamiaceae		r			Y
2754	Prostanthera spinosa	Spiny Mint-bush	Lamiaceae		r			Y

Specnum	Name	Common Name	Family Name	AROTS	VROTS	ESP	FFG	Post1950
2760	Pseudanthus divaricatissimus	Tangled Pseudanthus	Euphorbiaceae	R	r			Y
2766	Psilotum nudum	Skeleton Fork-fern	Psilotaceae		r		Х	Y
3948	Pterostylis aciculiformis	Slender Ruddyhood	Orchidaceae		k			Y
3940	Pterostylis bicolor	Black-tip Greenhood	Orchidaceae		k			Y
4876	Pterostylis furcata s.s.	Small Sickle Greenhood	Orchidaceae		k			Y
3917	Pterostylis planulata s.s.	Grampians Rustyhood	Orchidaceae		r			Y
3915	Pterostylis smaragdyna	Emerald-lip Greenhood	Orchidaceae	R	r			Y
2784	Pterostylis sp. aff. aphylla	Marsh Greenhood	Orchidaceae		k			Ν
3914	Pterostylis sp. aff. longifolia (Stawell)	Western Emerald-lip Greenhood	Orchidaceae		k			Y
2838	Pultenaea benthamii	Bentham's Bush-pea	Fabaceae		r			Y
2839	Pultenaea canaliculata	Coast Bush-pea	Fabaceae		r			Y
2841	Pultenaea costata	Ribbed Bush-pea	Fabaceae	R	r			Y
2843	Pultenaea daltonii	Hoary Bush-pea	Fabaceae		r			Y
4624	Pultenaea gunnii ssp. tuberculata	Golden Bush-pea	Fabaceae	К	r			Y
4856	Pultenaea juniperina s.s.	Pungent Bush-pea	Fabaceae		r			Y
2858	Pultenaea luehmannii	Thready Bush-pea	Fabaceae	R	r			Y
4860	Pultenaea muelleri var. reflexifolia	Mueller's Bush-pea	Fabaceae		k			Y
2863	Pultenaea patellifolia	Mt. Byron Bush-pea	Fabaceae	R	r			Y
2868	Pultenaea prolifera	Otway Bush-pea	Fabaceae		r			Y
2873	Pultenaea subalpina	Rosy Bush-pea	Fabaceae	R	r			Y
4563	Pultenaea victoriensis	Victoria Range Bush-pea	Fabaceae	R	r			Y
2881	Pultenaea weindorferi	Swamp Bush-pea	Fabaceae	R	r		Х	Y
2885	Quinetia urvillei	Quinetia	Asteraceae		r			Y
4911	Ranunculus sessiliflorus var. pilulifer	Annual Buttercup	Ranunculaceae		k			Y
2929	Rhagodia parabolica	Fragrant Saltbush	Chenopodiaceae		r			Y
4948	Sarcocornia quinqueflora ssp. tasmanica	Beaded Glasswort	Chenopodiaceae		k		Ν	Y
3043	Schoenus carsei	Wiry Bog-sedge	Cyperaceae		r			Y
3069	Schoenus laevigatus	Short-leaf Bog-sedge	Cyperaceae		k			Y
3050	Schoenus nanus	Tiny Bog-sedge	Cyperaceae		k			Y
3053	Schoenus sculptus	Gimlet Bog-sedge	Cyperaceae		r			Y

Specnum	Name	Common Name	Family Name	AROTS	VROTS	ESP	FFG	Post1950
3057	Schoenus turbinatus	Top Bog-sedge	Cyperaceae		r			Y
3061	Scleranthus diander	Tufted Knawel	Caryophyllaceae		r			Y
4974	Sclerolaena muricata var. muricata	Black Roly-poly	Chenopodiaceae		k			Y
3104	Senecio cunninghamii var. cunninghamii	Branching Groundsel	Asteraceae		k			Y
3241	Stackhousia aspericocca	Rough-nut Stackhousia	Stackhousiaceae		k			Y
3246	Stackhousia spathulata	Coast Stackhousia	Stackhousiaceae		k			Y
3307	Stylidium soboliferum	Grampians Trigger-plant	Stylidiaceae		r			Y
4944	Swainsona behriana	Southern Swainson-pea	Fabaceae		r			Y
3354	Tetratheca stenocarpa	Long Pink-bells	Tremandraceae	R	r			Y
4007	Thelionema umbellatum	Clustered Lily	Phormiaceae		r			Y
3375	Thelymitra luteocilium	Fringed Sun-orchid	Orchidaceae		r			Y
3392	Thomasia petalocalyx	Paper Flower	Sterculiaceae		r			Y
3395	Thryptomene calycina	Grampians Thryptomene	Myrtaceae		r			Y
3446	Triglochin minutissimum	Tiny Arrow-grass	Juncaginaceae		r			Y
3455	Tripogon Ioliiformis	Rye Beetle-grass	Poaceae		r			Y
3464	Trymalium daltonii	Narrow-leaf Trymalium	Rhamnaceae		r			Y
3465	Trymalium X ramosissimum	Branched Trymalium	Rhamnaceae	R				Y
3482	Utricularia violacea	Violet Bladderwort	Lentibulariaceae		r			Y
5059	Viola sieberiana s.s.	Tiny Violet	Violaceae		k			Y
3583	Wurmbea uniflora	One-flower Early Nancy	Colchicaceae		r			Y
0550	X Calassodia tutelata	Bluebeard Waxlip Hybrid Orchid	Orchidaceae		r			Y
5088	Xanthorrhoea caespitosa	Yucca	Xanthorrhoeaceae		r			Y
3606	Zieria sp. (Grampians)	Grampians Zieria	Rutaceae		r			Y
3607	Zieria veronicea	Pink Zieria	Rutaceae		r			Y
Plants believ	Head to be extinct in Victoria omitted from the list of P	riority Flora						
0202	Asplenium nolvodon	l ong-tail Soleenwort	Aspleniaceae		¥			v
3665	Caladenia brachyscana	Short Spider-orchid	Orchidaceae	x	~ v	x		ı V
2/122	Dhohalium brachyscapa		Dutacoao	∧ D	×	^		r V
2482	Pheballum brachyphyllum	Spreading Pheballum	Rulaceae	к	х			Y

Specnum	Name	Common Name	Family Name	AROTS	VROTS	ESP	FFG	Post1950
Non-forest r	are or threatened plants in the Western CRA R lora	egion omitted from the list						
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4755	Adriana quadripartita	Coast Bitter-bush	Euphorbiaceae		v		L	٨
0137	Adriana quadripartita (pubescent form)	Coast Bitter-bush	Euphorbiaceae		v		L	Y
0138	Adriana quadripartita s.s. (glabrous form)	Rare Bitter-bush	Euphorbiaceae		е		L	Y
0148	Agrostis adamsonii	Adamson's Blown-grass	Poaceae	Е	v	Е	L	Y
4206	Agrostis aemula var. setifolia	Gilgai Blown-grass	Poaceae		v			Y
4222	Agrostis billardierei var. filifolia	Gilgai Blown-grass	Poaceae		v		L	Y
4223	Agrostis billardierei var. robusta	Plains Blown-grass	Poaceae		v			Y
0202	Ammannia multiflora	Jerry-jerry	Lythraceae		v			Y
3624	Amphibromus pithogastrus	Plump Swamp Wallaby-grass	Poaceae	К	е		L	Y
3625	Amphibromus sinuatus	Wavy Swamp Wallaby-grass	Poaceae		v			Y
3626	Asplenium aethiopicum	Shredded Spleenwort	Aspleniaceae		v			Y
1361	Austrofestuca littoralis	Coast Fescue	Poaceae		v			Y
0431	Borya mirabilis	Grampians Pincushion-lily	Anthericaceae	V	е	V	L	Y
0445	Botrychium australe	Austral Moonwort	Ophioglossaceae		v			Y
3763	Bracteantha sp. aff. subundulata	Swamp Everlasting	Asteraceae		v		L	Y
3727	Caladenia fragrantissima	Scented Spider-orchid	Orchidaceae		е			۸
0568	Callitriche brachycarpa	Short Water-starwort	Callitrichaceae	R	V			а
0569	Callitriche cyclocarpa	Western Water-starwort	Callitrichaceae	V	v	V		Y
0650	Carex tasmanica	Curly Sedge	Cyperaceae	V	v	V	L	Y
4358	Cassinia rugata	Wrinkled Cassinia	Asteraceae	V	v	V	L	Y
0682	Casuarina obesa	Swamp She-oak	Casuarinaceae		е		L	Y
0836	Corybas despectans	Coast Helmet-orchid	Orchidaceae		v			Y
4651	Craspedia sp. aff. variabilis (Derrinallum)	Derrinallum Billy-buttons	Asteraceae		v			Y
0935	Cyperus subulatus	Pointed Flat-sedge	Cyperaceae		v			Y
1473	Diuris sp. aff. lanceolata (Laverton)	Small Golden Moths	Orchidaceae		е		Ν	Y
1143	Eleocharis pallens	Pale Spike-sedge	Cyperaceae		v			Y
1180	Epilobium pallidiflorum	Showy Willow-herb	Onagraceae		v			Y

Specnum	Name	Common Name	Family Name	AROTS	VROTS	ESP	FFG	Post1950
1217	Eriocaulon australasicum	Southern Pipewort	Eriocaulaceae	V	е	V	L	Y
1595	Halosarcia syncarpa	Fused Glasswort	Chenopodiaceae		v			Y
5087	Hibbertia humifusa ssp. debilis	Dergholm Guinea-flower	Dilleniaceae		v			Y
4696	Lavatera plebeia var. tomentosa	Coast Hollyhock	Malvaceae		v			Y
1897	Lepidium aschersonii	Spiny Pepper-cress	Brassicaceae	V	е	V	L	Y
1903	Lepidium hyssopifolium	Basalt Pepper-cress	Brassicaceae	Е	е	Е	L	Y
3846	Lepilaena patentifolia	Spreading Water-mat	Zannichelliaceae		v			Y
2149	Melaleuca halmaturorum ssp. halmaturorum	Salt Paperbark	Myrtaceae		v		L	Y
2180	Microlepidium pilosulum	Hairy Shepherd's Purse	Brassicaceae	K	v			Y
2186	Microtis orbicularis	Dark Mignonette-orchid	Orchidaceae		v			Y
3894	Pimelea spinescens	Spiny Rice-flower	Thymelaeaceae		е		Ν	Y
4823	Pimelea spinescens ssp. spinescens	Spiny Rice-flower	Thymelaeaceae		е			Y
3891	Poa sallacustris	Salt-lake Tussock-grass	Poaceae	V	v	V		Y
4658	Podolepis sp. aff. jaceoides (Basalt Plain)	Basalt Podolepis	Asteraceae		е			Y
3889	Prasophyllum litorale	Coastal Leek-orchid	Orchidaceae		v			Ν
4506	Prasophyllum spicatum	Dense Leek-orchid	Orchidaceae	K	v			Y
4567	Prasophyllum suaveolens	Fragrant Leek-orchid	Orchidaceae	K	е			Y
4156	Pterostylis basaltica	Basalt Greenhood	Orchidaceae	Е	е	Е	L	Y
2819	Pterostylis tenuissima	Swamp Greenhood	Orchidaceae	V	v	V		Y
3034	Schoenoplectus dissachanthus	Blunt Club-sedge	Cyperaceae		е			Y
3223	Spiranthes sinensis	Austral Ladies' Tresses	Orchidaceae		v			Y
3233	Spyridium cinereum	Tiny Spyridium	Rhamnaceae	R	v			Y
3363	Thelymitra azurea	Azure Sun-orchid	Orchidaceae		v			Y
3380	Thelymitra mucida	Plum Orchid	Orchidaceae		v			Y
4019	Thelymitra sp. aff. nuda (Derrinallum)	Basalt Sun-orchid	Orchidaceae		е			Y
Rare plants	previously known from or incorrectly recorded fo	or the Western CRA Region omitted from						
Turmer analy	515							
0013	Acacia ausfeldii	Ausfeld's Wattle	Mimosaceae	R	v		Ν	Ν
4269	Acacia dodonaeifolia	Sticky Hop Wattle	Mimosaceae	R				Ν

Specnum	Name	Common Name	Family Name	AROTS	VROTS	ESP	FFG	Post1950
0043	Acacia havilandiorum	Needle Wattle	Mimosaceae		е		L	Ν
0044	Acacia howittii	Sticky Wattle	Mimosaceae	R	r			Y
5140	Acacia leprosa (Dandenong Range variant)	Dandenong Range CinnamonWattle	Mimosaceae		r			Ν
5141	Acacia leprosa (large phyllode variant)	Large-leaf Cinnamon Wattle	Mimosaceae		r			Ν
5142	Acacia leprosa (Seymour variant)	Seymour Cinnamon Wattle	Mimosaceae		v			Ν
0050	Acacia lineata	Streaked Wattle	Mimosaceae		r			Ν
5136	Acacia verniciflua (Bacchus Marsh variant)	Bacchus Marsh Varnish Wattle	Mimosaceae		v			Ν
5137	Acacia verniciflua (Casterton variant)	Casterton Varnish Wattle	Mimosaceae		v			Ν
5139	Acacia verniciflua (southern variant)	Southern Varnish Wattle	Mimosaceae		k			Ν
0103	Acacia williamsonii	Williamson's Wattle	Mimosaceae	R	r		Ν	Y
4202	Allocasuarina mackliniana ssp. mackliniana	Western She-oak	Casuarinaceae		k			Ν
0207	Amphibolis antarctica	Sea Nymph	Cymodoceaceae		k			Ν
1615	Argentipallium dealbatum	Silver Everlasting	Asteraceae		r			Ν
0280	Asperula gemella	Twin-leaf Bedstraw	Rubiaceae		r			Ν
0291	Asplenium obtusatum	Shore Spleenwort	Aspleniaceae	Е	v	Е		Ν
0294	Asplenium trichomanes	Common Spleenwort	Aspleniaceae		r			Ν
3360	Atriplex billardierei	Glistening Saltbush	Chenopodiaceae		v			Ν
4418	Austrodanthonia bipartita s.s.	Leafy Wallaby-grass	Poaceae		k			Ν
4403	Austrodanthonia pilosa var. paleacea	Large Velvet Wallaby-grass	Poaceae		r			Ν
0978	Austrodanthonia richardsonii	Straw Wallaby-grass	Poaceae		v			Ν
0359	Ballantinia antipoda	Ballantinia	Brassicaceae	Е	е	Е	Ν	Ν
4290	Billardiera scandens var. brachyantha	Velvet Apple-berry	Pittosporaceae		r			Ν
0411	Blechnum sp. (King Island)	King Island Water-fern	Blechnaceae		r			Ν
4669	Bolboschoenus fluviatilis	Tall Club-sedge	Cyperaceae		k			Ν
0432	Bossiaea bracteosa	Mountain Leafless Bossiaea	Fabaceae		r			Ν
3654	Brachyscome chrysoglossa	Yellow-tongue Daisy	Asteraceae		v			Ν
0453	Brachyscome curvicarpa	Curved-fruit Daisy	Asteraceae		е			Y
0480	Brachyscome trachycarpa	Inland Daisy	Asteraceae		v			Ν
4340	Caesia parviflora var. minor	Pale Grass-lily	Phormiaceae		k			Ν
3725	Caladenia alata	Fairy Caladenia	Orchidaceae		k			Y

Specnum	Name	Common Name	Family Name	AROTS	VROTS	ESP	FFG	Post1950
3664	Caladenia audasii	McIvor Spider-orchid	Orchidaceae	E	е	E	L	Ν
3666	Caladenia carnea var. subulata	Striped Pink Fingers	Orchidaceae		е			Ν
0538	Caladenia leptochila	Narrow-lip Spider-orchid	Orchidaceae		k			Ν
0544	Caladenia pumila	Dwarf Spider-orchid	Orchidaceae	Х	х	Х		Ν
3669	Caladenia rosella	Rosella Spider-orchid	Orchidaceae	Е	е	Е	L	Ν
0209	Caladenia sp. (Dadswells Bridge)	Dadswells Bridge Spider-orchid	Orchidaceae		k			Ν
0549	Caladenia toxochila	Bow-lip Spider-orchid	Orchidaceae		v			Ν
0573	Callitriche sonderi	Matted Water-starwort	Callitrichaceae		k			Ν
0575	Callitriche umbonata	Winged Water-starwort	Callitrichaceae		v			Ν
3670	Calochilus imberbis	Naked Beard-orchid	Orchidaceae		r			Ν
5033	Cardamine gunnii s.s.	Tuberous Bitter-cress	Brassicaceae		х			Ν
5028	Cardamine lineariloba	Western Bitter-cress	Brassicaceae		k			Ν
5035	Cardamine paucijuga s.s.	Annual Bitter-cress	Brassicaceae		k			Ν
4673	Carex gunniana var. brevior	Mountain Sedge	Cyperaceae		r			Ν
0723	Ceratophyllum demersum	Common Hornwort	Ceratophyllaceae		k			Ν
4383	Chenopodium desertorum ssp. virosum	Frosted Goosefoot	Chenopodiaceae		k			Ν
4364	Correa alba var. pannosa	Velvet White Correa	Rutaceae		r			Ν
1295	Corymbia maculata	Spotted Gum	Myrtaceae		v			Y
0915	Cyperus concinnus	Trim Flat-sedge	Cyperaceae		v			Ν
0920	Cyperus flaccidus	Flaccid Flat-sedge	Cyperaceae		v			Ν
4402	Dampiera dysantha	Shrubby Dampiera	Goodeniaceae		r			Ν
0983	Darwinia micropetala	Small Darwinia	Myrtaceae		v			Ν
0990	Davallia pyxidata	Australian Hare's-foot	Davalliaceae		v			Ν
0995	Daviesia genistifolia	Broom Bitter-pea	Fabaceae		r			Ν
1468	Diuris brevissima	Short-tail Leopard-orchid	Orchidaceae		k			Ν
4414	Diuris fragrantissima	White Diuris	Orchidaceae	Е	е	Е	L	Ν
1083	Diuris lanceolata	Golden Moths	Orchidaceae	Е		Е		Y
3685	Dodonaea heteromorpha	Angular Hop-bush	Sapindaceae		х			Ν
4674	Eleocharis macbarronii	Grey Spike-sedge	Cyperaceae		k			Ν
1583	Elymus multiflorus	Short-awned Wheat-grass	Poaceae		k			Y

Specnum	Name	Common Name	Family Name	AROTS	VROTS	ESP	FFG	Post1950
3790	Entolasia stricta	Upright Panic	Poaceae		k			Ν
1190	Eragrostis lacunaria	Purple Love-grass	Poaceae		v			Ν
1226	Eriostemon scaber	Rough Wax-flower	Rutaceae		х			Ν
5174	Eucalyptus aromaphloia ssp. 1	Wimmera Scentbark	Myrtaceae		r			Ν
5178	Eucalyptus ovata var. grandiflora	West-coast Swamp-gum	Myrtaceae		r			Ν
5177	Eucalyptus splendens	Apple Jack	Myrtaceae		е			Ν
4470	Euphrasia collina ssp. speciosa	Purple Eyebright	Scrophulariaceae		х			Ν
4472	Euphrasia collina ssp. trichocalycina	Purple Eyebright	Scrophulariaceae	R	r			Ν
1343	Euphrasia scabra	Rough Eyebright	Scrophulariaceae	K	е		L	Ν
1372	Frankenia crispa	Hoary Sea-heath	Frankeniaceae		r			0
1386	Gahnia ancistrophylla	Donkey Saw-sedge	Cyperaceae		v			Ν
1388	Gahnia deusta	Heathy Saw-sedge	Cyperaceae		v			Ν
2700	Genoplesium nudum	Tiny Midge-orchid	Orchidaceae		r			Ν
4690	Genoplesium sp. aff. morrisii (Pyrete Ranges)	Red-beard Midge-orchid	Orchidaceae		v			Ν
1493	Goodenia benthamiana	Clasping Goodenia	Goodeniaceae		r			Ν
4600	Goodia lotifolia var. pubescens	Silky Golden-tip	Fabaceae		r			Ν
4925	Grevillea sp. 1	Gariwerd Grevillea	Proteaceae		k			Ν
1572	Hakea tephrosperma	Hooked Needlewood	Proteaceae		v			Ν
1578	Halophila australis	Oval Sea-wrack	Hydrocharitaceae		k			Ν
1585	Haloragis myriocarpa	Prickly Raspwort	Haloragaceae		v			Ν
3761	Halosarcia flabelliformis	Bead Glasswort	Chenopodiaceae	V	е	V	L	Ν
1634	Heliotropium asperrimum	Rough Heliotrope	Boraginaceae		v			Ν
5082	Hibbertia humifusa ssp. humifusa	Rising Star Guinea-flower	Dilleniaceae	R	r			Ν
4592	Hibbertia sericea var. scabrifolia	Silky Guinea-flower	Dilleniaceae		r			Ν
1709	Huperzia australiana	Fir Clubmoss	Lycopodiaceae		r			Ν
1757	Hypsela tridens	Hypsela	Campanulaceae		k			Ν
4538	Isoetes pusilla	Small Quillwort	Isoetaceae		k			Ν
1804	Juncus antarcticus	Cushion Rush	Juncaceae		v			Y
1836	Juncus psammophilus	Sand Rush	Juncaceae		r			Ν
1900	Lepidium desvauxii	Bushy Pepper-cress	Brassicaceae		r			Ν

Specnum	Name	Common Name	Family Name	AROTS	VROTS	ESP	FFG	Post1950
1902	Lepidium foliosum	Leafy Pepper-cress	Brassicaceae		V			Ν
3845	Lepilaena marina	Sea Water-mat	Zannichelliaceae		v			Ν
1944	Leptorhynchos scabrus	Annual Buttons	Asteraceae		е		L	Ν
1977	Leucopogon costatus	Twiggy Beard-heath	Epacridaceae		r			Ν
2059	Lotus cruentus	Red Bird's-foot Trefoil	Fabaceae		v			Ν
2111	Maireana rohrlachii	Rohrlach's Bluebush	Chenopodiaceae	R	v			Ν
2145	Melaleuca armillaris ssp. armillaris	Giant Honey-myrtle	Myrtaceae		r			Y
2201	Minuria integerrima	Smooth Minuria	Asteraceae		r			Y
2240	Myoporum montanum	Waterbush	Myoporaceae		r			Ν
2257	Myriophyllum porcatum	Ridged Water-milfoil	Haloragaceae	V	v	V		Y
7603	Nyctalis mirabilis	Beech Nyctalis	Tricholomataceae		r			Y
2371	Orthrosanthus multiflorus	Morning Flag	Iridaceae		r			Ν
1632	Ozothamnus tuckeri	Tucker's Everlasting	Asteraceae		х			Ν
4107	Parietaria australis	Western Pellitory	Urticaceae		r			Ν
2494	Philydrum lanuginosum	Woolly Waterlily	Philydraceae		v			Ν
2499	Phyllanthus australis	Southern Spurge	Euphorbiaceae		r			Ν
2518	Pimelea flava ssp. dichotoma	Diosma Rice-flower	Thymelaeaceae		r			Ν
2532	Pimelea pagophila	Grampians Rice-flower	Thymelaeaceae	R	v			Ν
2586	Poa halmaturina	Dwarf Coast Tussock-grass	Poaceae	R	v			Ν
4826	Poa poiformis var. ramifer	Trailing Coast Poa	Poaceae		r			Ν
2664	Pomaderris obcordata	Pimelea Pomaderris	Rhamnaceae		v			Ν
2665	Pomaderris oraria ssp. oraria	Coast Pomaderris	Rhamnaceae	R	r			Y
3943	Pomaderris paniculosa ssp. paniculosa	Inland Pomaderris	Rhamnaceae		v			Ν
2682	Poranthera corymbosa	Clustered Poranthera	Euphorbiaceae		r			Ν
2687	Potamogeton australiensis	Thin Pondweed	Potamogetonaceae		k			Ν
2692	Potamogeton perfoliatus	Perfoliate Pondweed	Potamogetonaceae		k			Ν
2726	Prasophyllum affine	Heathland Leek-orchid	Orchidaceae	V	k	V		Y
4850	Prasophyllum correctum	Gaping Leek-orchid	Orchidaceae	Е	е	Е	L	Y
2718	Prasophyllum pallidum	Pale Leek-orchid	Orchidaceae	V	е	V	Х	Y
2719	Prasophyllum parviflorum	Slender Leek-orchid	Orchidaceae		v		Х	Ν

Specnum	Name	Common Name	Family Name	AROTS	VROTS	ESP	FFG	Post1950
2721	Prasophyllum patens	Broad-lip Leek-orchid	Orchidaceae		r			Y
4507	Prasophyllum sylvestre	Forest Leek-orchid	Orchidaceae		V			Ν
2751	Prostanthera sp. (Cultivation Ck)	Mint-bush	Lamiaceae		r			Ν
2778	Pteris comans	Netted brake	Adiantaceae		r			Ν
4728	Pterostylis chlorogramma	Green-striped Greenhood	Orchidaceae	V	v	V		Y
2790	Pterostylis cucullata	Leafy Greenhood	Orchidaceae	V	v	V	L	Ν
3957	Pterostylis despectans	Lowly Greenhood	Orchidaceae	Е	е	Е	L	Ν
3958	Pterostylis maxima	Large Rustyhood	Orchidaceae		v			Ν
4872	Pterostylis planulata s.l.	Flat Rustyhood	Orchidaceae		k			Ν
2803	Pterostylis sp. aff. excelsa	Sunset Rustyhood	Orchidaceae		k			Ν
4853	Pterostylis tasmanica	Southern Bearded Greenhood	Orchidaceae		k			Y
2821	Pterostylis truncata	Brittle Greenhood	Orchidaceae		е		L	Ν
3931	Pultenaea maidenii	Maidens Bush-pea	Fabaceae	Х	х	Х		Ν
4314	Ranunculus diminutus	Lesser River Buttercup	Ranunculaceae		k			Ν
3962	Rumex stenoglottis	Tongue Dock	Polygonaceae		k			Ν
2980	Ruppia tuberosa	Tuberous Tassel	Potamogetonaceae		k			Ν
2986	Sagina maritima	Sea Pearlwort	Caryophyllaceae		k			Y
3101	Senecio behrianus	Stiff Groundsel	Asteraceae	Е	е	Е	L	Ν
3112	Senecio hypoleucus	Pale Groundsel	Asteraceae		v			Ν
3982	Senecio murrayanus	Murray Groundsel	Asteraceae		х			Ν
3220	Sphaerolobium acanthos	Grampians Globe-pea	Fabaceae	R	r			Ν
3227	Sporobolus caroli	Yakka Grass	Poaceae		r			Ν
3321	Swainsona murrayana	Slender Darling-pea	Fabaceae	V	е	V	L	Ν
3374	Thelymitra malvina	Mauve-tuft Sun-orchid	Orchidaceae		v			Ν
3389	Thesium australe	Austral Toad-flax	Santalaceae	V	е	V	L	Ν
3390	Thismia rodwayi	Fairy Lanterns	Burmanniaceae	R	v		L	Ν
4997	Thysanotus tuberosus ssp. parviflorus	Common Fringe-lily	Anthericaceae		k			Ν
1476	Trichanthodium baracchianum	Dwarf Yellow-heads	Asteraceae	V	v	V	L	Ν
3540	Vittadinia megacephala	Giant New Holland Daisy	Asteraceae		v			Ν
3577	Wolffia angusta	Narrow Duckweed	Lemnaceae		k			Ν

Specnum	Name	Common Name	Family Name	AROTS	VROTS	ESP	FFG	Post1950
3602	Zieria aspalathoides	Whorled Zieria	Rutaceae		v		Ν	N

APPENDIX E: Summary information of Listed (FFG Act or ESP Act) threatened plant taxa in the West RFA Region

Notes on interpretation:

- The following species summaries include information about the number of records within the West region and Victoria for each taxon. This information is automatically derived from NRE databases, and may include historical records of populations which are now extinct or repeated records from the same populations. They do not therefore represent an accurate measure of the number of extant populations.
- 2. The tables which indicate the relative importance of potential threats to each taxon include ratings as follows: 1 equates to relatively low importance and 3 equates to relatively high importance.
- 3. The per cent of West region population in the Reservation Status table represents an estimate of the proportion of the total number of plants occurring in each tenure category in the Region.

Hairy-pod Wattle Family: Mimosaceae

Acacia glandulicarpa

Species Characteristics: Dense, spreading, somewhat viscid shrub, 1-2m high; branchlets minutely pubescent. Phyllodes erect, on short stem projections, asymmetrically ovate to ovate-elliptic, 0.5-1.3 cm long, 3-8 mm wide, glabrous; veins 2, midrib the more prominent. Peduncles 1 or 2 per axil, 4-10 mm long, slender, glabrous, basal bract persistent; heads prolific, globular, 8-20 flowered, bright golden. Pods narrowly oblong, to 3 cm long, c. 5 mm wide, thinly coriaceous, densely pilose with straight, gland-tipped hairs; seeds oblong-elliptic, c. 3 mm long (Entwisle *et al.*, 1996)

Conservation Status:

ROTAP: Vulnerable VROTS: vulnerable FFG: listed ESP: listed

RESERVATION STAT	US		RARITY
% of CRA population	% Australian		
in biological	in other public land	on private land	population within RFA
conservation reserve			Region
0	80	20	0-25

Distribution in Western RFA Region: Restricted to an area of the Little Desert and Wimmera in Western Victoria, the largest populations being in the Gerung Gerung and Kiata districts. The majority of plants are on uncommitted public land, roadsides or rail reserves. A few small stands occur on private land. Some small populations occur in the Little Desert National Park. One population is known from South Australia (Venn, 1996, nom.; Stuwe, 1982; SAC, 1989, nom.; SAC, 1991, final rec.).

Habitat: The species is found in the transition zone between gravelly soils and sandy rises. It occurs in open woodland or mallee scrub, usually with an open shrub understorey, and herbs may be present. A variety of dominant tree species may occupy the sites, including Yellow Mallee (*Eucalyptus costata/incrassata*), Dumosa Mallee (*E. dumosa*), Green Mallee (*E. viridis*), Yellow Gum (*E. leucoxylon*), Grey Box (*E. microcarpa*) and Buloke (*Allocasuarina luehmannii*). Topsoils are relatively fertile ranging from sandy clay to sandy-clay loam (Venn, 1996; Stuwe, 1982).

Life History: Flowering time is July to October (Entwisle *et al*, 1996). Sexual reproduction, with establishment from seed, occurs only occasionally. Asexual reproduction is unknown. It tolerates occasional major disturbance. Following fire, the species is an obligate seed

regenerator; nearly all plants are killed and regeneration is solely from seed stored in the soil prefire. Fire promotes germination and establishment (VRFAF).

Threatening Processes operating in Western RFA Region:

- Land clearing on private land is still occurring (SAC, 1991, final rec.).
- Sheep grazing is a major threat, leading to soil compaction, weed invasion, removal of shoots and buds, and inhibition of regeneration (SAC, 1991, final rec.).
- Inappropriate management on uncommitted public land, roadsides and rail reserves (SAC, 1991, final rec.).
- Roadside and rail reserve stands are threatened by maintenance works, and installation and maintenance of utilities (Venn, 1996).
- Fire protection works, involving burning or ploughing can have detrimental effects on the species (Venn, 1996).
- Browsing by rabbits has an adverse impact (Venn, 1996).
- Sites adjacent to cropping land can be severely affected by aerial application of herbicides (Venn, 1996).

Rating	of	Threats:

Disturbance	Rating	Source
Clearing of native vegetation	2	SAC final rec
Fragmentation of native veg.	2	SAC final rec
Unplanned fire	1	Venn 1996
Introduced animals	1	Venn 1996
Grazing/ trampling	2	SAC final rec
Weed control	1	Venn 1996
Road/ rail construction/	2	Venn 1996
maintenance		

Current Management:

Venn (1992) Action Statement:

- Past management actions: Reserves created at Gerang Gerung and Winiam East, expansion of The John Smith Reserve in 1995; roadside sites protected from road works and optic fibre cable-laying works; increased contact with shires and other authorities through the need for planning permits, resulting in a greater awareness for protection of remnant vegetation.
- Intended management actions: Identify major sites on all categories of land and implement long-term management strategies for representative sites; complete Horsham Field Naturalists survey and prepare detailed site maps and status reports; monitor all targeted sites annually and remaining sites at least biennially; monitor major sites on protected public land; document threats to any sites and prepare and implement measures to alleviate identified threats; seek cooperation of landholders on private land to search for, document, and protect such stands; enter all sites on NRE's Register of Significant Sites and supply information to all relevant land managers; provide relevant government authorities with documented maps of roadside and railway populations; incorporate planned control activities into work schedules where weed invasion is a threat; recommend planting of this species at suitable sites; propagate from identified seed sources for local planting.

Allocasuarina luehmannii Family: Casuarinaceae

Buloke

Species Characteristics: Dioecious tree, 5-15 m tall, bark furrowed. Branchlets ascending, to 40 cm long; internodes 8-22 mm long, 1-2 mm diameter, often waxy, finely pubescent; ribs flat to slightly rounded, minutely roughened. Teeth 10-14, erect, tightly appressed, 0.5-1 mm long. Male spikes 1-5 mm long in whorls of 5-8 per cm. Cones shortly cylindric, broader than long, pubescent when young, sessile or on peduncle to 5 mm long; cone body 5-12 mm long, 8-14 mm diameter; bracts inconspicuous; valves in 2 or 3 wheel-like rows. Seeds winged, red-brown, 4-5 mm long (Entwisle, 1996).

Conservation Status: ROTAP: VROTS: vulnerable FFG: listed ESP:

RESERVATION STATUS			RARITY
% of CRA population	% of CRA population	% of CRA population	% Australian
in biological	in other public land	on private land	population within RFA
conservation reserve			Region
30	20	50	0-25

Distribution in Western RFA Region: It has scattered occurrences on private and public land and roadsides, and is reserved in Grampians National Park, Dergholm State Park, Lerderderg State Park and Organ Pipes National Park (NRE, 1996f; Parks Victoria, 1998c,f,g). Found throughout northern Victoria from the far north-west across the northern plains to Wodonga and in the west from the Little Desert and Upper Glenelg River to the Goldfields with a disjunct occurrence in the Keilor volcanic plain west of Melbourne (Willis, 1972).

Habitat: Usually growing in a woodland with Grey Box (*Eucalyptus microcarpa*) on non-calcareous soils Entwisle (1996) on the alluvial plains and the fringes of low hills.

Life History: Plants are long-lived perennials. Male and female parts are held on separate plants and flowers are unisexual. Flowering time is between September and November (Entwisle, 1996). Sexual reproduction, and subsequent establishment from seeds. Asexual reproduction and establishment occurs occasionally. The species is an obligate seed regenerator after fire; nearly all plants are killed by fire and regeneration is solely from seed. However, there is no notable seed or canopy seed store and plants often re-establish only via invasion from unburnt sites. It requires long periods without major disturbance for survival and establishment (VRFAF).

Threatening Processes operating in Western RFA Region:

- Considerable areas of original habitat have been destroyed or highly modified, and current habitat is fragmented (VRFAF).
- The species occurs on fairly fertile soils that are favoured by agriculture and only on the margins of uncleared land. It is threatened by continuing land clearance (SAC, 1991, final rec.).
- The reproductive capacity of *A. luehmannii* has seriously declined because of grazing of seedlings and young plants by stock and rabbits (SAC, 1991, final rec.).

Rating of Threats:

	Disturbance Rating	Source
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Clearing of native vegetation	2	SAC, 1991, final rec.
Fragmentation of native veg.	2	VRFAF
Introduced animals	2	SAC, 1991, final rec
Grazing/trampling	2	SAC, 1991, final rec

Current Management:

Grampians National Park Draft Management Plan (Parks Vic.1998f):

- ensure that significant plants and communities are adequately protected from recreational activities, planned and unplanned fire, invasion by pest plants, over-grazing by pest animals, and inappropriate management activities, through implementation of the Environmental Action Plan, and the Grampians-Black Range Park Fire Management Plan; undertake distribution mapping and monitoring of endangered and significant endemic species; encourage surveys of and research into significant flora (including rare or threatened species) and plant communities in the Park, and consider that information in all management actions. Dergholm State Park and Mt Arapiles-Tooan State Park (Tooan Block) Management Plan (Parks Vic.1998c):
- Dergholm State Park actively manage vegetation communities to retain habitat and community diversity by giving priority to the control of pest plants and adopting appropriate fire regimes; protect sites of botanical significance, and encourage ongoing monitoring of these areas.

Lerderderg State Park and Werribee Gorge State Park Draft Management Plan (Parks Vic.1998g):

 Lerderderg State Park - manage and protect known occurrences of significant plant species; facilitate flora and fauna surveys, targeting significant species and record species distributions; encourage research into the status, distribution and management requirements of native flora and vegetation communities; encourage research into the fire ecology of the Park's vegetation communities and produce an ecologically-based fire management plan.

Organ Pipes National Park Draft Management Plan (NRE 1996d):

 finalise a comprehensive list of flora species indigenous to the Park to form the basis for revegetation planting; protect significant flora species in accordance with approved FFG action statements; encourage investigation of ecological burning to facilitate regeneration of woodland communities and grasslands and control of pest plants; develop pest animal control programs.

Midlands Forest Management Area Forest Management Plan (NRE 1996b):

• ensure that 30% of Gum/Box Woodland/ Open Forest is included in the Special Protection Zone and conservation reserves; control rabbit populations to reduce grazing pressure.

Australian Piert Family: Rosaceae

Aphanes australiana

Species Characteristics: Herb to 10 cm high; stems villous with spreading hairs. Leaves fanshaped, 6-9-lobed, 4-12 mm long, 3-7 mm wide, with long spreading hairs; stipules bowl-shaped, 7-9 lobed, 4-8 mm wide. Flowers in clusters of 5-7. Sepals 4 or 5, occasionally 6, lanceolate, one-third to half as long as the hypanthium, spreading at maturity, with a few spreading hairs along margin, lobes 0.5-0.75 mm long; hypanthium bell-shaped, glabrous to bristly hairy with white spreading hairs and a hairless band just below base of sepal lobes, 1-2 mm long. Fruiting hypanthium reddish-brown (Jeanes *et al.*, 1996).

Conservation Status:

ROTAP: Vulnerable VROTS: FFG: ESP: listed

RESERVATION STATUS			RARITY
% of CRA population	% of CRA population	% of CRA population	% Australian
in biological in other public land on private land		population within RFA	
conservation reserve			Region
30	30	40	0-25

Distribution in Western RFA Region: Lorne-Angahook State Park and Otway State Forest (FIS). Widespread in Victoria. Also found in South Australia, Tasmania and New South Wales (Jeanes *et al*, 1996).

Habitat: It occurs in drier open eucalypt forest (Jeanes et al, 1996).

Life History: Flowering time is August to November (Jeanes et al, 1996).

Threatening Processes operating in Western RFA Region:

• Any soil disturbance caused by humans could be a threat

Rating of Threats:

Disturbance	Rating	Source

Current Management:

Tall Astelia Family: Asteliaceae

Astelia australiana

Species Characteristics: Colony-forming, tufted rhizomatous dioecious perennial herb, to c.1.8m high. Roots fibrous; rhizome stout. Leaves numerous in a basal rosette, linear, 60-230 cm long, silvery indumentum on lower surface. Inflorescence a terminal racemose panicle, to 1.2m high, many-flowered; axis stout; each raceme subtended by a leaf-like bract. Flowers unisexual or bisexual, 12-18 mm wide, green to deep maroon, silky-hairy externally. Berry ovoid to globular, 6-10 mm long, orange (Conran, 1994).

Conservation Status: ROTAP: Vulnerable VROTS: vulnerable FFG: listed; action statement ESP: listed

RESERVATION STATUS			RARITY
% of CRA population in biological conservation reserve	% of CRA population in other public land	% of CRA population on private land	% Australian population within RFA Region
0	100	0	26-50

Distribution in Western RFA Region: A small population in the Otway Ranges, in the headwaters of Cianco Creek, on public land zoned for rainforest conservation. Outside the Region it occurs in the headwaters of the Bunyip, La Trobe and Yarra Rivers. The species is endemic to Victoria (SAC, 1989, nom.; Yugovic, 1991).

Habitat: Gully heads or on the verges of permanent watercourses, where soil is waterlogged and humus-rich. The vegetation is usually Cool Temperate Rainforest, dominated by Myrtle Beech (*Nothofagus cunninghamii*), Sassafras (*Atherosperma moschatum*), Swamp Paperbark (*Melaleuca squarrosa*) or Woolly Tea-tree (*Leptospermum lanigerum*). The understorey is dominated by ferns, particularly Soft-Tree-fern (*Dicksonia antarctica*), Hard-Water-fern (*Blechnum wattsii*). Filmy ferns (eg *Hymenophyllum* spp.) are often abundant as epiphytes on the tree-fern trunks (SAC, 1989, nom.; Yugovic, 1991).

Life History: Flowers November to February (Conran, 1994). It flowers and sets seed infrequently (Yugovic, 1991). Asexual reproduction and establishment occurs commonly. Following fire, the species is an obligate seed regenerator; nearly all plants are killed by fire, and regeneration is solely from seed, but there is no notable soil or canopy seed store, and often re-establishment is only via invasion from unburnt sites. It requires long periods without major disturbance for survival and establishment, and is sensitive to fire at any intensity (VRFAF).

- The species was once widespread but has been reduced to a few small sites in a limited area (SAC, 1991, final rec.).
- The species has been much depleted by successive forest fires, and the most important threat to its survival is fire, which can destroy a population and its habitat (SAC, 1991, final rec.; Yugovic, 1991).
- Siltation and changes in hydrology caused by land clearing and road works may threaten its habitat (SAC, 1991, final rec.).
- ?Although the Otways population is within a rainforest conservation area, it is surrounded by a hardwood production area which may have implications for Tall Astelia. Regrowth forest resulting from logging is considered more likely to burn than mature forest. Stream flows from regrowth forest may also be reduced (Yugovic, 1991).

- The population in the Otways is geographically isolated from the other populations in the Central Highlands (SAC, 1991, final rec.).
- Seed production is uncommon and infrequent, and recruitment may be limited by its dioecious nature and its tendency to form unisexual colonies from one parent plant (SAC, 1991, final rec.).
- Genetic variation within and between colonies may be low, leading to a limited potential to survive events such as drought, pathogen attack or climatic change (Yugovic, 1991).
- There is a potential risk of damage to colonies by visitors and collectors (Yugovic, 1991).
- Competition from other native plants may suppress Tall Astelia where gaps are created in the tree canopy (Yugovic, 1991).

Rating of Threats:

Disturbance	Rating	Source
Fragmentation of native veg.	2	Yugovic 1991
Timber harvesting	?2	Yugovic 1991
Unplanned fire	3	Yugovic 1991, SAC final rec
Road/ rail construction/	2	SAC final rec
maintenance		
Vandalism/ human disturbance	1	Yugovic 1991
Dams/ alteration to water regimes	2	SAC final rec
Reproductive problems	2	Yugovic 1991, SAC final rec
Other: native plant competition	1	Yugovic 1991

Current Management:

NRE monitoring

Yugovic (1991) Action Statement:

- Past management actions: a number of surveys by La Trobe University and NRE; since 1990 a 40 m buffer zone prescription introduced for logging adjacent to colonies of Tall Astelia.
- Intended management actions: a Critical Habitat determination to be made; the Otways colony and its subcatchment will be protected within the Youngs Creek Rainforest Conservation Area as indicated in the Proposed Otway Forest Management Plan (DCE 1992a); investigation of possible occurrence of myrtle wilt within or near Tall Astelia habitat; assessment of effective means of controlling weeds; restriction of site location information to minimise disturbance and loss of plants; a comprehensive search of drainage lines adjacent to the Otways colony; colonies in conservation areas will be monitored every ten years and in hardwood production areas every five years; research to be undertaken on the biology and ecology of Tall Astelia, and the effects of wildfire and forest management practices.

Downy Star-bush Family: Rutaceae

Asterolasia phebaloides

Species Characteristics: Small slender shrub to 1.5 m high; branchlets densely grey-tomentose with silvery and ferruginous hairs. Leaves densely crowded, lacking obvious petioles, broadly cuneate, less than 1 cm long, densely stellate-tomentose. Inflorescence terminal with subsessile solitary flowers; calyx minute; petals 8-10 mm long, golden yellow. (Armstrong & Telford, 1986).

Conservation Status:

ROTAP: Vulnerable VROTS: vulnerable FFG: listed ESP: listed

RESERVATION STATUS			RARITY
% of CRA population	% of CRA population	% of CRA population	% Australian
in biological in other public land on private land		population within RFA	
conservation reserve			Region
50	30	20	76-100

Distribution in Western RFA Region: Black Ranges State Park and Grampians National Park (SAC, 1995, nom.), and some on private land. Also found near Little Desert National Park and in South Australia (Armstrong & Telford, 1986).

Habitat: The species grows on sandy, acidic soils derived from sandstone. In the Grampians the species occurs as part of dense heathy shrub layers between 1 and 1.5 m high, with sparse canopies of trees such as Oyster Bay Cypress-pine (*Callitris rhomboidea*) and Brown Stringybark (*E. baxteri*) (Overton *et al.*, 1990).

Life History: The species appears to be long-lived, and is an early coloniser following fire and soil disturbance by humans and native mammals (Overton *et al.*, 1990). Sexual reproduction, and subsequent establishment from seeds. The species is an obligate seed regenerator; nearly all plants are killed by fire, and regeneration is solely from seed stored in the canopy or in the soil for a short time pre-fire. It tolerates occasional major disturbance and requires such disturbance for the rare opportunity to establish and spread (VRFAF).

Threatening Processes operating in Western RFA Region:

• The species is rare in terms of abundance and distribution, which makes it vulnerable to unplanned events. For example it is not known what fire frequency is necessary for its survival (SAC, 1995, nom.).

Rating of Threats:

Disturbance	Rating	Source
Unplanned fire	1	SAC, 1995, nom.

Current Management:

Black Range State Park Management Plan (Parks Vic.1998a):

• Encourage surveys and research on significant flora and plant communities in the Park, and consider that information in all management actions; encourage ongoing research and undertake monitoring in vegetation communities to identify ecologically-based fire prescriptions; control, and where possible eradicate, pest plants and animals, and prevent the entry of Cinnamon Fungus to the Park.

Grampians National Park Draft Management Plan (Parks Vic. 1998f)

• Ensure that significant plants and communities are adequately protected from recreational activities, planned and unplanned fire, invasion by pest plants, over-grazing by pest animals, and inappropriate management activities, through implementation of the Environmental Action Plan, and the Grampians-Black Range Park Fire Management Plan; undertake distribution mapping and monitoring of endangered and significant endemic species; encourage surveys of and research into significant flora (including rare or threatened species) and plant communities in the Park, and consider that information in all management actions.

Audas's Spider-orchid Family: Orchidaceae

Caladenia audasii

Species Characteristics: Leaf single, lanceolate, to 10 cm x 10 mm, sparsely hairy. Flower stem to 20 cm tall, slender, hairy. Flower single, to 10 cm across; pale yellow, labellum with some reddish spotting, a pair of yellow glands at column base. Perianth segments to 60 mm long, narrow, ending in long tails, often with reddish spots and stripes. Labellum with entire or very shortly toothed margins, and short laminar calli (Backhouse & Jeanes, 1995).

Conservation Status:

ROTAP: Endangered VROTS: endangered FFG: listed ESP: listed

RESERVATION STATUS			RARITY
% of CRA population	% of CRA population	% of CRA population	% Australian
in biological	in other public land	on private land	population within RFA
conservation reserve			Region
0	100	0	76-100

Distribution in Western RFA Region: Known only from public land in the Stawell area (SAC, 1991, final rec.).

Habitat: Flat terrain on soils derived from sandstone. Open forest dominated by Yellow Gum (*Eucalyptus leucoxylon*), with a few heathy shrubs in the understorey and a variety of herbs, lilies, grasses and orchids (VrotPop).

Life History: Flowers in September and October (Backhouse & Jeanes, 1995). Sexual reproduction, with establishment from seed, occurs only occasionally. Asexual reproduction is unknown. The species is an optional root resprouter; most plants survive fire and resprout from dormant buds, but there is also a significant re-establishment from seed (VRFAF).

Threatening Processes operating in Western RFA Region:

- Its extreme rarity makes it vulnerable to extinction (SAC, 1991, final rec.).
- Collection is the most serious threat (SAC, 1990, nom.).
- Gold mining, exploration and fossicking are potential threats (SAC, 1990, nom.).

Rating of Threats:

Disturbance	Rating	Source
Fragmentation of native veg.	2	SAC final rec
Mining/ quarrying	2	SAC nom
Deliberate collecting/ harvesting	3	SAC nom
Reproductive problems	3	SAC final rec

Current Management:

NRE monitoring

Limestone Caladenia Family: Orchidaceae

Caladenia calcicola

Species Characteristics: Leaf single, lanceolate, to 12 cm x 15 mm, densely hairy on both surfaces, green with red spots near base. Flower stem to 25 cm tall, slender, hairy. Flowers one or two, to 40 mm across; glossy greenish yellow with red stripes on segments, lateral lobes greenish with maroon stripes. Perianth segments to 40 mm long, slender, tapering to filamentous points, sepals with distinct club-like glands to 9 mm long. Labellum mid-lobe maroon, with four to six rows of crowded calli (Backhouse & Jeanes, 1995).

Conservation Status:

ROTAP: Vulnerable VROTS: endangered FFG: listed, action statement ESP:

RESERVATION STAT	RARITY		
% of CRA population in biological conservation reserve	% of CRA population n biological in other public land % of CRA population conservation reserve		% Australian population within RFA Region
50	0	50	76-100

Distribution in Western RFA Region: Endemic to the Portland district of south-western Victoria, and known only from a single conservation reserve and a private property (Backhouse & Jeanes, 1995).

Habitat: Found in open forests and heathy woodlands on low limestone ridges. Soils are generally well-drained, calcareous, red sandy loams (Backhouse & Jeanes, 1995), Dominant structural components of the open-forest habitat are Coast Wattle (Acacia sophorae), Manna Gum (Eucalyptus viminalis), Hoary Rapier-sedge (Lepidosperma canescens) and Coast Beardheath (Leucopogon parviflorus) (Carr, 1986).

Life History: Deciduous terrestrial orchids that die back annually to small subterranean tuberoids. Plants shoot in response to soaking rains in late autumn. Flowering occurs during September, October and November, and is enhanced by hot fires during the previous summer. A "daughter" tuberoid is produced during the growing season to enable the plant to survive over summer. Plants become dormant as temperature increase and soils dry out in late spring. Reproduction is only possible by seed. The long filamentous flower segments are sexual attractants for the pollinators, usually male thynnid wasps (Backhouse & Jeanes, 1995). Germination occurs in early winter, and is reliant on a mycorrhizal relationship with a free-living fungus, which continues for the life of the plant (SAC, 1995, nom.). Sexual reproduction, with establishment from seed, occurs only occasionally. The species is an optional root resprouter; most plants survive fire and resprout from dormant buds, but there is also a significant reestablishment from seed (VRFAF).

- A large population was recently destroyed by limestone quarrying (Backhouse & Jeanes, 1995).
- Long term survival of populations on private property is doubtful due to land clearance and stock grazing (SAC, 1991, final rec.; Backhouse & Jeanes, 1995).
- Habitat degradation is being caused by weeds, feral animals and unnatural fire regimes (Backhouse & Jeanes, 1995).
- Invasion by Coast Wattle (Acacia sophorae) which is dominating areas to the exclusion of other species (Beecham & Fisher, 1992).
- Rabbit grazing is reducing the number of plants (Beecham & Fisher, 1992).

- Wildfire could have a detrimental effect (Beecham & Fisher, 1992).
- Some illegal collecting is occurring (Beecham & Fisher, 1992; Backhouse & Jeanes, 1995).

Disturbance	Rating	Source
Clearing of native vegetation	3	SAC, 1991, final rec.
Fragmentation of native veg.	3	Backhouse & Jeanes, 1995
Unplanned fire	2	Backhouse & Jeanes, 1995
Introduced animals	2	Backhouse & Jeanes, 1995
Introduced plants	3	Backhouse & Jeanes, 1995
Grazing/ trampling	3	SAC, 1991, final rec.
Mining/ quarrying	3	Backhouse & Jeanes, 1995
Deliberate collecting/ harvesting	2	Backhouse & Jeanes, 1995

Rating of Threats:

Current Management:

Beecham & Fisher (1992) Action Statement:

- Past management actions: voluntary agreement by Shire of Heywood to halt further expansion of quarry operations which had destroyed most of population adjacent to reserve; searches for previously recorded populations; mosaic burning of Bats Ridge Wildlife Reserve to reduce Coast Wattle dominance and lower fuel loads.
- Intended management actions: assess status of existing populations; monitor known populations annually recording numbers and condition of plants, seedling recruitment, weed cover and disturbance; encourage research into ecological requirements of the orchid including pollinators, response to fire, genetic variability, seedling establishment requirements; exclude stock and rabbits, and control pest plants on private property; fence population adjacent to quarry; carry out mosaic burning in Bats Ridge Wildlife Reserve; Encourage the use of conservation covenants on private land supporting the orchid; negotiate a Public Authority Management Agreement with Shire to permanently exclude quarrying; encourage research into *ex-situ* conservation of the species.

Elegant Spider-orchid Family: Orchidaceae

Caladenia formosa

Species Characteristics: Leaf single, lanceolate, to 15 cm x 12 mm, sparsely hairy, green with a few reddish basal spots. Flower stem to 50 cm tall, slender, hairy. Flower single, rarely two, to 60 mm across; uniform pinkish-red to blood-red. Perianth segments to 80 mm long, broad near base, abruptly tapering to long, filamentous, glandular hairy tips. Related to *C concolor*, but can be distinguished by its paler blood-red flowers and shorter, more numerous marginal labellum calli (Backhouse & Jeanes, 1995).

Conservation Status:

ROTAP: Vulnerable VROTS: vulnerable FFG: listed ESP: listed

RESERVATION STAT	RARITY		
% of CRA population in biological conservation reserve	% of CRA population in other public land	% of CRA population on private land	% Australian population within RFA Region
20	0	80	51-75

Distribution in Western RFA Region: Known only from a few sites in the south-west; a private property at Poolaijelo and possibly on adjacent public land; in the Grampians National Park near Cavendish; and possibly at Mt Richmond National Park near Portland. Also found in South Australia (Backhouse & Jeanes, 1995).

Habitat: Grows in heathy woodlands and woodlands on well-drained sandy soils and clay loams (Backhouse & Jeanes, 1995). At Poolaijelo it occurs in open grassy and shrubby woodland dominated by Yellow Gum (*Eucalyptus leucoxylon*) and Red Gum (*E. camaldulensis*). The soil is pale brown well-drained silty loam which is relatively fertile (SAC, 1995, nom.).

Life History: Deciduous terrestrial orchids that die back annually to small subterranean tuberoids. Plants shoot in response to soaking rains in late autumn. Flowering occurs from September to October, and is enhanced by hot fires during the previous summer. A "daughter" tuberoid is produced during the growing season to enable the plant to survive over summer. Plants become dormant as temperature increase and soils dry out in late spring. Reproduction is only possible by seed. The long filamentous flower segments are sexual attractants for the pollinators, usually male thynnid wasps (Backhouse & Jeanes, 1995). Germination occurs in early winter, and is reliant on a mycorrhizal relationship with a free-living fungus, which continues for the life of the plant (SAC, 1995, nom.). Sexual reproduction, with establishment from seed, occurs only occasionally. The species is an optional root resprouter; most plants survive fire and resprout from dormant buds, but there is also a significant re-establishment from seed (VRFAF).

- Weed invasion, especially by introduced herbs and grasses, interferes with recruitment (SAC, 1995, nom.).
- Cattle, sheep and rabbit grazing have exacerbated the weed invasion by causing soil disturbance, and have the capacity to directly affect the orchid by trampling and grazing (SAC, 1995, nom.).
- Removal by orchid collectors is another threat (SAC, 1996, final rec.).
- Clearing for agriculture has significantly depleted the habitat for the orchid (SAC, 1995, nom.).
- The rarity of the species makes it susceptible to catastrophic events (SAC, 1996, final rec.).

Rating of Threats:

Disturbance	Rating	Source
Clearing of native vegetation	2	SAC, 1995, nom.
Fragmentation of native veg.	2	SAC, 1995, nom.
Introduced animals	2	SAC, 1995, nom.
Introduced plants	2	SAC, 1995, nom.
Grazing/ trampling	2	SAC, 1995, nom.
Deliberate collecting/ harvesting	2	SAC, 1996, final rec.

Current Management:

Grampians National Park Draft Management Plan (1998f)

• Ensure that significant plants and communities are adequately protected from recreational activities, planned and unplanned fire, invasion by pest plants, over-grazing by pest animals, and inappropriate management activities, through implementation of the Environmental Action Plan, and the Grampians-Black Range Park Fire Management Plan; undertake distribution mapping and monitoring of endangered and significant endemic species; encourage surveys of and research into significant flora (including rare or threatened species) and plant communities in the Park, and consider that information in all management actions.

Tawny Spider-orchid Family: Orchidaceae

Caladenia fulva

Species Characteristics: Leaf single, lanceolate, to 12 cm x 8 mm, sparsely hairy on both surfaces, green with reddish basal spots. Flower stem to 15 cm tall, slender, hairy, green or reddish. Flowers one or two, to 80 mm across; creamy white to pale yellowish, segments with tawny to black tips; labellum lamina deep red or tawny, paler towards base. Perianth segments to 80 mm long, glandular-hairy, broad near base and abruptly tapering to long, slender filaments. (Backhouse & Jeanes, 1995).

Conservation Status: ROTAP: Endangered VROTS: endangered FFG: listed ESP: listed

RESERVATION STAT	RARITY		
% of CRA population in biological 8conservation reserve	% of CRA population in other public land	% of CRA population on private land	% Australian population within RFA Region
50	50	0	76-100

Distribution in Western RFA Region: Endemic species known only from the type locality north of Stawell on public land (SAC, 1995, nom.).

Habitat: It occurs in Yellow Gum (*Eucalyptus leucoxylon* ssp. *pruinosa*) woodland on gravelly clay-loams. Common understorey species include Golden Wattle (*Acacia pycnantha*), Black-anther Flax-lily (*Dianella revoluta* var. *revoluta*), Flame Heath (*Astroloma conostephoides*) and Daphne Heath (*Brachyloma daphnoides*) (Carr *et al.*, 1989).

Life History: Deciduous terrestrial orchids that die back annually to small subterranean tuberoids. Plants shoot in response to soaking rains in late autumn. Flowering occurs from September to October, and is enhanced by hot fires during the previous summer. A "daughter" tuberoid is produced during the growing season to enable the plant to survive over summer. Plants become dormant as temperature increase and soils dry out in late spring. Reproduction is only possible by seed. The long filamentous flower segments are sexual attractants for the pollinators, usually male thynnid wasps (Backhouse & Jeanes, 1995). Germination occurs in early winter, and is reliant on a mycorrhizal relationship with a free-living fungus, which continues for the life of the plant (SAC, 1995, nom.). Sexual reproduction, with establishment from seed, occurs only occasionally. The species is an optional root resprouter; most plants survive fire and resprout from dormant buds, but there is also a significant re-establishment from seed (VRFAF).

Threatening Processes operating in Western RFA Region:

- Weed invasion may inhibit recruitment (SAC, 1995, nom.).
- Off-road vehicle use has caused damage to orchid habitat (SAC, 1995, nom.).
- Illicit wood cutting has the potential to damage plants or cause soil disturbance (SAC, 1995, nom.).
- Rabbits graze or dig up plants (SAC, 1995, nom.).
- Gold prospecting and mining is a potential threat (SAC, 1996, final rec.).
- Collection is a high potential threat, as well as trampling by orchid enthusiasts (SAC, 1996, final rec.).

Rating of Threats:

Disturbance	Rating	Source
Fragmentation of native veg.	2	
Timber harvesting	2	SAC nom
Introduced animals	2	SAC nom
Introduced plants	2	SAC nom
Recreation	2	SAC nom
Mining/ quarrying	2	SAC final rec
Deliberate collecting/ harvesting	3	SAC final rec

Current Management:

Melblom's Caladenia Family: Orchidaceae

Caladenia hastata

Species Characteristics: Leaf single, lanceolate, to 12 cm x 10 mm, hairy, green with a few red basal spots. Flower stem to 35 cm tall, slender, hairy. Flowers one to three, to 80 mm across; creamy white with deep red to blackish terminal glands on petals and sepals, labellum with purplish calli and marginal teeth. Perianth segments to 40 mm long, abruptly tapering with thickened club-like glands to 20 mm long (Backhouse & Jeanes, 1995).

Conservation Status: ROTAP: Endangered VROTS: endangered FFG: listed ESP: listed

RESERVATION STAT	RARITY		
% of CRA population in biological conservation reserve	% of CRA population in other public land	% of CRA population on private land	% Australian population within RFA Region
50	0	50	76-100

Distribution in Western RFA Region: Endemic to south-western Victoria, mostly near Portland (Backhouse & Jeanes, 1995). Only known from an area at Point Danger used for aluminium smelting.

Habitat: Grows in dense coastal heathlands and heathy woodlands on deep, well-drained sands (Backhouse & Jeanes, 1995). The species grows in the more open areas of low heathland between stands of Shining Peppermint (*Eucalyptus willisii*) and Brown Stringybark (*E. baxteri*). These species-rich areas are dominated by Austral Grass-tree (*Xanthorrhoea australis*), Smooth Parrot-pea (*Dillwynia glaberrima*), Flame Heath (*Astroloma conostephoides*) and Tassel Roperush (*Hypolaena fastigiata*) (Carr & Kinhill Planners, 1980). The soil is siliceous sand with a hardpan of coffee rock between 50 and 100 cm in depth, and topography is flat. Soils may be seasonally waterlogged (Scarlett, 1984).

Life History: Deciduous terrestrial orchids that die back annually to small subterranean tuberoids. Plants shoot in response to soaking rains in late autumn. Flowering occurs from October to November, and is enhanced by hot fires during the previous summer. A "daughter" tuberoid is produced during the growing season to enable the plant to survive over summer. Plants become dormant as temperature increase and soils dry out in late spring. Reproduction is only possible by seed. The long filamentous flower segments are sexual attractants for the pollinators, usually male thynnid wasps (Backhouse & Jeanes, 1995). Germination occurs in early winter, and is reliant on a mycorrhizal relationship with a free-living fungus, which continues for the life of the plant (SAC, 1995, nom.). Seedling establishment mainly takes place in the open vegetation created in the first few years after a fire. Flowering frequency declines, potentially to zero in the total absence of fire due to plant competition (Scarlett, 1984). Sexual reproduction, with establishment from seed, occurs only occasionally. The species is an optional root resprouter; most plants survive fire and resprout from dormant buds, but there is also a significant re-establishment from seed (VRFAF).

- Much of the site of the sole remaining colony was destroyed by the building of an aluminium smelter (Backhouse & Jeanes, 1995).
- Some plants were translocated to a nearby coastal park, but the site is being invaded by weeds (*Acacia longifolia*) (Backhouse & Jeanes, 1995).

- No records from any conservation reserves (Backhouse & Jeanes, 1995).
- Any single event, such as development or expansion of the smelter or construction of an access track to the sea, could cause the extinction of the species (SAC, 1991, final rec.).
- Inappropriate fire regimes could pose a threat (SAC, 1991, final rec.).

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- The species is likely to become extinct from its only natural location due to direct destruction, increased human pressure, or through modification of the vegetation community by industrial gaseous emissions (SAC, 1991, nom.).
- At the relocation site, there is a threat that the species could exchange genetic material with a closely related species already occurring in the area (SAC, 1991, nom).

Backhouse & Jeanes, 1995

Backhouse & Jeanes, 1995

SAC, 1991, nom.

SAC, 1991, nom.

VrotPop

SAC, 1991, final rec.

- Grazing and soil disturbance by rabbits and native animals are additional threats at the relocation site (SAC, 1991, nom.).
- Plant competition from indigenous plants is a threat because the orchid appears to favour more open areas (VrotPop).

Disturbance	Rating	Source
Clearing of native vegetation	3	Backhouse & Jeanes, 1995
Fragmentation of native veg.	2	SAC, 1991, final rec.
Unplanned fire	2	SAC, 1991, final rec.

Rating of Threats:

Introduced plants Introduced animals

Mining/ quarrying

Road/rail

Current Management:

construction/maintenance

Other: native plant competition

Reproductive problems

Discovery Bay Parks Draft Management Plan (1998d)

- Caladenia hastata: implement appropriate fire regime; translocate new plants to supplement existing population; hand pollination; monitoring; assess impacts of burning on Coast Wattle invasion; liaise with Portland Aluminium to monitor vegetation change following weed clearing and burning at Point Danger.
- Rare or threatened species: document locations; investigate ecological requirements; monitoring; implement vegetation modification to improve habitats; survey sites where changes in maintenance or construction are planned; pest plant and animal control.

Lower Glenelg National Park Management Plan (DCE 1991a)

- Caladenia hastata: monitor population annually; prepare a population management plan based on prescribed burning every 5-10 years.
- Rare or threatened species: conduct surveys to determine the distribution and abundance of rare or threatened species within the Park; prepare improved management prescriptions based on detailed ecological study for rare or threatened plant species; protect and manage identified threatened species; train Park staff to undertake monitoring programs; maintain the natural influence of fires on ecological processes; monitor, control, and where possible eradicate introduced plants and animals, and isolate any Cinnamon Fungus occurrence in the Park.

Candy Spider-orchid Family: Orchidaceae

Caladenia versicolor

Species Characteristics: Leaf single, lanceolate, to 10 cm x 8 mm, sparsely hairy on both surfaces, green with reddish basal spots. Flower stem to 25 cm tall, slender, hairy, green or reddish. Flowers one or two, to 60 mm across; white, pale pink or purplish, segment tips covered with purple or black glandular hairs; labellum lamina white, mid-lobe, calli and marginal teeth often pink. Perianth segments to 60 mm long, broad near base and abruptly tapering to long, slender filaments for most of their length (Backhouse & Jeanes, 1995).

Conservation Status:

ROTAP: Vulnerable VROTS: vulnerable FFG: ESP: listed

RESERVATION STAT	RARITY		
% of CRA population in biological conservation reserve	% of CRA population in other public land	% of CRA population on private land	% Australian population within RFA Region
0	100	0	0-25

Distribution in Western RFA Region: Confined to the western Goldfields on public land near Stawell (VrotPop). Also found in South Australia (Backhouse & Jeanes, 1995).

Habitat: Found mainly in woodlands dominated by Eucalyptus leucoxylon (Yellow Gum) on seasonally inundated sandy loams (Backhouse & Jeanes, 1995).

Life History: Deciduous terrestrial orchids that die back annually to small subterranean tuberoids. Plants shoot in response to soaking rains in late autumn. Flowering occurs from September to November, and is enhanced by hot fires during the previous summer. A "daughter" tuberoid is produced during the growing season to enable the plant to survive over summer. Plants become dormant as temperature increase and soils dry out in late spring. Reproduction is only possible by seed. The long filamentous flower segments are sexual attractants for the pollinators, usually male thynnid wasps (Backhouse & Jeanes, 1995). Germination occurs in early winter, and is reliant on a mycorrhizal relationship with a free-living fungus, which continues for the life of the plant (SAC, 1995, nom.). Sexual reproduction, with establishment from seed, occurs only occasionally. The species is an optional root resprouter; most plants survive fire and resprout from dormant buds, but there is also a significant re-establishment from seed (VRFAF).

Threatening Processes operating in Western RFA Region:

- Plant collection (VrotPop).
- Rabbit control works have caused soil disturbance (VrotPop).
- Soil disturbance is being caused by vehicles using a track through site (VrotPop).
- Rabbits grazing may be a threat

Rating of Threats:		
Disturbance	Rating	Source
Fragmentation of native veg.	2	
Introduced animals	1	
Pest control	2	VrotPop
Deliberate collecting/ harvesting	2	VrotPop
Vandalism/ human disturbance	2	VrotPop

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Current Management:

Yellow-lip Spider-orchid Family: Orchidaceae

Caladenia xanthochila

Species Characteristics: Leaf single, lanceolate, to 17 cm x 10 mm, hairy, green with a reddish base. Flower stem to 30 cm tall, slender, hairy, green or reddish. Flowers one or two, to 50 mm across; pale greenish yellow with red sepaline glands, labellum rarely with reddish margins and calli. Perianth segments to 50 mm long, relatively broad at base, tapering to filamentous tips, sepals with glands forming prominent clubs to 10 mm long. Labellum obscurely tri-lobed (Backhouse & Jeanes, 1995).

Conservation Status:

ROTAP: Endangered VROTS: endangered FFG: listed ESP: listed

RESERVATION STAT	RARITY		
% of CRA population in biological conservation reserve	opulation % of CRA population % of CRA population in other public land on private land		% Australian population within RFA Region
0	0	100	26-50

Distribution in Western RFA Region: Private land at Murtoa. Outside the study area it occurs in state forest near Inglewood (SAC, 1995, nom.).

Habitat: It grows in damp sandy loams in open forest and woodland. Overstorey trees are Yellow Gum (*Eucalyptus leucoxylon*), Yellow Box (*Eucalyptus melliodora*) or Grey Box (*Eucalyptus microcarpa*), with an open understorey of grasses, herbs and sparse shrubs (SAC, 1995, nom.).

Life History: Deciduous terrestrial orchids that die back annually to small subterranean tuberoids. Plants shoot in response to soaking rains in late autumn. Flowering occurs from August to September. A "daughter" tuberoid is produced during the growing season to enable the plant to survive over summer. Plants become dormant as temperature increase and soils dry out in late spring. Reproduction is only possible by seed, but only occurs occasionally. The long filamentous flower segments are sexual attractants for the pollinators, usually male thynnid wasps (Backhouse & Jeanes, 1995). Germination occurs in early winter, and is reliant on a mycorrhizal relationship with a free-living fungus, which continues for the life of the plant (SAC, 1995, nom.). The species' response to fire is unknown (VRFAF).

Threatening Processes operating in Western RFA Region:

- Habitat destruction is the major reason for the orchid's rarity (SAC, 1995, nom.).
- Small remnants of potential habitat have been degraded by agricultural activities (SAC, 1995, nom.).
- Grazing by rabbits is the most immediate threat (SAC, 1995, nom.).
- Weed invasion is a serious problem on the golf course, where pasture grasses from surrounding farmland have established across the site, and fertiliser use favours weed establishment (SAC, 1995, nom.).
- Disturbance from recreational activities occurs, with vehicles and humans traversing the site (SAC, 1995, nom.).
- Collection is a possible threat (SAC, 1996, final rec.).
- The rarity of the species makes it susceptible to catastrophic events (SAC, 1996, final rec.).

Rating of Threats:

Disturbance	Rating	Source
Clearing of native vegetation	3	SAC nom
Fragmentation of native veg.	3	SAC nom
Introduced animals	3	SAC nom
Introduced plants	3	SAC nom
Recreation	2	SAC nom
Deliberate collecting/ harvesting	2	SAC final rec

Current Management:

Small Milkwort Family: Polygalaceae

Comesperma polygaloides

Species Characteristics: Subshrub, 10-20 cm tall, rarely to 35 cm, forming clumps of upright shoots from woody underground rhizomes. Leaves subsessile, narrowly oblong to obovate, 5-15 mm long, 1-3 mm wide, glaucous. Racemes 20-70 mm long; outer sepals much shorter than the wings; wings c. 6 mm long, obovate, purple-mauve and green; keel about as long, with 2 lateral lobes; posterior petals oblong (Stove, 1986).

Conservation Status: ROTAP: VROTS: vulnerable FFG: listed ESP:

RESERVATION STATUS			RARITY
% of CRA population	% of CRA population	% of CRA population	% Australian
in biological	in other public land	on private land	population within RFA
conservation reserve			Region
20	20	60	26-50

Distribution in Western RFA Region: Once widespread on the riverina and volcanic plains, but now restricted to roadsides or rail reserves and lightly grazed unimproved pastures. It is reserved in Mt Arapiles-Tooan State Park, Grampians National Park, Jilpanger Flora and Fauna Reserve, Black Range State Park, Organ Pipes National Park, Derrimut Grassland Reserve, State Forest near Glen Isla and Kanagulk State Forest (SAC, 1990, nom.; Parks Victoria, 1998a,c,f, DCE 1992b). Also found in South Australia (Stove, 1986).

Habitat: On the western volcanic plains the species grows in grasslands dominated by Kangaroo Grass (*Themeda triandra*) and less commonly Wallaby Grasses (*Danthonia* spp.) and Spear Grasses (*Stipa* spp.). On the northern slopes and plains and scattered localities in the west of the state, it occurs in grassy woodlands dominated by Grey Box (*Eucalyptus microcarpa*), Yellow Box (*E. leucoxylon*) and Red Gum (*E. camaldulensis*) (SAC, 1990, nom.). Annual rainfall range is between 400 and 600 mm (Scarlett, 1984).

Life History: Flowers during November and December (SAC, 1990, nom.). Seeds are covered in fine hairs which aid wind dispersal (Scarlett, 1984). Both sexual reproduction, with establishment from seed, and asexual reproduction occur only occasionally. The species is an optional root resprouter; most plants survive fire and resprout from dormant buds, but there is also significant re-establishment from seed. Natural disturbances are tolerated, but regeneration is not dependent on them (VRFAF).

- The species has been severely depleted throughout its former range through the effects of clearing, heavy grazing and cultivation of its grassland and grassy woodland habitat (SAC, 1990, nom.).
- Surviving stands have low numbers of individuals (SAC, 1990, nom.).
- Many populations occur in degraded remnant sites on road and rail reserves, which are under threat from road and rail maintenance activities (Scarlett, 1984).
- It is susceptible to heavy grazing pressure as it is very palatable to stock (SAC, 1991, final rec.).
- Competition from introduced weeds (VrotPop).
- Heavy grazing by rabbits (Scarlett, 1984).
- Potential damage from recreational vehicles at some sites (VrotPop).

- Kangaroo grazing (VrotPop).
- Inappropriate fire regimes (Scarlett, 1984).

Rating of Threats:

Disturbance	Rating	Source
Clearing of native vegetation	2	SAC, 1990, nom.
Fragmentation of native veg.	2	SAC, 1990, nom.
Unplanned fire	1	Scarlett, 1984
Introduced animals	2	Scarlett, 1984
Introduced plants	2	SAC, 1990, nom.
Grazing/ trampling	2	SAC, 1990, nom.
Road/ rail construction/	2	Scarlett, 1984
maintenance		
Recreation	1	VrotPop

Current Management:

- NRE monitoring
- Black Range State Park Management Plan (Parks Vic 1998a):
- Encourage surveys and research on significant flora and plant communities in the Park, and consider that information in all management actions; encourage ongoing research and undertake monitoring in vegetation communities to identify ecologically-based fire prescriptions; control, and where possible eradicate, pest plants and animals, and prevent the entry of Cinnamon Fungus to the Park.

Mt Arapiles State Park Management Plan (Parks Vic. 1991b):

 Location of significant species will be identified and threats will be evaluated; protection will be provided from identified threats; locations of significant species will not be publicised; status of all significant species will be monitored; ecological studies of the effects of fire on significant species will be promoted, and the effects of fire monitored; control, and if possible eradicate pest plants and animals.

Grampians National Park Draft Management Plan (Parks Vic. 1998f)

- Ensure that significant plants and communities are adequately protected from recreational activities, planned and unplanned fire, invasion by pest plants, over-grazing by pest animals, and inappropriate management activities, through implementation of the Environmental Action Plan, and the Grampians-Black Range Park Fire Management Plan; undertake distribution mapping and monitoring of endangered and significant endemic species; encourage surveys of and research into significant flora (including rare or threatened species) and plant communities in the Park, and consider that information in all management actions. Dergholm State Park and Mt Arapiles-Tooan State Park (Tooan Block) (Parks Vic. 1998c):
- Tooan Block encourage a survey of the Park's flora and production of an Ecological Vegetation Class map; support the community-based program to develop a habitat link with the Mt Arapiles block and encourage the maintenance of existing habitat connections between Little Desert National Park and Jilpanger Flora and Fauna Reserve.

Derrimut Grassland Reserve Draft Management Plan (DCE 1992b):

• investigate the feasibility of using controlled light grazing as a management tool; minimise the use of slashing and mowing machinery; minimise soil disturbance; control pest animals and plants; employ fire as an appropriate management tool to maintain and enhance flora diversity; undertake regular monitoring of changes in the flora of the Reserve; maintain and enhance suitable habitat to maximise species diversity.

Organ Pipes National Park Draft Management Plan (NRE 1996d):

 finalise a comprehensive list of flora species indigenous to the Park to form the basis for revegetation planting; protect significant flora species in accordance with approved FFG action statements; encourage investigation of ecological burning to facilitate regeneration of woodland communities and grasslands and control of pest plants; develop pest animal control programs.
Slender Tree-fern Family: Cyathaceae

Cyathea cunninghamii

Species Characteristics: Trunk erect, slender, to 20 m tall and 8-10 cm diameter, adventitious roots at base; stipe bases persistent, crumbly. Fronds 1.5-3 m long forming small crown; stipe short, coarse, black, dull, with sharp tubercles; scales at base papery, shiny, pale. Lamina dark green, 3-pinnate with pinnae shorter towards stipe; lower surfaces of rachises with scattered scales, upper surfaces with numerous, curled hairs. Pinnules sessile with adjacent, broad bases continuous. Sori in 2 rows on pinnules with 1 sorus per lobe, conspicuous; indusium prominent, cup like (Duncan & Isaac, 1986).

Conservation Status: ROTAP: Rare VROTS: vulnerable FFG: listed ESP:

RESERVATION STATUS			RARITY
% of CRA population	% of CRA population	% of CRA population	% Australian
in biological in other public land on private land			population within RFA
conservation reserve			Region
50	50	0	0-25

Distribution in Western RFA Region: Found in the Otway National Park, Carlisle State Park and Angahook-Lorne State Park (NRE, 1996g; Parks Victoria, 1998b, 1999) and Otway State Forest (DCE, 1992a). Elsewhere in Victoria there are scattered populations in South and Central Gippsland, the Dandenongs, Healesville area, and East Gippsland. Also present in Tasmania, Chatham Island, New Zealand (Willis, 1970) and the Nadgee area of New South Wales (SAC, 1991, nom.; VrotPop).

Habitat: Confined to deep wet fern gullies and temperate rainforest protected from fire and wind. In mountainous terrain, above 1200 mm annual rainfall, clay loam soils (Scarlett, 1984). Usually on creek banks with constant moisture supply, but confined to small catchments and headwaters where plants are not damaged by flooding (Lobert *et. al.* in prep). These habitats commonly include an overstorey of Blackwood (*Acacia melanoxylon*), a mid-layer of Soft Tree-fern (*Dicksonia antarctica*) and a ground layer of ferns (Scarlett, 1984).

Life History: Sexual reproduction, and subsequent establishment from spores. It requires long periods without major disturbance for survival and establishment. Following fire, the species is an obligate seed regenerator; all or nearly all plants are killed by fire, and regeneration is solely from spores, often only via invasion from unburnt sites (VRFAF).

Threatening Processes operating in Western RFA Region:

- A significant threat is fire, mainly caused by the forestry practice of lighting fires to promote regeneration. The fires are often very hot and can scorch fern gullies where plants of *C. cunninghamii* die from either the burn or from exposure after the fire, and regeneration is reduced. Although the species is widespread in Cool Temperate Rainforest which is protected from logging, burning and logging can occur very close to rainforest and fern gully margins, and the species is vulnerable to any breaches of buffer zones (SAC, 1992, final rec.)
- Populations not in forestry areas are potentially threatened by wildfire (SAC, 1992, final rec.)
- The species may also be threatened by illegal collection and by trampling and disturbance which inhibit regeneration (SAC, 1992, final rec., Scarlett, 1984).
- The species is vulnerable due to its small population size, with usually only one or two plants occurring together (SAC, 1992, final rec.)

- Blackberries may inhibit regeneration (SAC, 1991, nom.) and can be a serious competitor after severe disturbance (Scarlett, 1984).
- Reproduction in the wild appears to be slow (Scarlett, 1984)

Disturbance	Rating	Source
Fragmentation of native veg.	1	SAC, 1992, final rec.
Timber harvesting	2	SAC, 1992, final rec.
Fuel reduction burning	2	SAC, 1992, final rec.
Unplanned fire	2	SAC, 1992, final rec.
Introduced plants	2	Scarlett, 1984
Deliberate collecting/ harvesting	2	Scarlett, 1984; SAC, 1992, final rec.
Vandalism/human disturbance	2	Scarlett, 1984; SAC, 1992, final rec.
Reproductive problems	1	Scarlett, 1984

Carlisle State Park Draft Management Plan (Parks Vic. 1998b):

 encourage surveys and research on significant flora and plant communities in the Park, and consider that information in all management actions; encourage ongoing research and undertake monitoring in vegetation communities to identify ecologically-based fire prescriptions; control, and where possible eradicate, pest plants and animals, and prevent the entry of Cinnamon Fungus to the Park; provide special protection for sites of botanical significance.

Otway National Park Management Plan (NRE 1996e):

• prepare a vegetation map for the Park to facilitate future ecological management; minimise disturbance in the Calder, Parker and Elliot River catchments; minimise the spread of Myrtle Wilt by protecting Beech trees from damage; encourage and support surveys and research on significant flora in the Park and contribute to the NRE computer-based register for sites of significance; evaluate the adequacy of forest regeneration in former logging coupes in the Park and revegetate as required; encourage ongoing research and undertake monitoring in vegetation communities to identify ecologically-based fire prescriptions; prepare a pest management strategy for the Park; monitor known occurrences of Cinnamon Fungus and Root Rot Fungus and prevent the spread of outbreaks by minimising visitor and management activities from infected sites.

Angahook- Lorne State Park Draft Management Plan (Parks Vic. 1999):

 encourage and support surveys and research on significant plant species and communities; prepare a vegetation map to facilitate future ecological management; collate and document botanical knowledge of local interest groups and educational institutions; identify, map and protect as necessary sites of botanical significance in the Park; monitor plant populations using VrotPop; control pest plants and fungal pathogens; implement ecologically appropriate fire regimes.

Otway Forest Management Area Forest Management Plan (DCE 1992a)

 Rare or threatened species: develop and maintain a flora database using the GIS giving the location of species of National, State and Regional significance; promote research into the ecology and reproductive biology of significant plant species; incorporate VROTS occurrences into the Conservation Zone, as appropriate, manage occurrences of VROTS outside the Conservation Zone.

Grampians Bitter-pea Family: Fabaceae

Daviesia laevis

Species Characteristics: Slender, erect shrub 2-4 m tall; branches arching, glabrous, somewhat glaucous; branchlets angular-terete. Phyllodes linear to narrow-elliptic, 4-15 cm long, 5-25 mm wide, grey-green, coriaceous, margins entire, apex acute, tapering gradually to an articulate petiole-like base 2-10 mm long; midrib prominent. Inflorescences 1-3 per axil, racemose 5-15 flowered; calyx 4.5-5 mm long, corolla mostly orange-yellow. Pod obliquely triangular, seeds compressed ovoid (Jeanes, 1996).

Conservation Status:

ROTAP: Vulnerable VROTS: vulnerable FFG: ESP: listed

RESERVATION STAT	RARITY		
% of CRA population in biological conservation reserve	% of CRA population in other public land	% of CRA population on private land	% Australian population within RFA Region
10	60	30	76-100

Distribution in Western RFA Region: Confined to the Grampians National Park and Mt Cole State Forest (Jeanes, 1996) and some private land.

Habitat: Found mostly in montane gullies on poor sandy or skeletal soils (Jeanes, 1996). It grows in open forest dominated by trees such as Messmate (Eucalyptus obligua) and Blue Gum (E. globulus ssp bicostata), most frequently at the margins of tall shrub thickets of Leptospermum, Melaleuca and Gahnia fringing creeks (Crisp, 1991).

Life History: Flowers September to December (Jeanes, 1996). Sexual reproduction, with establishment from seed, occurs only occasionally. Asexual reproduction is unknown. Following fire, the species is an obligate seed regenerator; nearly all plants are killed and regeneration is solely from seed stored in the soil pre-fire. Fire promotes germination and establishment (VRFAF).

Threatening Processes operating in Western RFA Region:

- Forestry operations may have caused the decline of the species at Mt Cole (Crisp, 1991).
- Frequent fuel-reduction burning at Mt Cole has eliminated understorey shrubs, replacing them with a dense growth of Austral Bracken (Pteridium esculentum) (Crisp, 1991).
- Small population size is a threat to its survival (Crisp, 1991).

Rating of Threats:

Disturbance	Rating	Source
Timber harvesting	2	Crisp 1991
Fuel reduction burning	2	Crisp 1991
Reproductive problems	1	Crisp 1991

Current Management:

Hairy Anchor Plant Family: Rhamnaceae

Discaria pubescens

Species Characteristics: Much branched, rigid shrub, 0.4-2.5 m high; opposite, spreading, branchlets dominated by spines; leaves often falling early. Spines 15-50 mm long, green; stems green. Leaves opposite, ovate to oblong, 3-15 mm long, finely toothed; stipules 1.5-3 mm long. Flowers clustered, 10-50 at base of spines; flowers c. 3 mm diameter, pedicels 5-10 mm long, hypanthium cupular. Capsule 3-lobed, 4-5 mm diameter (Harden, 1990).

Conservation Status:

ROTAP: Rare VROTS: vulnerable FFG: listed, Action Statement ESP:

RESERVATION STAT	RARITY		
% of CRA population	% of CRA population	% of CRA population	% Australian
in biological in other public land on private land		population within RFA	
conservation reserve		Region	
0	100	0	0-25

Distribution in Western RFA Region: Small populations at Birches Creek near Clunes, Lal Lal near Ballarat, Stockyard Hill near Creswick and in the upper reaches of the Campaspe River (Lunt, 1987). One population occurs in Turpins Falls Scenic Reserve, but the rest are on private land or public water frontages. The major occurrences of the species are in the alpine areas of Gippsland (Scarlett, 1984;DCE 1992a; VrotPop). The species formally had a widespread distribution in eastern Australia, but is now regarded as extinct in Queensland and endangered in Tasmania (Humphries, 1993).

Habitat: The species grows on rocky slopes, in stream valleys, on well-drained usually stony basaltic soils (Lunt, 1987).

Life History: Perennial. Regeneration from seed appears to be rare and seedlings are not often seen. Only a small proportion of plants in any stand bear seed in a season. The necessity of fire for seed regeneration is unknown. Old plants regenerate vegetatively after fire. The relative rarity of the species in heavily timbered sites suggests that it does not compete successfully with Eucalypts (Scarlett, 1984; Hall & Parsons, 1987). Sexual reproduction, and subsequent establishment from seeds. Regeneration is habitat dependent on particular rare or unpredictable events, and between such event plants may appear to be absent. It tolerates major natural disturbance and requires such disturbance for the rare opportunity to establish and spread (VRFAF).

Threatening Processes operating in Western RFA Region:

- *D. pubescens* is under threat from grazing by stock and rabbits, because new shoots are very palatable (Hall & Parsons, 1987). Grazing on new growth may be responsible for the observed lack of regeneration (SAC, 1991, final rec).
- All known populations are on private land or public water frontages grazed under licence (Humphries, 1993).
- Weed competition and shading can be a threat because the species appears to be adapted to fairly exposed areas (SAC, 1991, final rec.).
- Complete absence of natural seedling regeneration anywhere in the state (SAC, 1991, final rec.)

- Senescence and lack of juvenile recruitment will lead to eventual death of remaining individuals and thus local extinctions (Humphries, 1993).
- Erosion (VrotPop).
- Herbicide spraying (VrotPop).

Rating of Threats:

Disturbance	Rating	Source
Clearing of native vegetation	2	Humphries, 1993
Fragmentation of native veg.	2	Humphries, 1993
Introduced animals	2	Hall & Parsons, 1987
Introduced plants	2	SAC, 1991, final rec.
Grazing/trampling	3	Hall & Parsons, 1987; SAC, 1991, final rec .
Weed control	2	VrotPop
Reproductive problems	2	SAC, 1991, final rec.; Humphries, 1993

Current Management:

Humphries (1993) Action Statement, Morcom & Bramwell (1997) Action Statement Monitoring

- Past management actions: eradication of environmental weeds such as blackberries is ongoing in all areas.
- Intended management actions: prepare a critical habitat determination; where necessary fence public land frontages with adjoining landowners to protect populations from grazing; protect all sites from burning; assess recruitment and facilitate seedling establishment by removing competition from introduced grasses; eliminate competition from introduced woody weeds; monitor all existing populations to assess seedling recruitment and establishment and different management techniques, assess the effects of cattle grazing; liaise with landowners about appropriate management of stands on private lands and assist with grant applications; involve community groups in maintenance of populations and seed collection; collect seed from all populations for future reintroductions; investigate suitable locations for reintroductions.

Swamp Diuris Family: Orchidaceae

Diuris palustris

Species Characteristics: Leaves 3 to 10, linear, to 80 mm x 2 mm, erect, twisted, in a loose tussock, green with a dark reddish base. Flower stem to 15 cm tall, stout. Flowers perfumed, 1 to 4, to 20 mm across, yellow with brown spots and blotches, especially on outer surface, lateral sepals greenish brown. Dorsal sepal to 8 mm long, rounded to wedge-shaped, tip recurved; lateral sepals to 20 mm long, linear; petals to 15 mm long, prominently stalked. Labellum to 10 mm long, tri-lobed, apex notched or peaked (Backhouse & Jeanes, 1995).

Conservation Status: ROTAP: VROTS: vulnerable FFG: listed ESP:

RESERVATION STAT	RARITY		
% of CRA population in biological conservation reserve	% of CRA population in other public land	% of CRA population on private land	% Australian population within RFA Region
10	30	60	26-50

Distribution in Western RFA Region: Confined to the western half of Victoria, from both coastal and inland areas. It has been recorded at Organ Pipes National Park, Long Forest Flora Reserve, Bay of Islands Coastal Park and Port Campbell National Park (SAC, 1996, nom.), roadsides in the Kanya area and on private land (FIS). Also Little Desert National Park, South Australia and Tasmania (Backhouse & Jeanes, 1995).

Habitat: Usually found in swampy depressions in grasslands, heathlands and woodlands. Soils range from well-drained sandy loams to heavy clay loams that may be inundated in winter months (Backhouse & Jeanes, 1995). The population in Bay of Islands Coastal Park grows in a shrubland dominated by Kangaroo Grass (*Themeda triandra*) and Coast Beard-heath (*Leucopogon parviflorus*).

Life History: Deciduous terrestrial orchid with a dormant period over summer, growth resuming with autumn rains. Flowering occurs in August, September and November. Flowering is enhanced by hot fires during the previous summer. Reproduction is by division of the fleshy underground tuberoids, and by seed. Pollination is brought about by small native bees, probably drawn to the flowers by visual stimulus and strong scent (Backhouse & Jeanes, 1995). Sexual reproduction and subsequent establishment is from seeds. The species is an optional root resprouter; most plants survive fire and resprout from dormant buds, but there is also significant re-establishment from seed. Natural disturbances are tolerated, but regeneration is not dependent on them (VRFAF).

Threatening Processes operating in Western RFA Region:

- Much of the former habitat of this species, particularly native grasslands and grassy woodlands on fertile plains, has disappeared due to agricultural uses (SAC, 1997, final rec.).
- Remnants of the plant communities supporting Swamp Diuris are often narrow and linear and prone to changes in vegetation structure and composition because of lack of suitable fire regimes (SAC, 1997, final rec.).
- Disturbance is caused by railway track or road maintenance work (SAC, 1997, final rec.).
- Grazing and weed invasion from surrounding agricultural land threatens the species (SAC, 1997, final rec.).
- Soil disturbance caused by four-wheel drive vehicles and trail bikes (SAC, 1997, final rec.).
- Mining and mineral exploration disturbs the species' habitat (SAC, 1997, final rec.).

Rating of Threats:

Disturbance	Rating	Source
Clearing of native vegetation	2	SAC final rec.
Fragmentation of native veg.	2	SAC final rec.
Lack of fire	2	SAC final rec.
Introduced plants	2	SAC final rec.
Grazing/ trampling	2	SAC final rec.
Road/ rail construction/	2	SAC final rec.
maintenance		
Recreation	2	SAC final rec.
Mining/ quarrying	2	SAC final rec.

Current Management:

Port Campbell National Park and Bay Of Islands Coastal Park Management Plan (Parks Vic. 1998h).

• Monitor threatened plant populations and significant sites using the monitoring system VrotPop, in conjunction with NRE, Friends groups and naturalists; monitor populations of plants susceptible to collecting by fanciers, and in conjunction with NRE take necessary steps to prevent collecting; encourage research on significant plant species and communities; identify, map and protect as necessary, sites of botanical significance in the Parks; actively manage vegetation to retain habitat and community diversity by giving priority to the control of pest plants and the implementation of ecologically appropriate fire regimes; ensure that records of all significant species in the Parks are incorporated into the Flora Information System; ensure that the potential impacts on flora of any future developments in the Parks are fully assessed in the planning phase, are avoided or minimised by appropriate siting and design, and undertake necessary surveys at appropriate times of year to ensure seasonal species are identified.

Purple Diuris Family: Orchidaceae

Diuris punctata var. punctata

Species Characteristics: Terrestrial geophyte. Leaves one to three, slender, linear, to 25 cm long and 5 mm wide, channelled, grass-like, erect or lax, green. Flower stem to 50 cm tall, relatively robust, greenish brown. Flowers one to ten, to 50 mm across, purple with yellow on base of labellum mid-lobe, lateral sepals greenish brown. Distinguished from the similar *Diuris dendroboides* by its darker purple flowers, proportionatley shorter lateral sepals and slightly earlier flowering time and from *D. fragrantissima* by its more robust stature and larger, deep purple, unscented flowers (Backhouse & Jeanes, 1995).

Conservation Status: ROTAP: VROTS: vulnerable

FFG: listed ESP:

RESERVATION STAT	RARITY		
% of CRA population in biological conservation reserve	% of CRA population in other public land	% of CRA population on private land	% Australian population within RFA Region
10	60	30	26-50

Distribution in Western RFA Region: Grampians National Park (Parks Victoria, 1998f), Mount Beckworth Scenic Reserve, Organ Pipes National Park, public land near Stawell, a flora reserve in the Cavendish area, private land, road and rail reserves north of Melbourne (FIS). Elsewhere this species is widely distributed on low-altitude plains from near the coast to well inland (including most other RFA Regions) as well as South Australia, New South Wales and Queensland (Backhouse & Jeanes, 1995).

Habitat: The species is found in grasslands and grassy woodlands on rich, heavy, sandy loams which may be inundated during winter months (Backhouse & Jeanes, 1995).

Life History: All species of *Diuris* are deciduous and die back to a fleshy tuberoid to avoid the summer extremes of dryness and heat. Tuberoids sprout after soaking rains in the autumn and the leaves develop fully before the infloresence is produced. *D. punctata* var. *punctata* flowers from September to December. Replacement tuberoids are produced by all species and many increase vegetatively by daughter tuberoids. Pollination seems to be primarily by small native bees (Jones, 1988). Asexual reproduction and establishment occurs occasionally. In response to fire, this species is an optional root resprouter where most plants survive fire and resprout from underground tubers, but there is also a significant re-establishment from seed germination. Generally it requires long periods without major disturbance for survival and establishment (VRFAF).

Threatening Processes operating in Western RFA Region:

- Historically the species has undergone a massive decline. The species occurs in grasslands and grassy woodlands, habitat types which have suffered a major decline since European settlement and have largely been converted to pasture (SAC, 1991, final rec.).
- Its habitat is threatened by soil disturbance and continuing land clearance. Ploughing is the greatest threat to the survival of the species and it probably only occurs in areas which have never been ploughed (SAC, 1991, final rec.).
- Invasion and competition from weeds threatens the species (Scarlett, 1984)
- Removal of plants and flowers by collectors is also a threat (Scarlett, 1984)

- Fire prevention works, that is, slashing, ploughing and herbicide spraying, have the potential to cause serious damage at several sites (Scarlett, 1984)
- The long term absence of burning may cause the decline of *D. punctata* (Scarlett, 1984)
- Ground disturbance and rubbish dumping associated with vehicle access causes damage to some populations (Scarlett, 1984).
- The species is palatable to mammalian herbivores (VRFAF) but this is not considered to be a major threat (SAC, 1990, nom.). Heavy cattle grazing at some rail reserve sites has significantly reduced numbers of the orchid (Scarlett, 1984).

Rating of Threats:

Disturbance	Rating	Source
Clearing of native vegetation	2	SAC, 1991, final rec.
Fragmentation of native veg.	2	SAC, 1991, final rec.
Lack of fire	1	Scarlett, 1984
Introduced plants	2	Scarlett, 1984
Grazing/trampling	2	SAC, 1990, nom.
Weed control	2	Scarlett, 1984
Deliberate collecting/harvesting	2	Scarlett, 1984
Vandalism/human disturbance	2	Scarlett, 1984
Reproductive problems	2	Scarlett, 1984
Other: slashing, ploughing	2	Scarlett, 1984

Current Management:

Grampians National Park Draft Management Plan (Parks Vic. 1998f):

- ensure that significant plants and communities are adequately protected from recreational activities, planned and unplanned fire, invasion by pest plants, over-grazing by pest animals, and inappropriate management activities, through implementation of the Environmental Action Plan, and the Grampians-Black Range Park Fire Management Plan; undertake distribution mapping and monitoring of endangered and significant endemic species; encourage surveys of and research into significant flora (including rare or threatened species) and plant communities in the Park, and consider that information in all management actions.
 Organ Pipes National Park Draft Management Plan (NRE 1996d):
- finalise a comprehensive list of flora species indigenous to the Park to form the basis for revegetation planting; protect significant flora species in accordance with approved FFG action statements; encourage investigation of ecological burning to facilitate regeneration of woodland communities and grasslands and control of pest plants; develop pest animal control programs.

Midlands Forest Management Area Forest Management Plan (NRE 1996b):

place any State forest populations into the Special Protection Zone; review this action when 10 sites and 1000 individuals have been catered for; finalise Action Statement.

Trailing Hop-bush Family: Sapindaceae

Dodonaea procumbens

Species Characteristics: A low, diffuse or prostrate shrub, glabrous and scarcely viscid. Leaves crowded, linear-cuneate, spathulate or almost triangular, mostly acute and often coarsely 3- to 5-toothed or lobed, 8-15 mm long, 1-nerved. Flowers mostly solitary, on short terminal pedicels. Sepals lanceolate. Style much more frequently elongated than in other species. Capsule oblong, the angles produced into wings rounded at the top and base (Black, 1964 and Bentham, 1967).

Conservation Status:

ROTAP: Vulnerable VROTS: vulnerable FFG: ESP: listed

RESERVATION STATUS			RARITY
% of CRA population in biological with other public land on private land		% Australian population within RFA Region	
20	50	30	0-25

Distribution in Western RFA Region: Grampians National Park (Parks Victoria, 1998f), Deep Lead Education Area, Illawarra State Forest, roadsides in the Skipton and Willaura areas, and on private land (FIS).

Habitat: Grassy woodland with an overstorey of Yellow Gum (*Eucalyptus leucoxylon*) and Yellow Box (*E. melliodora*). Grasses and forbs dominate the understorey (Tumino & Roberts, in prep.).

Life History: Sexual reproduction, with establishment from seed, occurs only occasionally. Asexual reproduction is unknown. Following fire, the species is an obligate seed regenerator; nearly all plants are killed and regeneration is solely from seed stored in the soil pre-fire. Fire promotes germination and establishment. It tolerates occasional major disturbance and requires such disturbance for the rare opportunity to establish and spread, and between such events plants may appear to be absent (VRFAF).

Threatening Processes operating in Western RFA Region:

- unknown
- habitat may be depleted

Rating of Threats:

Disturbance	Rating	Source
Fragmentation of native veg.	1	

Current Management:

Grampians National Park Draft Management Plan (Parks Vic.1998f):

 ensure that significant plants and communities are adequately protected from recreational activities, planned and unplanned fire, invasion by pest plants, over-grazing by pest animals, and inappropriate management activities, through implementation of the Environmental Action Plan, and the Grampians-Black Range Park Fire Management Plan; undertake distribution mapping and monitoring of endangered and significant endemic species; encourage surveys of and research into significant flora (including rare or threatened species) and plant communities in the Park, and consider that information in all management actions.

Black Gum Family: Myrtaceae

Eucalyptus aggregata

Species Characteristics: Tree to 18 m tall; bark rough to the small branches, firm, flaky and fissured. Juvenile leaves shortly petiolate, opposite at first but soon alternate, elliptic to narrowly lanceolate, to 10 cm long, 3 cm wide, dull, green; adult leaves petiolate, alternate, lanceolate to narrowly lanceolate, 6-13 cm long, 1-2 cm wide, concolorous, slightly glossy, green; reticulation dense, with island oil glands. Inflorescences axillary, unbranched; buds pedicellate, ovoid, scar present; operculum obtusely conical. Fruit pedicellate, valves rim level or slightly exserted; seed brown-black, flattened-ellipsoid (Brooker *et al.*, 1996).

Conservation Status:

ROTAP: VROTS: endangered FFG: listed ESP:

RESERVATION STATUS			RARITY
% of CRA population	% of CRA population	% of CRA population	% Australian
in biological in other public land on private land		population within RFA	
conservation reserve			Region
0	30	70	51-75

Distribution in Western RFA Region: Known only from near Woodend, on both public (Macedon Ranges Shire managed roadsides, Council reserves, Western Region Water Authority land, Melbourne-Bendigo rail reserve) and private land (Yugovic, 1997; SAC, 1993, nom.).

Habitat: It grows typically on recent alluvium on floodplains and narrow flats near watercourses. Soils are moist to wet but fairly fertile. Its natural habitat typically comprises open riparian woodland, including Swamp Gum (*Eucalyptus ovata*). The species also occurs in New South Wales (Yugovic, 1997; SAC, 1993, nom.).

Life History: Flowers summer to autumn (Brooker *et al.*, 1996). Sexual reproduction, and establishment from seed. Asexual reproduction is unknown. Following fire, the species is an optional root resprouter; most plants survive and resprout from dormant buds, but there is also significant re-establishment from seed germination. Occasional natural disturbances are tolerated, but regeneration is not dependent on such disturbance (VRFAF).

Threatening Processes operating in Western RFA Region:

- It primarily occurs in remnant vegetation along roadsides and streamsides which are prone to destructive activities (SAC, 1993, final rec.).
- Grazing by sheep and cattle eliminates seedlings (Yugovic, 1997).
- The entire habitat of Black Gum has been altered by extensive weed invasion, which inhibits regeneration (SAC, 1993, final rec.).
- Stream-bank erosion, due to extensive vegetation clearance, causes undermining of trees along streams (Yugovic, 1997).
- Residential development threatens the survival of the species on private land because regeneration is prevented (Yugovic, 1997).
- Future clearance of the species for road modifications may be a threat (SAC, 1993, final rec.).
- The occurrence of this species in remnant stands causes physiological stress and a consequent increased susceptibility to disease and insect attack (SAC, 1993, final rec.).

Rating of Threats:

Disturbance	Rating	Source
Clearing of native vegetation	3	SAC final rec, Yugovic 1997
Fragmentation of native veg.	2	SAC final rec
Introduced plants	2	SAC final rec
Grazing/ trampling	2	Yugovic 1997
Disease	2	SAC final rec
Road/ rail construction/	1	SAC final rec
maintenance		
Other: erosion	2	Yugovic 1997

Yugovic(1997) Action Statement:

- Past management actions: A number of surveys since 1964 in the Woodend area; establishment of two small reserves on public land, woody weed control, rubbish removal and tree planting on the Council reserve on Five Mile Creek.
- Intended management actions: facilitate the natural regeneration of Black Gum on private land by using such schemes as Landcare, Land Protection Incentive Scheme and Land for Wildlife; promote the use of conservation covenants on title; manage roadside stands by controlling weeds, liaise with relevant government service agencies; support Macedon Ranges Shire in establishing Black Gum reserves on Shire land at Five Mile Creek and a management regime for these reserves; ensure that all rail reserves containing Black Gum are listed on the PTC schedule of rare plant reserves; facilitate the natural regeneration of Black Gum through an agreement between NRE and Macedon Ranges Water Authority by fencing trees and creek frontages; investigate the possibility of amending the Macedon Ranges Shire Planning Scheme to take into account conservation measures for Black Gum; community involvement through education in schools and support of schemes such as Botanic Guardians; tree planting; further searches of suitable habitat, monitoring of the populations and establishing databases of sites.

Clover Glycine Family: Fabaceae

Glycine latrobeana

Species Characteristics: Decumbent or ascending herb. Stems short, non-stoloniferous, hairy. Leaves palmately trifoliolate; leaflets sessile to subsessile, those on mature leaves obovate to orbicular, 5-20 mm long, those of immature leaves often elliptic, upper surface glabrous, lower surface silky-strigose; stipules 1.5-2 mm long. Racemes of 3-8 flowers, peduncles mostly 5-10 cm long. Petals deep purple, keel shorter than wings. Pod linear-lanceolate, seeds dark brown (Jeanes, 1996).

Conservation Status:

ROTAP:	Vulnerable
VROTS:	vulnerable
ESP:	listed
FFG:	listed

RESERVATION STATUS			RARITY
% of CRA population in biological conservation reserve	% of CRA population in other public land	% of CRA population on private land	% Australian population within RFA Region
30	10	60	51-75

Distribution in Western RFA Region: It has mostly been recorded from the lowland plains of south-west Victoria through to the Gippsland plains with an extension to Omeo (SAC, 1993, nom.). In the study area it is reserved in Black Range State Park, Brisbane Ranges National Park, Grampians National Park, Lower Glenelg National Park, Port Campbell National Park, Dergholm State Park and Inverleigh Common Flora Reserve (Parks Victoria, 1998a,c,f; NRE, 1996c; DCE, 1991a; VrotPop). There are scattered occurrences on road and rail reserves and private land. Also occurs in South Australia, New South Wales and Tasmania (Jeanes, 1996).

Habitat: Across the State the species occurs in grassland, grassy woodland, grassy heath and occasionally sclerophyll scrub woodland. Soil types vary, but are mainly of high to moderate fertility. It is found predominantly at low elevations. There is a wide range in annual rainfall, with a maximum in Spring. (Scarlett, 1984).

Life History: Perennial. Little is known of its biology. Flowering is in summer (Scarlett, 1984). Sexual reproduction, and subsequent establishment from seeds. Natural disturbances are tolerated, but regeneration is not dependent on such disturbance. Following fire, the species is an obligate seed regenerator, with all plants being killed, and regeneration is solely from seed (VRFAF). Ecological burns are preferable in autumn, no more frequently than once every 5 years (Scarlett, 1984).

Threatening Processes operating in Western RFA Region:

- *G. latrobeana* has suffered severe depletion throughout its range, as a result of land clearance, cultivation and overgrazing (SAC, 1994, final rec.).
- Roadside stands are at risk from disturbance caused by firebreak ploughing and slashing (SAC, 1993, nom.).
- Populations on some public land blocks are potentially threatened by trail bikes and cars (SAC, 1993, nom.).
- Inappropriate burning regimes threaten the species because it is very susceptible to regular late spring- early summer burning which destroys flowers and seeds (Scarlett 1984).
- Heavy grazing pressure from kangaroos and rabbits is affecting regeneration of the species at some sites (VrotPop).

Rating of Threats:

Disturbance	Rating	Source
Clearing of native vegetation	2	SAC, 1994, final rec.
Fragmentation of native veg.	2	SAC, 1994, final rec.
Unplanned fire	2	Scarlett, 1984
Introduced animals	2	SAC, 1993, nom.
Grazing/trampling	2	Scarlett, 1984, SAC, 1993, nom
Road/rail	2	SAC, 1994, nom.
construction/maintenance		
Recreation	1	SAC, 1994, nom.

NRE monitoring

Black Range State Park Management Plan (Parks Vic.1998a):

Encourage surveys and research on significant flora and plant communities in the Park, and consider that information in all management actions; encourage ongoing research and undertake monitoring in vegetation communities to identify ecologically-based fire prescriptions; control, and where possible eradicate, pest plants and animals, and prevent the entry of Cinnamon Fungus to the Park.

Brisbane Ranges National Park Draft Management Plan (NRE 1996c):

Continue to record location and status data for threatened species and consider that information in all management actions; encourage research into the location and ecology of threatened species; initiate surveys and research into the effects of fire on threatened species; minimise the spread of Cinnamon Fungus in all management activities; prepare a pest plants and animal control strategy

Grampians National Park Draft Management Plan (Parks Vic. 1998f)

Ensure that significant plants and communities are adequately protected from recreational activities, planned and unplanned fire, invasion by pest plants, over-grazing by pest animals, and inappropriate management activities, through implementation of the Environmental Action Plan, and the Grampians-Black Range Park Fire Management Plan; undertake distribution mapping and monitoring of endangered and significant endemic species; encourage surveys of and research into significant flora (including rare or threatened species) and plant communities in the Park, and consider that information in all management actions.

Lower Glenelg National Park Management Plan (DCE 1991a)

Protect and manage identified threatened species: train Park staff to undertake monitoring programs; conduct surveys to determine the distribution and abundance of rare or threatened species in the Park; prepare improved management prescriptions based on detailed ecological study for rare or threatened plants species; maintain the natural influence of fires on ecological processes; monitor, control, and where possible eradicate introduced plants and animals, and isolate any Cinnamon Fungus occurrence in the Park.

Port Campbell National Park and Bay Of Islands Coastal Park Management Plan (1998h).

Monitor threatened plant populations and significant sites using the monitoring system VrotPop, in conjunction with NRE, Friends groups and naturalists; monitor populations of plants susceptible to collecting by fanciers, and in conjunction with NRE take necessary steps to prevent collecting; encourage research on significant plant species and communities; identify, map and protect as necessary, sites of botanical significance in the Parks; actively manage vegetation to retain habitat and community diversity by giving priority to the control of pest plants and the implementation of ecologically appropriate fire regimes; ensure that records of all significant species in the Parks are incorporated into the Flora Information System; ensure that the potential impacts on flora of any future developments in the Parks are fully assessed in the planning phase, are avoided or minimised by appropriate siting and design, and undertake necessary surveys at appropriate times of year to ensure seasonal species are identified; protect Clover Glycine populations from grazing by rabbits, and manage the populations either with fire or slashing of vegetation until Action Statement is prepared.

Dergholm State Park and Mt Arapiles-Tooan State Park (Tooan Block) Management Plan (Parks Vic. 1998c):

• Dergholm State Park - actively manage vegetation communities to retain habitat and community diversity by giving priority to the control of pest plants and adopting appropriate fire regimes; protect sites of botanical significance, and encourage ongoing monitoring of these areas.

Midlands Forest Management Area Forest Management Plan (NRE 1996b):

• include State forest populations in the Special Protection Zone; review this action when 10 sites and 1000 individuals have been catered for.

Drooping Grevillea Family: Proteaceae

Grevillea floripendula

Species Characteristics: Spreading decumbent to semi-prostrate shrub, 0.3-1 m high. Leaves pinnatisect or occasionally pinnatifid, 2-6.5 cm long, 1.5-4 cm wide, with 5-9 primary lobes; lower surface with an indumentum of curly hairs; margins shortly recurved. Inflorescences terminal, usually simple, 3-5.5 cm long; rachises tomentose; outer surface of perianth greenish to mauve, inner surface mauve-maroon to blackish. Fruits densely covered in appressed hairs, with longitudinal brown stripes (Makinson, 1996).

Conservation Status: ROTAP: Rare VROTS: vulnerable FFG: listed ESP:

RESERVATION STATUS			RARITY
% of CRA population in biological conservation reserve	% of CRA population in other public land	% of CRA population on private land	% Australian population within RFA Region
20	50	30	76-100

Distribution in Western RFA Region: Restricted to north of Beaufort, in Ben Major Forest Reserve, near Troy's Reservoir, above Cockney Gully, State Forest near Musical Gully Reservoir, Mount Ben Major and Grampians National Park (Smith, 1981; SAC, 1995, nom.; Parks Victoria, 1998f).

Habitat: Ordovician rock, forming shallow clay soils with guartz fragments and outcrops near surface. Dry woodland communities with Broad-leaf Peppermint (Eucalyptus dives), Long-leaf Box (E goniocalyx), and Messmate (E obligua) dominant. Common understorey species include Thin-leaf Wattle (Acacia aculeatissima), Common Correa (Correa reflexa), Bitter Peas (Daviesia spp.), Common Heath (Epacris impressa) and Trailing Goodenia (Goodenia lanata) (Smith, 1981; SAC, 1995, nom.).

Life History: Flowers October to December (Makinson, 1996). Sexual reproduction, and subsequent establishment from seeds only. Following fire, the species is an obligate seed regenerator; nearly all plants are killed by fire, and regeneration is solely from seed stored in the canopy or soil for a short time. Natural disturbances are tolerated, but regeneration is not dependent on such disturbance (VRFAF).

Threatening Processes operating in Western RFA Region:

The species may require a specific regime of disturbance, and inappropriate fire regimes may be a threat (SAC, 1997, final rec.).

Rating of Threats:

Disturbance	Rating	Source
Unplanned fire	1	SAC final rec

Current Management:

Grampians National Park Draft Management Plan (Parks Vic. 1998f):

ensure that significant plants and communities are adequately protected from recreational activities, planned and unplanned fire, invasion by pest plants, over-grazing by pest animals, and inappropriate management activities, through implementation of the Environmental Action Plan, and the Grampians-Black Range Park Fire Management Plan; undertake

distribution mapping and monitoring of endangered and significant endemic species; encourage surveys of and research into significant flora (including rare or threatened species) and plant communities in the Park, and consider that information in all management actions; Midlands Forest Management Area Forest Management Plan (NRE 1996b):

• avoid disturbance to known populations within the Special Management Zone and General Management Zone; the species and its regeneration is well catered for in legislated conservation reserves within the FMA.

Anglesea Grevillea Family: Proteaceae

Grevillea infecunda

Species Characteristics: Open, root-suckering shrub, 0.3-1.2 m high. Leaves pinnatifid, 5-11lobed, ovate or rhombic to oblong, 3-7 cm long, 1.3-4 cm wide; lobes spreading, triangular to rounded, 6-15 mm long, 7-10 mm wide. Conflorescences terminal or axillary, more or less erect, simple, 2-4 cm long; rachises tomentose, glabrous inside; pistil 18-26 mm long. Fruits not known (Makinson, 1996).

Conservation Status:

ROTAP: Vulnerable VROTS: vulnerable FFG: ESP: listed

RESERVATION STATUS			RARITY
% of CRA population	% of CRA population	% of CRA population	% Australian
in biological in other public land on private land		on private land	population within RFA
conservation reserve			Region
60	30	10	76-100

Distribution in Western RFA Region: A Victorian endemic now confined to hilly country in the Anglesea area (Makinson, 1996), and reserved in Angahook-Lorne State Park (Parks Victoria, 1999). It also occurs in the Alcoa lease and in State Forest (DCE, 1992a).

Habitat: Grows in dry sclerophyll forest or woodland, usually in sandy or gravelly soils (Makinson, 1996). Messmate (E obligua) is the dominant tree.

Life History: Flowers October to December (Makinson, 1996). Sexual reproduction unknown. Asexual reproduction and establishment occurs commonly. Following fire, the species is an obligate root resprouter, many plants survive and resprout from dormant buds, and there is minimal re-establishment from seed. Occasional natural disturbance is tolerated, but regeneration is not dependent on such disturbance (VRFAF).

Threatening Processes operating in Western RFA Region:

- Uncontrolled motor-bike use is causing ground disturbance where the species occurs at the edge of tracks
- Roadworks can damage plants near tracks
- Timing and frequency of fire may not be appropriate
- Firewood collection is a potential threat
- Gravel extraction is a potential threat

Rating of Threats:

Disturbance	Rating	Source
Firewood collection	1	
Unplanned fire	1	
Road/ rail construction/ maintenance	2	
Recreation	2	
Mining/ quarrying	1	

Current Management:

NRE monitoring

Angahook- Lorne State Park Draft Management Plan (Parks Vic. 1999):

 encourage and support surveys and research on significant plant species and communities; prepare a vegetation map to facilitate future ecological management; collate and document botanical knowledge of local interest groups and educational institutions; identify, map and protect as necessary sites of botanical significance in the Park; monitor plant populations using VrotPop; control pest plants and fungal pathogens; implement ecologically appropriate fire regimes.

Otway Forest Management Area Forest Management Plan (DCE 1992a):

 ensure hygiene measures are undertaken to minimise the spread of diseases such as Cinnamon Fungus; monitor all known occurrences of this species and encourage research into its ecology; permit limited minor forest produce operations in areas within the production zone where this species occurs, provided a majority of existing plants are shown not to be adversely affected and there is clear evidence of adequate regeneration; undertake surveys to determine the full distribution of this species in the Otways.

Mt William Grevillea

Grevillea williamsonii

Family: Proteaceae

Species Characteristics: Spreading shrub, 0.6-1.5 m high. Leaves elliptic, 1.5-2(-4) cm long, 0.3-0.8 cm wide, entire or (usually on juveniles) with 1-4 spreading simple triangular teeth or lobes with lateral veins very prominent. Inflorescences terminal on short lateral branchlets or axillary, usually simple. Fruit sparsely silky with reddish stripes (Makinson, 1996).

Conservation Status:

ROTAP: Endangered VROTS: endangered FFG: ESP: listed

RESERVATION STATUS RARITY			RARITY
% of CRA population	% of CRA population	% of CRA population	% Australian
in biological	in other public land	on private land	population within RFA
conservation reserve			Region
50	0	50	76-100

Distribution in Western RFA Region: Endemic to the southern part of the Grampians National Park (Makinson, 1996) and private land (FIS).

Habitat: Grows in rich heathy shrubland and Brown Stringybark (Eucalyptus baxteri) woodland on poor grey sand soil (Makinson, 1996).

Life History: Flowers around August to November (Makinson, 1996). Sexual reproduction and asexual reproduction is unknown. Following fire, the species is an obligate seed regenerator: nearly all plants are killed and regeneration is solely from seed stored in the soil pre-fire. Fire promotes germination and establishment. Occasional natural disturbances are tolerated, but regeneration is not dependent on such disturbance (VRFAF).

Threatening Processes operating in Western RFA Region:

- Infection by the fungus *Phytophthora cinnamomi* is possible
- Trampling by visitors
- Illegal collecting
- Lack of recruitment due to small population size
- Unsuitable fire regimes

Rating of Threats:

Disturbance	Rating	Source
Unplanned fire	2	
Disease	2	
Deliberate collecting/ harvesting	3	
Vandalism/ human disturbance	2	
Reproductive problems	2	

Current Management:

Grampians National Park Draft Management Plan (Parks Vic. 1998f):

ensure that significant plants and communities are adequately protected from recreational activities, planned and unplanned fire, invasion by pest plants, over-grazing by pest animals, and inappropriate management activities, through implementation of the Environmental Action Plan, and the Grampians-Black Range Park Fire Management Plan; undertake distribution mapping and monitoring of endangered and significant endemic species;

encourage surveys of and research into significant flora (including rare or threatened species) and plant communities in the Park, and consider that information in all management actions.

Slender Club-sedge Family: Cyperaceae

Isolepis congrua

Species Characteristics: Small tufted annual. Culms filiform, to 20 cm high. Leaf-blades to 9 cm long. Spikelets 1-5 per inflorescence, 3-5 mm long; involucral bract erect to spreading, exceeding inflorescence, to 15 mm long; glumes acute; stamen 1; style 3-fid. Nut glistening, dark red-brown to dark grey, from one-third to one-half as long as glume (Wilson, 1994).

Conservation Status:

ROTAP: VROTS: vulnerable FFG: listed ESP:

RESERVATION STATUS			RARITY
% of CRA population	% of CRA population	% of CRA population	% Australian
in biological	in other public land	on private land	population within RFA
conservation reserve			Region
80	20	0	0-25

Distribution in Western RFA Region: Jilpanger Flora and Fauna Reserve, Deep Lead Flora and Fauna Reserve, a road reserve at Cherrypool and near Dadswell's Bridge. Outside the study area it has been recorded in Flora and Fauna reserves near St Arnaud and Donald, in Murray-Kulkyne National Park and Warby Range State Park, and at Puckapunyal (SAC, 1996, nom.; SAC, 1997, final rec.). Also found in Western Australia, South Australia, Northern Territory and New South Wales (Wilson, 1994).

Habitat: Seasonally wet habitats including River Red Gum (*Eucalyptus camaldulensis*) swamps, grassy wetlands and Yellow Gum (*Eucalyptus leucoxylon*) woodland (SAC, 1996, nom.).

Life History: Flowers in spring (Wilson, 1994). Sexual reproduction, and establishment from seed. Asexual reproduction is unknown. It tolerates occasional major disturbance and requires such disturbance for the rare opportunity to establish and spread, and between such events plants may appear to be absent. The species occurs in habitats not normally subject to fire (VRFAF).

Threatening Processes operating in Western RFA Region:

• Possible threats posed by alteration to its wetland habitat by changes in hydrology or trampling by introduced stock (SAC, 1997, final rec.).

Rating of Threats:

Disturbance	Rating	Source
Grazing/ trampling	1	SAC final rec
Dams/ alteration to water regimes	1	SAC final rec

Current Management:

Wrinkled Buttons Family: Asteraceae

Leptorhynchos gatesii

Species Characteristics: Short-lived perennial, 10-20 cm high; stems branched at or near base, ascending, white-cottony. Leaves linear to narrow-oblanceolate, 2-5 mm long, 1-4 mm wide, acute, upper surface with scattered hairs, lower surface densely cottony, margins undulate. Capitula c. 1-1.5 cm diam.; outer involucral bracts linear, acuminate , golden, lower margins cottony-ciliate; inner bracts linear, herbaceous and cottony-ciliate, tip golden, laciniate; florets yellow. Cypselas oblong-quadrangular, c. 1-1.5 mm long, glabrous; pappus white, bristles 16-24 (Walsh, unpub.).

Conservation Status:

ROTAP: Vulnerable VROTS: vulnerable FFG: listed ESP: listed

RESERVATION STATUS			RARITY
% of CRA population in biological conservation reserve	% of CRA population in other public land	% of CRA population on private land	% Australian population within RFA Region
50	20	30	76-100

Distribution in Western RFA Region: Angahook/Lorne State Park, State Forest near Lorne (SAC, 1997, final rec.) and private land (FIS). Endemic in Victoria.

Habitat: Most plants are growing on black ash soil resulting from wildfire. It occurs in an open forest of Scentbark (*Eucalyptus aromaphloia*) and Red Ironbark (*E. tricarpa*), with an understorey of Thatch Saw-sedge (*Gahnia radula*) and Varnish Wattle (*Acacia verniciflua*). Sites have a mean annual rainfall of 730 mm, are near ridge tops and have loamy soils on mudstones. It sometimes occurs in Messmate (*Eucalyptus obliqua*) – Mountain Grey Gum (*E. cypellocarpa*) open forest with a dense understorey commonly including Bootlace Bush (*Pimelea axiflora*) and Forest Wire-grass (*Tetrarrhena juncea*) (Scarlett, 1984).

Life History: Flowers from December to July (SAC, 1996, nom.). Sexual reproduction, with establishment from seed, occurs only occasionally. The species is an obligate seed regenerator; nearly all plants are killed by fire, and regeneration is solely from seed stored in the canopy or in the soil for a short time pre-fire. It tolerates occasional major disturbance and requires such disturbance for the rare opportunity to establish and spread (VRFAF).

Threatening Processes operating in Western RFA Region:

- Inappropriate fire management (including fire frequency, intensity and season) could threaten the species' survival (SAC, 1997, final rec.).
- Majority of populations recorded near tracks, and track maintenance and widening may have an impact on the species (SAC, 1997, final rec.).
- The species is a post-fire pioneer and is likely to disappear a few years after fire due to competition from other species (Scarlett, 1984).

Disturbance	Rating	Source
Unplanned fire	2	SAC, 1997, final rec.
Road/ rail construction/	2	SAC, 1997, final rec.
maintenance		
Other: native plant competition	1	Scarlett, 1984

Rating of Threats:

Angahook-Lorne State Park Management Plan (Parks Vic. 1999)

- Wrinkled Buttons: protect and monitor populations
- Rare or threatened species: encourage surveys and research on significant plant species and their ecology; document known sites; monitor threatened plant populations; identify priority weed control areas including habitats of significant species; control key invasive plants and animals; promote habitat of threatened species using fire; encourage research into ecological burning requirements.

Otway Forest Management Area Forest Management Plan (DCE 1992a):

• monitor all sites where this species has been recorded, especially those harvested or burnt by wildfire, to determine conditions required to stimulate the germination of soil-stored seed and regeneration of this species and develop special management prescriptions accordingly.

Velvet Daisy-bush Family: Asteraceae

Olearia pannosa ssp. cardiophylla

Species Characteristics: Spreading, tuberous-rooted shrub to c. 1 m high; branchlets and leaf undersurfaces buff-coloured, woolly with Y-shaped hairs. Leaves alternate, ovate or cordate, 30-120 mm long, 18-65 mm wide, obtuse, flat, upper surface green, finally glabrous or remaining woolly about the midrib, with impressed reticulate venation. Capitula 35-75 mm diam., terminal and solitary; peduncles c. 5-25 cm long; involucre hemispherical, 15-21 mm long; bracts 3-6, seriate, graduating, woolly. Ray florets 8-18, white, ligules 18-45 mm long; disc florets c. 30-60, yellow. Cypsela cylindric, 8-10 ribbed, pubescent, often reddish; pappus bristles pale to rusty (Walsh, unpub.).

Conservation Status: ROTAP: Rare VROTS: vulnerable FFG: listed ESP:

RESERVATION STATUS			RARITY
% of CRA population in biological conservation reserve	% of CRA population in other public land	% of CRA population on private land	% Australian population within RFA Region
60	10	30	26-50

Distribution in Western RFA Region: The majority of sites are in and around the Brisbane Ranges, in the National Park, on road reserves and private property. There are also sites at Point Addis near Anglesea. Outside the study area the species occurs near Wedderburn and Nagambie. One population also in South Australia (SAC, 1994, nom.; Wisnieswski et al., 1987).

Habitat: It is found on shallow, rocky soils in woodlands and open-forest, where mean annual rainfall ranges from 600 to 650 mm. At the Brisbane Ranges sites Red Stringybark (*Eucalyptus macrorhyncha*) is always present. Other associations include Golden Wattle (*Acacia pycnantha*) and Austral Grass-tree (*Xanthorrhoea australis*) (SAC, 1994, nom.; Wisnieswski et al., 1987). It grows in coastal woodland at Angelsea (Walsh, unpubl.).

Life History: Flowers September to November (Walsh, unpub.). Sexual reproduction, and establishment from seed. Asexual reproduction is unknown. Following fire, the species is an optional root resprouter; most plants survive and resprout from dormant buds, but there is also a significant re-establishment from seed. Occasional natural disturbances are tolerated, but regeneration is not dependent on such disturbance (VRFAF).

Threatening Processes operating in Western RFA Region:

- Road-works (SAC, 1995, final rec.).
- Browsing by native and introduced animals (SAC, 1995, final rec.).
- Insect attack (SAC, 1995, final rec.).
- Weed competition (SAC, 1995, final rec.).
- Infection by Phytophthora cinnamomi (SAC, 1995, final rec.).
- Wildflower picking (SAC, 1995, final rec.).
- Rubbish dumping (SAC, 1995, final rec.).
- Erosion (SAC, 1995, final rec.).

Rating of Threats:

Disturbance	Rating	Source
Introduced plants	2	SAC final rec

Grazing/ trampling	2	SAC final rec
Disease	2	SAC final rec
Road/ rail construction/	2	SAC final rec
maintenance		
Deliberate collecting/ harvesting	2	SAC final rec
Vandalism/ human disturbance	2	SAC final rec

Steiglitz Historic Park Management Plan (CNR 1996):

• manage Flora and Fauna Guarantee listed flora according to approved action statements; develop and implement a monitoring program for significant species; Encourage research into appropriate management strategies; minimise disturbance to roadside vegetation; control pest plants; liaise with the Golden Plain Shire to protect vegetation on adjoining freehold land.

Gorae Leek-orchid Family: Orchidaceae

Prasophyllum diversiflorum

Species Characteristics: Leaf single, terete, to 45 cm long, erect, slender, brownish green with a reddish base; free section usually withered by flowering time. Flower stem to 60 cm tall. Flowers 10 to 40, to 10 mm across, fragrant, arranged in an open to congested spike; greenish brown with reddish tonings, labellum white to pinkish with crisped margins, callus green (Backhouse & Jeanes, 1995).

Conservation Status:

ROTAP: Endangered VROTS: endangered FFG: listed ESP: listed

RESERVATION STATUS			RARITY
% of CRA population	% of CRA population	% of CRA population	% Australian
in biological in other public land		on private land	population within RFA
conservation reserve			Region
k	k	k	76-100

Distribution in Western RFA Region: Endemic to Victoria and only known from near Portland (SAC, 1993, nom.) on road reserves, private land, state forest and a flora reserve.

Habitat: Seasonally inundated floodplains of watercourses, with moist black loamy soils. It grows amongst grasses, sedges and low herbaceous plants, and trees may be present (SAC, 1993, nom.). Open tussock grassland dominated by Kangaroo Grass (Themeda triandra) and Common Tussock-grass (Poa labillardieri) Average annual rainfall about 750 mm (Scarlett, 1984).

Life History: All species of Prasophyllum are deciduous. Plants are dormant during summer and sprout after good autumn rains to form a short, filiform leaf. P diversiflorum flowers in December and January (Backhouse & Jeanes, 1995). Species of Prasophyllum are mainly pollinated by bees and wasps which are attracted to the flower by perfumes and nectar released from the labellum. Many other insects are also attracted to the flowers and some of these probably contribute to pollination of the flowers (Jones, 1988). In response to fire this species is an optional root resprouter where most plants survive fire and resprout from underground tubers, in addition to a significant re-establishment from seed germination. It requires long periods without major disturbance for survival and establishment (VRFAF).

Threatening Processes operating in Western RFA Region:

- Its extreme rarity makes it susceptible to unpredictable catastrophes (SAC, 1993, final rec.).
- The roadside verge is threatened by road realignment, widening and works associated with a nearby bridge (SAC, 1993, final rec.) and changed water regimes.
- The plants on private property are threatened by heavy grazing and trampling by sheep (SAC, 1993, final rec.).
- Weed invasion, especially by pasture grasses such as Phalaris aquatica (SAC, 1993, final rec.).
- Drainage works and soil disturbance from use of heavy machinery involved in forestry operations.
- Plant collection is a potential threat (Scarlett, 1984)

Rating of Threats:

Disturbance	Rating	Source
Fragmentation of native veg.	3	SAC final rec

Introduced plants	2	SAC final rec
Grazing/ trampling	3	SAC final rec
Road/ rail construction/	3	SAC final rec
maintenance		
Deliberate collecting/ harvesting	1	Scarlett 1984
Dams/ alteration to water regimes	2	

Fitzgerald's Leek-orchid Family: Orchidaceae

Prasophyllum fitzgeraldii

Species Characteristics: Leaf single, terete, to 40 cm long, erect, slender, green, reddish at base; free section to 20 cm long, erect and non-sheathing, tip often withered by flowering time. Flower stem to 50 cm tall, slender, green. Flowers ten to thirty, to 8 mm across, fragrant, arranged in a moderately dense spike; green with brownish striations and suffusions, labellum lamina pink to purplish, sometimes white, callus green with pink margins (Backhouse & Jeanes, 1995).

Conservation Status: ROTAP: VROTS: endangered FFG: listed ESP:

RESERVATION STATUS			RARITY
% of CRA population in biological conservation reserve	% of CRA population in other public land	% of CRA population on private land	% Australian population within RFA Region
k	k	k	51-75

Distribution in Western RFA Region: Found primarily around the northern Grampians-Stawell area, with a single doubtful record east of Portland. It occurs on unprotected public land, conservation reserves and private land. It also occurs in South Australia (SAC, 1996, nom.).

Habitat: Heathy woodlands, with Brown Stringybark (*Eucalyptus baxteri*), Yellow Gum (*Eucalyptus leucoxylon*) or Long-leaf Box (*Eucalyptus goniocalyx*) forming an open canopy. The heathy understorey commonly includes Daphne Heath (*Brachyloma daphnoides*) and Common Fringe-myrtle (*Calytrix tetragona*). A dense herbaceous layer is typical (SAC, 1996, nom.).

Life History: All species of *Prasophyllum* are deciduous. Plants are dormant during summer and sprout after good autumn rains to form a short, filiform leaf. *P fitzgeraldii* flowers from September to November (Backhouse & Jeanes, 1995). Species of *Prasophyllum* are mainly pollinated by bees and wasps which are attracted to the flower by perfumes and nectar released from the labellum. Many other insects are also attracted to the flowers and some of these probably contribute to pollination of the flowers (Jones, 1988). In response to fire this species is an obligate root resprouter where many plants survive fire and resprout from underground tubers, with minimal re-establishment from seed germination. It requires long periods without major disturbance for survival and establishment (VRFAF).

Threatening Processes operating in Western RFA Region:

- Potential threats from mineral exploration or extraction (SAC, 1995, final rec.).
- Inappropriate fire regime may be a threat, because autumn burning is needed to reduce competition (SAC, 1995, final rec.; VrotPop).
- Damage from trampling and illegal collection may threaten the species (SAC, 1995, final rec.).
- Sites are accessible to vehicles (VrotPop)

Disturbance	Rating	Source	
Unplanned fire	2	SAC final rec	
Mining/ quarrying	2	SAC final rec	
Deliberate collecting/ harvesting	2	SAC final rec	

Rating of Threats:

Maroon/ Slaty Leek-orchid Family: Orchidaceae

Prasophyllum frenchii

Species Characteristics: Terrestrial geophyte. Leaf single, terete, to 60 cm long, erect, green with a purplish base. Flower stem to 60 cm tall, slender to stout, green to reddish-green. Flowers 20-60, sub-sessile, to 8 mm across, fragrant, arranged in a relatively dense spike; colour variable, usually greenish with reddish tonings to almost entirely reddish. Recognised by its dark flowers with short, broad perianth segments (Backhouse & Jeanes, 1995).

Conservation Status:

ROTAP:	Vulnerable
VROTS:	endangered
FFG:	listed
ESP:	listed

RESERVATION STATUS			RARITY
% of CRA population	% of CRA population	% of CRA population	% Australian
in biological	in other public land	on private land	population within RFA
conservation reserve			Region
k	k	k	26-50

Distribution in Western RFA Region: near Winchelsea (SAC, 1996, nom), Discovery Bay Coastal Park, Angahook-Lorne State Park (Parks Victoria, 1998d,1999) and Otway State Forest (DCE, 1992a), rail and road reserves on the basalt plains (FIS). Widespread, disjunct occurrence across southern Victoria. It is also found in South Australia (Backhouse & Jeanes, 1995; Willis, 1970).

Habitat: Scattered through cooler parts of Victoria both in sandy coastal heathlands and more open inland forest tracts (Willis, 1970). Found mostly as loose colonies in grasslands, heathlands and grassy woodlands on moderately rich sandy and black clay loams (Backhouse & Jeanes, 1995).

Life History: All species of *Prasophyllum* are deciduous. Plants are dormant during summer and sprout after good autumn rains to form a short, filiform leaf. *P. frenchii* flowers from October to December. Species of *Prasophyllum* are mainly pollinated by bees and wasps which are attracted to the flower by perfumes and nectar released from the labellum. Many other insects are also attracted to the flowers and some of these probably contribute to pollination of the flowers (Jones, 1988). It requires occasional ('natural') disturbance for regeneration, establishment and spread. Between such events the plants may appear to be absent. In response to fire this species is an optional root resprouter where most plants survive fire and resprout from underground tubers, in addition to a significant re-establishment from seed germination (VRFAF).

Threatening Processes operating in Western RFA Region:

- Historically, *Prasopyllum frenchii* has declined in abundance and distribution because of habitat destruction and grazing. Most of its former habitat, especially native grasslands and grassy woodlands on fertile plains has been affected by agricultural uses (SAC, 1996, nom.).
- Weed invasion from surrounding agricultural land and grazing are threats to the species (SAC, 1997, final rec., SAC, 1996, nom.).
- Sites are prone to soil disturbance caused by maintenance work and ploughing for fire hazard management (SAC, 1997, final rec., SAC, 1996, nom.).
- Changes in fire hazard management on road and rail reserves from controlled burning to spraying has contributed to the decline of the species (SAC, 1996, nom.).
- It occurs on road and rail reserves which are insecure for nature conservation (SAC, 1996, nom.).

• Rabbit grazing threatens the species.

Nating of Theats.		
Disturbance	Rating	Source
Clearing of native vegetation	2	SAC, 1996, nom.
Fragmentation of native veg.	3	SAC, 1996, nom.
Lack of fire	2	SAC, 1996, nom.
Introduced plants	3	SAC, 1997, final rec.
Grazing/trampling	2	SAC, 1996, nom.
Weed control	2	SAC, 1997, final rec.
Road construction/maintenance	3	SAC, 1997, final rec.
Other:ploughing	2	SAC, 1997, final rec.

Rating of Threats:

Current Management:

Angahook-Lorne State Park Management Plan (Parks Vic. 1999)

• Rare or threatened species: encourage surveys and research on significant plant species and their ecology; document known sites; monitor threatened plant populations; identify priority weed control areas including habitats of significant species; control key invasive plants and animals; promote habitat of threatened species using fire; encourage research into ecological burning requirements.

Discovery Bay Parks Draft Management Plan (Parks Vic. 1998d)

Rare or threatened species: document locations; investigate ecological requirements; monitoring; implement vegetation modification to improve habitats; survey sites where changes in maintenance or construction are planned; pest plant and animal control.
 Otway: Ecrect Management Area Ecrect Management Plan. (DCE 1992a);

Otway Forest Management Area Forest Management Plan (DCE 1992a):

 Rare or threatened species: develop and maintain a flora database using the GIS giving the location of species of National, State and Regional significance; promote research into the ecology and reproductive biology of significant plant species; incorporate VROTS occurrences into the Conservation Zone, as appropriate, manage occurrences of VROTS outside the Conservation Zone.

Pomonal Leek-orchid Family: Orchidaceae

Prasophyllum subbisectum

Species Characteristics: Leaf single, terete, to 15 cm long, erect, thin, slender, green, reddish at base; free section to 5 cm long, erect and non-sheathing, withered by flowering time. Flower stem to 30 cm tall, slender, brownish. Flowers six to fifteen, to 6 mm across, non-scented, arranged in a loose open spike; brown with some green tonings, petals with a brown stripe, labellum lamina pale greenish to pinkish, callus green (Backhouse & Jeanes, 1995).

Conservation Status:

ROTAP: Endangered VROTS: endangered FFG: listed ESP: listed

RESERVATION STATUS			RARITY
% of CRA population	% of CRA population	% of CRA population	% Australian
in biological	in other public land	on private land	population within RFA
conservation reserve			Region
100	0	0	76-100

Distribution in Western RFA Region: Recorded from two localities near Stawell and the Grampians on public land SAC, 1993, nom.). Endemic (Backhouse & Jeanes, 1995).

Habitat: Damp, clayey soil which is somewhat stony. A woodland dominated by Yellow Gum (*Eucalyptus leucoxylon*). The understorey has areas of low herbs and grasses and areas of low dense heathland (SAC, 1993, nom.).

Life History: All species of *Prasophyllum* are deciduous. Plants are dormant during summer and sprout after good autumn rains to form a short, filiform leaf. *P subbisectum* flowers in October and November (Backhouse & Jeanes, 1995). Species of *Prasophyllum* are mainly pollinated by bees and wasps which are attracted to the flower by perfumes and nectar released from the labellum. Many other insects are also attracted to the flowers and some of these probably contribute to pollination of the flowers (Jones, 1988). In response to fire this species is an optional root resprouter where most plants survive fire and resprout from underground tubers, in addition to a significant re-establishment from seed germination. It requires long periods without major disturbance for survival and establishment (VRFAF).

Threatening Processes operating in Western RFA Region:

- Weed invasion is a current threat (SAC, 1993, final rec.).
- Predation of tubers by introduced herbivores, especially rabbits (SAC, 1993, final rec.).
- The area is potentially subject to mineral exploration and mining which could threaten the survival of the colony by the removal of topsoil, disturbance by heavy machinery and dumping of tailings or alteration of drainage patterns (SAC, 1993, final rec.).
- The extreme rarity of the species makes it vulnerable to catastrophic events (SAC, 1993, final rec.).

Disturbance	Rating	Source
Fragmentation of native veg.	2	SAC final rec
Introduced animals	3	SAC final rec
Introduced plants	3	SAC final rec
Mining/ quarrying	2	SAC final rec

Rating of Threats:

Leafy Greenhood Family: Orchidaceae

Pterostylis cucullata

Species Characteristics: Terrestrial geophyte. Leaves 3-7 in a ground-hugging, stemencircling basal rosette, ovate to elliptic, 4-10 cm long, 1.5-2 cm wide, dark green, petiole short. Flower stem to 20 cm tall, stout, fleshy, with several large, elliptical stem leaves, the uppermost often ensheathing base of flower. Flower solitary, to 40 mm long, white and green, heavily

suffused with red-brown (Jones, 1994; Backhouse & Jeanes, 1995).

Conservation Status:

ROTAP:	Vulnerable
VROTS:	vulnerable
FFG:	listed; Action Statement
ESP:	listed

RESERVATION STATUS			RARITY
% of CRA population	% of CRA population	% of CRA population	% Australian
in biological	in other public land	on private land	population within RFA
conservation reserve			Region
k	k	k	k

Distribution in Western RFA Region: Reserved populations occur at Oxbow Lake near Nelson, within Discovery Bay Coastal Park (Parks Vic. 1998d) and Otway National Park (NRE, 1996g). Unreserved sites are on private land at Bridgewater Lake, Bridgewater Bay and Cape Otway (SAC, 1989, nom.). Elsewhere the species is scattered across southern coastal Victoria and extends into montane areas of the Eastern Highlands and East Gippsland. It also occurs in South Australia, Tasmania and New South Wales (Backhouse & Jeanes, 1995).

Habitat: The typical habitat of coastal populations is stabilised sand dunes under open to closed scrub of Coast Tea-tree (*Leptospermum laevigatum*) or Moonah (*Melaleuca lanceolata*) with an open ground stratum. Sites are usually sheltered, with seasonally damp but well-drained humusrich loams, often with moss and deep leaf litter (Scarlett, 1984). At Cape Otway the species occurs in coastal woodland dominated by Manna Gum (*Eucalyptus viminalis*) and Austral Bracken (*Pteridium esculentum*) (SAC, 1989, nom.). Elsewhere this species grows in a variety of vegetation and soil types as it ranges from stabilised coastal sand dunes to montane areas (Bramwells, 1993).

Life History: *P. cucullata* is summer-deciduous, dying back after flowering to a fleshy rounded tuberoid. Several extra tuberoids may also be produced. It remains dormant underground for one of the longest periods of any Greenhood species. In Victoria the taxon displays two distinct behaviours associated with distribution: inland and coastal. Plants in coastal populations appear above ground from late autumn to early winter and commence flowering towards the end of winter, whilst the inland populations emerge later in winter and commence flowering in spring (Bramwells, 1993). Asexual reproduction and establishment occurs commonly. 'Natural' disturbances, such as fires, floods, or occasional browsing/grazing are tolerated but regeneration is not dependent on such disturbance. In response to fire *P. cucullata* is an obligate root resprouter where many plants survive fire and resprout from underground tubers, and there is minimal re-establishment from seed germination (VRFAF).

Threatening Processes operating in Western RFA Region:

- Clearing for agriculture has reduced the species' habitat (Bramwells, 1993).
- Weed invasion threatens the species (Bramwells, 1993).
- The species is regarded as having a relatively low seed production and as a consequence low reproductive rates (Bramwells, 1993).
- It is very sensitive to competition from other plants (Bramwells, 1993).

- Collection and trampling of habitat by enthusiasts is a threat to *P. cucullata* (Bramwells, 1993).
- The Cape Bridgewater population is subject to heavy grazing by cattle (SAC, 1991, final rec.).
- Trampling by horses is causing serious decline on private property at Cape Otway (Bramwells, 1993).
- Most of the populations are on private land or roadsides where management is insecure (SAC, 1991, final rec.).
- Grazing of flowers by introduced snails at Nelson and Cape Otway is causing loss of seed production and secondary viral and/or fungal infections (Bramwells, 1993).
- Ad-hoc camping and vehicle use at Cape Bridgewater is causing some damage (Bramwells, 1993).
- Rabbit grazing threatens the species

Disturbance	Rating	Source
Clearing of native vegetation	2	Bramwells, 1993
Introduced animals	2	Bramwells, 1993
Introduced plants	2	Bramwells, 1993
Grazing/trampling	2	SAC, 1991, final rec.
Disease	2	Bramwells, 1993
Recreation	1	Bramwells, 1993
Deliberate collecting/harvesting	2	Bramwells, 1993
Reproductive problems	1	Bramwells, 1993
Other: plant competition	2	Bramwells, 1993

Rating of Threats:

Current Management:

Bramwells (1993) Action Statement, Beecham et al. (1997) Action Statement Monitoring

- Past management actions: monitoring existing populations, searching for new populations; fencing to exclude cattle form Bridgewater Lakes populations which is now in disrepair; some weed management at Bridgewater Lakes.
- Intended management actions: determine critical habitat; monitor all populations annually
 during flowering period; search in areas where there are historic records of the orchid; where
 necessary protect populations with fences; evaluate management requirements of
 populations; redirect sightseers at Cape Bridgewater; carry out weed control where required;
 reduce the impact of rabbit grazing at Cape Otway and snails at Cape Otway and Nelson;
 provide management information to private landholders at Cape Otway and Bridgewater
 Lakes; encourage local conservation groups to carry out surveys; encourage research into the
 biology of the species.

Discovery Bay Parks Draft Management Plan (Parks Vic. 1998d)

- Leafy Greenhood: investigate use of fire as management tool; consider hand pollination, restocking with propagated tuberoids, or re-establishing in different location.
- Rare or threatened species: document locations; investigate ecological requirements; monitoring; implement vegetation modification to improve habitats; survey sites where changes in maintenance or construction are planned; pest plant and animal control.

Otway National Park Management Plan (NRE 1996e):

prepare a vegetation map for the Park to facilitate future ecological management; encourage
and support surveys and research on significant flora in the Park and contribute to the NRE
computer-based register for sites of significance; support research into the need for
ecological burning of species and vegetation communities in the Park; continue the
revegetation program in previously cleared areas in the western section of the Park; prepare
a pest management strategy for the Park.
Brittle Greenhood Family: Orchidaceae

Pterostylis truncata

Species Characteristics: Leaves 3 to 8 in ground-hugging rosette on sterile plants only; ovate, to 30 mm x 15 mm, grey-green, petiole short. Flower stem to 15 cm tall, stout, brownish green with up to 6 narrow cauline leaves, their bases ensheathing stem. Flower single, to 50 mm long, large, translucent white with green and brownish red stripes and tonings, labellum dark brown. Recognised by its expanded flower hood which appears abruptly cut off at the apex (Backhouse & Jeanes, 1995).

Conservation Status:

ROTAP: VROTS: endangered FFG: listed; action statement ESP:

RESERVATION STAT	RARITY		
% of CRA population % of CRA population % of CRA population in other public land on private land			% Australian
conservation reserve	Region		
k	k	k	К

Distribution in Western RFA Region: You Yangs Regional Park, private land at Black Hills, and Long Forest Flora and Fauna Reserve. It is also found in New South Wales and the Australian Capital Territory (Bramwells, 1995).

Habitat: Occurs across a broad range of dry, rocky environments. Annual rainfall is between 400 and 800 mm (SAC, 1990, nom.). It mostly grows in open woodlands of Long-leaf Box (*Eucalyptus goniocalyx*), Yellow Gum (*Eucalyptus leucoxylon*) or Grey Box (*Eucalyptus microcarpa*), often with grassy or mossy ground layers (Bramwells, 1995).

Life History: *Pterostylis* species are summer-deciduous, dying back after flowering to a fleshy rounded tuberoid. *P. truncata* flowers in April and May (Backhouse & Jeanes, 1995). Brittle Greenhood is a clonal plant, so populations are likely to consist of a limited number of individuals (Bramwells, 1995). Reproduction, and subsequent establishment from seed, as well as vegetative reproduction. In response to fire this species is an optional root resprouter where most plants survive fire and resprout from underground tubers, in addition to a significant reestablishment from seed germination. It requires long periods without major disturbance for survival and establishment (VRFAF).

Threatening Processes operating in Western RFA Region:

- Weed invasion, particularly Boneseed (*Chrysanthemoides monilifera*), is a serious threat in the You Yangs (SAC, 1991, final rec.).
- Heavy grazing by feral goats, sheep and rabbits has eliminated populations in the past (Bramwells, 1995).
- Grazing and soil disturbance by rabbits and kangaroos seriously affects the species now (Bramwells, 1995; SAC, 1991, final rec.).
- Loss of genetic diversity, leading to reduction inability to adapt to changing environmental conditions (Bramwells, 1995).
- White-winged Choughs actively seek out orchid tuberoids and consume them, and this can be a problem where bird numbers are artificially high as a result of feeding by local residents (Bramwells, 1995).
- Trampling and collection by visitors threatens the species (Bramwells, 1995).

- Roadside maintenance could cause accidental damage at Long Forest (Bramwells, 1995).
- Inappropriate fire regimes, because the fire requirements of the species are unknown (Bramwells, 1995).
- Populations close to Melbourne have disappeared due to urban development (SAC, 1991, final rec.).

Disturbance	Rating	Source
Clearing of native vegetation	3	SAC final rec
Unplanned fire	2	Bramwells 1995
Introduced animals	3	Bramwells 1995
Introduced plants	3	SAC final rec
Grazing/ trampling	3	Bramwells 1995
Road/ rail construction/	2	Bramwells 1995
maintenance		
Deliberate collecting/ harvesting	2	Bramwells 1995
Reproductive problems	2	Bramwells 1995

Rating of Threats:

Current Management:

Bramwells(1995) Action Statement:

- Past management actions: a covenant placed on a private Black Hill property title for flora and fauna conservation; cattle and sheep removed from the Murtcaim Wildlife Area in 1991; in 1995 a feasibility study for the reintroduction of the Brittle Greenhood into Point Wilson was carried out; in the You Yangs some populations were kept free of Boneseed seedlings by voluntary groups; discussions held with the Shire of Moorabool to conserve roadside populations; searches by members of the Geelong branch of ANOS for the Brittle Greenhood since 1993.
- Intended management actions: determine critical habitat for the Brittle Greenhood; monitor
 populations annually; re-establish and manage the orchid at the original site at Point Wilson;
 assess weed problems annually and determine appropriate management action;
 systematically search for populations in granite areas on property near Brisbane Ranges,
 Lerderderg Gorge and the Pyrete Ranges; register all data and identify any threats to newlydiscovered populations; at Long Forest Mallee, monitor White-winged Chough numbers and
 food preferences and install 'Significant Roadside' signs to prevent accidental damage; at the
 You Yangs, continue weed control in existing populations; organise community groups or
 students to participate in Adopt-a-Block.

Hairy Tails Family: Amaranthaceae

Ptilotus erubescens

Species Characteristics: Deeply taprooted herb, with 1 to several ascending to erect, usually unbranched stems to c. 30 cm high. Stems pubescent. Basal leaves usually numerous, linear to narrowly oblanceolate, to 10 cm long, 3 mm wide; stems leaves shorter and broader. Spike globoid to ovoid, to 4 cm long, 3 cm diameter, white, greyish or tinged pink; bract and bracteoles ovate, 6-12 mm long; perianth 12-16 mm long; tepals free, outer surface densely silky-hairy (Walsh, 1996).

Conservation Status: ROTAP: VROTS: endangered FFG: listed ESP:

RESERVATION STAT	RARITY		
% of CRA population in biological conservation reserve	% of CRA population in other public land	% of CRA population on private land	% Australian population within RFA Region
20	20	60	26-50

Distribution in Western RFA Region: Northern and western Victoria, excluding mallee areas. Very small populations in Mount Arapiles State Park, Inverleigh Flora and Fauna Reserve, Cobra Killuc Wildlife Reserve, Kanagulk Streamside Reserve, Yalla-Y-Poora recreation reserve, Grampians National Park and Dergholm State Park, but the majority occur on road and rail reserves and private property (SAC, 1992, nom.; Parks Victoria, 1998c,f). Also South Australia and New South Wales (Walsh, 1996).

Habitat: Grassland and grassy woodland communities (Walsh, 1996), commonly including Kangaroo Grass (*Themeda triandra*), Yellow Gum (*Eucalyptus leucoxylon*) and River Red Gum (*E. camaldulensis*). Average annual rainfall is between 350 and 550 mm, and soils are relatively fertile loams and clays. (Scarlett, 1984).

Life History: Flowers November to February (Walsh, 1996). Sexual reproduction, with establishment from seeds, occurs only occasionally. The species is an obligate root resprouter after fire; many plants survive fire and resprout from dormant buds, and there is minimal seed germination. Natural disturbances are tolerated but regeneration is not dependent on them (VRFAF).

Threatening Processes operating in Western RFA Region:

- It is under threat from habitat loss, modification and fragmentation of Western Basalt Plains Grassland (SAC, 1992, nom.).
- The species is sensitive to intense stock grazing and is easily exterminated by cultivation (Scarlett, 1984).
- Plants on road and rail reserves and private property are under threat from periodic grazing and inappropriate fire regimes (SAC, 1992, nom.).
- Direct destruction from road and rail maintenance and construction activities (SAC, 1992, nom.).

Rating	of	Threats:
nanng	U 1	mouto.

Disturbance	Rating	Source
Clearing of native vegetation	2	SAC, 1992, nom.
Fragmentation of native veg.	2	SAC, 1992, nom.

Unplanned fire	2	SAC, 1992, nom.
Grazing/ trampling	2	SAC, 1992, nom.
Road/ rail construction/	2	SAC, 1992, nom.
maintenance		

Current Management:

- NRE monitoring
- Mt Arapiles State Park Management Plan (DCE 1991b):
- Location of significant species will be identified and threats will be evaluated; protection will
 be provided from identified threats; locations of significant species will not be publicised;
 status of all significant species will be monitored; ecological studies of the effects of fire on
 significant species will be promoted, and the effects of fire monitored; control, and if possible
 eradicate pest plants and animals.

Grampians National Park Draft Management Plan (Parks Vic. 1998f)

- Ensure that significant plants and communities are adequately protected from recreational activities, planned and unplanned fire, invasion by pest plants, over-grazing by pest animals, and inappropriate management activities, through implementation of the Environmental Action Plan, and the Grampians-Black Range Park Fire Management Plan; undertake distribution mapping and monitoring of endangered and significant endemic species; encourage surveys of and research into significant flora (including rare or threatened species) and plant communities in the Park, and consider that information in all management actions.
 Dergholm State Park and Mt Arapiles-Tooan State Park (Tooan Block) Management Plan (Parks Via 1008c)
- Vic. 1998c)
- Tooan Block: encourage a survey of the Park's flora and production of an Ecological Vegetation Class map; support the community-based program to develop a habitat link with the Mt Arapiles block and encourage the maintenance of existing habitat connections between Little Desert National Park and Jilpanger Flora and Fauna Reserve.
- Dergholm State Park: actively manage vegetation communities to retain habitat and community diversity by giving priority to the control of pest plants and adopting appropriate fire regimes; protect sites of botanical significance, and encourage ongoing monitoring of these areas.

Scented Bush-pea Family: Fabaceae

Pultenaea graveolens

Species Characteristics: Resinous, strongly scented shrub to 1.5 m high; branches pendulous; stems terete, covered with short, spreading hairs. Leaves alternate, ovate, 4-25 mm long; apex acute; upper surface with pale hairs; lower surface scabrous and darker; stipules c. 1 mm long, resinous. Flower axillary toward tips of short lateral branches; bracts absent; calyx 3-6 mm long, covered with sparse, bristly hairs; standard 7-9 mm wide. Pod ovate, hairy. (Corrick, 1996).

Conservation Status: ROTAP: VROTS: vulnerable FFG: listed ESP:

RESERVATION STAT	RARITY		
% of CRA population in biological conservation reserve	% of CRA population in other public land	% of CRA population on private land	% Australian population within RFA Region
10	0	90	76-100

Distribution in Western RFA Region: Found in a few areas in the western part of Victoria; Brisbane Ranges, northern Grampians and midland areas between Nagambie and Castlemaine. In the study area the species is located near Roses Gap and Asses Ears in the northern part of Grampians National Park, and in Steiglitz Historic Area in the Brisbane Ranges National Park (SAC, 1989, nom.) and on private land (FIS). Also South Australia (Corrick, 1996).

Habitat: Occurs in dry hilly terrain with shallow, rocky soils of sedimentary origin. Annual rainfall of about 600mm is seasonal, keeping soils wet in winter and very dry in summer. The species is a locally important component of a dense, low, shrubby understorey to Stringybark/Box Open Forest. Dominant canopy species are Red Ironbark (*E. tricarpa*), Long-leaf Box (*E. goniocalyx*), Red Stringybark (*E. macrorhyncha*), Brown Stringybark (*E.baxteri*) and Messmate (*E. obliqua*). Frequently associated understorey species include Grey Everlasting (*Ozothamnus obcordatum*, Gold-dust Wattle (*Acacia acinacea*), Hedge Wattle (*A. paradoxa*), Common Heath (*Epacris impressa*) and Austral Grass-tree (*Xanthorrhoea australis*) (SAC, 1989, nom.).

Life History: Flowers October (Corrick, 1996). Regeneration is apparently adequate in undisturbed areas, and it also appears to proliferate along abandoned gravel scrapes. It is tolerant of wildfire and regenerates solely from seed (SAC, 1989, nom.). Sexual reproduction, and subsequent establishment from seeds. The species is an obligate seed regenerator; nearly all plants are killed by fire, and regeneration is solely from seed stored in the canopy or the soil for a short time pre-fire. Natural disturbances are tolerated but regeneration is not dependent on them (VRFAF).

Threatening Processes operating in Western RFA Region:

- The major immediate threat to the species is from the soil-born pathogen Cinnamon Fungus (*Phytophthora cinnamomi*) which causes root rot that may result in significant and irreversible die-back of plants through drought stress. Scented Bush-pea is particularly susceptible to Cinnamon Fungus and large stands have been decimated at Steiglitz. The fungus poses a similar threat to the Grampians populations (SAC, 1989, nom.).
- Inappropriate fire regimes pose a serious threat to populations. Too frequent fires may kill plants prior to attaining reproductive maturity. Burns of insufficient intensity may kill mature plants yet not break seed dormancy (SAC, 1989, nom.).

• As stands are highly localised, they are threatened by recreational development such as track, picnic and car-park construction work in the various reserves (SAC, 1989, nom.).

Rating	of	Threats:
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Disturbance	Rating	Source
Unplanned fire	2	SAC, 1989, nom.
Disease	3	SAC, 1989, nom.
Road/ rail construction/	2	SAC, 1989, nom.
maintenance		
Recreation	2	SAC, 1989, nom.

Current Management:

Steiglitz Historic Park Management Plan (CNR 1996):

• Develop and implement a monitoring program for significant species; encourage research into appropriate management strategies for significant species; fence the small stand of Scented Bush-pea to discourage off-road parking and visitor disturbance and to encourage natural regeneration

Brisbane Ranges National Park Draft Management Plan (NRE 1996c):

 Continue to record location and status data for threatened species and consider that information in all management actions; encourage research into the location and ecology of threatened species; initiate surveys and research into the effects of fire on threatened species; minimise the spread of Cinnamon Fungus in all management activities; prepare a pest plants and animal control strategy

Grampians National Park Draft Management Plan (Parks Vic. 1998f)

- Ensure that significant plants and communities are adequately protected from recreational activities, planned and unplanned fire, invasion by pest plants, over-grazing by pest animals, and inappropriate management activities, through implementation of the Environmental Action Plan, and the Grampians-Black Range Park Fire Management Plan; undertake distribution mapping and monitoring of endangered and significant endemic species; encourage surveys of and research into significant flora (including rare or threatened species) and plant communities in the Park, and consider that information in all management actions. Midlands Forest Management Area Forest Management Plan (NRE 1996b):
- avoid disturbance to any populations found within the Special Management Zone and the General Management Zone; the species and its regeneration is well catered for in legislated conservation reserves within the FMA; the species appears particularly susceptible to Cinnamon Fungus.

Large-fruit Fireweed Family: Asteraceae

Senecio macrocarpus

Species Characteristics: Erect or sprawling subshrub with stems to c. 70 cm high arising from a perennial rootstock, usually greyish-cobwebbed all over. Leaves sessile, linear, 4-12 cm long, 2-5 mm wide; entire to distantly and minutely dentate. Inflorescence cymose or corymbose, usually with c. 2-10 capitula; involucre plumply cylindric, 10-18 mm long, glabrous, or slightly cobwebbed near base; bracts 16-21,; bracteoles present; florets 50-150. Cypselas cylindric, dense papillose-hairy in rows; pappus of slender hairs 8-10 mm long, deciduous (Walsh, unpub).

Conservation Status: ROTAP: Vulnerable VROTS: endangered FFG: listed ESP: listed

RESERVATION STAT	RARITY		
% of CRA population in biological conservation reserve	% of CRA population in other public land	% of CRA population on private land	% Australian population within RFA Region
10	10	80	51-75

Distribution in Western RFA Region: Known from Deep Lead Flora and Fauna Reserve, Bannockburn Cemetery, Laverton North Grassland Reserve, Laverton RAAF base, rail reserves west of Melbourne and around Geelong, Ballarat and Ararat areas, and road reserve near Dunkeld. Also south-eastern South Australia and Tasmania (Hills & Boekel, 1996).

Habitat: Occurs mainly in Western Basalt Plains Grassland dominated by Kangaroo Grass (*Themeda triandra,* on red-brown earth soils formed from recent basalt deposits. It is also found in open grassy woodlands of Grey Box (*Eucalyptus microcarpa*), on sedimentary derived soils (Hills & Boekel, 1996).

Life History: Flowers August to October (Walsh, unpub). Sexual reproduction, and establishment from seed. Asexual reproduction is unknown. It tolerates occasional major disturbance and requires such disturbance for the rare opportunity to establish and spread, and between such events plants may appear to be absent. Following fire, the species is an optional root resprouter; most plants survive fire and resprout from dormant buds, but there is also a significant re-establishment from seed (VRFAF).

Threatening Processes operating in Western RFA Region:

- The habitat of the species has declined dramatically through use for agriculture (Hills & Boekel, 1996).
- The species cannot survive excessive grazing or mechanical disturbance (SAC, 1991, final rec.).
- Grazing by rabbits is a serious threat at all sites (Hills & Boekel, 1996).
- Accidental damage is likely in the rail reserves where the species occurs, and make it prone to destruction (SAC, 1991, final rec.).
- Weed competition is a serious threat at all sites (Hills & Boekel, 1996).
- Competition from dominant grasses, due to lack of appropriate fire regimes, inhibits regeneration (Scarlet 1984).
- Soil disturbance is a potential threat at all sites (Hills & Boekel, 1996).
- Plants are prone to attack by Red-legged Earthmites (Hills & Boekel, 1996).

Rating of Threats:

Disturbance	Rating	Source
Clearing of native vegetation	3	Hills & Boekel 1996
Fragmentation of native veg.	3	Hills & Boekel 1996
Introduced animals	3	Hills & Boekel 1996
Introduced plants	3	Hills & Boekel 1996
Grazing/ trampling	3	Hills & Boekel 1996
Disease	2	Hills & Boekel 1996
Road/ rail construction/	3	Hills & Boekel 1996
maintenance		
Other: native plant competition	2	Hills & Boekel 1996

Current Management:

Hills and Boekel (1996) Action Statement:

- Past management actions: Sites were located, described and monitored from 1979 to the present; ecological knowledge of the plant was obtained through field observations and replanting programs; fencing of areas of grassland and appropriate information posts were erected at these sites; some sites have been burnt and burning prescriptions have been developed; weed control has been undertaken at the Manor Rail Reserve site; seed has been collected and propagated, and populations have been planted at several sites.
- Intended management actions: fence and signpost remaining rail reserve sites; erect information signs; maintain sites by controlling threats such as weeds and grazing; undertake an annual or biennial burning regime; monitor all known populations annually and assess threats and management requirements; contribute information to a database; arrange for extensive seed collection and seedling propagation from all populations; use seedlings for research and re-establishment in appropriate habitat; encourage private landholders to re-introduce the Large-fruit Groundsel in suitable habitat areas; encourage community participation and liaison; develop and maintain effective liaison between all relevant management bodies; research the effects of different fire regimes, develop more extensive knowledge of the ecological requirements of the species; undertake a population viability analysis and continue to search across the historically recorded range of the Large-fruit Groundsel for further populations.

Slender Swainson-pea Family: Fabaceae

Swainsona brachycarpa

Species Characteristics: Prostrate or ascending perennial herb, to c. 10 cm tall; stems glabrous or tuberculate. Leaves mostly 2-10 cm long; leaflets 9-23, narrow-elliptic to ovate, both surfaces virtually glabrous. Racemes, mostly 2-6 flowered; flowers 6-10 mm long; calyx teeth shorter than tube; petals white to purplish or dark red; standard c. 10 mm long, suborbicular, clawed; keel 6-9 mm long. Pod ellipsoid to crescent-shaped, mostly 15-30 mm long, glabrous (Jeanes, 1996).

Conservation Status: ROTAP: VROTS: vulnerable FFG: listed

ESP:

RESERVATION STAT	RARITY		
% of CRA population	% of CRA population	% of CRA population	% Australian
in biological in other public land on private land			population within RFA
conservation reserve			Region
70	30	0	26-50

Distribution in Western RFA Region: Confined to the Grampians National Park in Victoria, at only two localities, and an adjacent water production area. Also found in Queensland and New South Wales (Jeanes, 1996).

Habitat: Tall open-forest (Jeanes, 1996) with an overstorey of Swamp Gum (Eucalyptus ovata) and Blackwood (Acacia melanoxylon) and an understorey of Austral Bracken (Pteridium esculentum), Spiny-headed Mat-rush (Lomandra longifolia) and Native Violet (Viola spp.) (Tumino & Roberts, in prep.).

Life History: Flowers November to January (Jeanes, 1996). Requires some soil disturbance for regeneration (SAC, 1991, nom.). Sexual reproduction, and subsequent establishment from seeds. The species is an obligate seed regenerator; nearly all plants are killed by fire, and regeneration is solely from seed stored in the canopy or in the soil for a short time pre-fire. Natural disturbances are tolerated, but regeneration is not dependent on them (VRFAF).

Threatening Processes operating in Western RFA Region:

- Road making activities, entailing grading and vegetation clearance, endanger the species (SAC, 1991, nom.).
- Possibly affected by competition from weeds and other native plants (SAC, 1991, nom.).
- Its extreme rarity makes it vulnerable to chance events which could cause extinction (SAC. 1991. final rec.).

Disturbance	Rating	Source
Introduced plants	2	SAC, 1991, nom.
Road/ rail construction/	2	SAC, 1991, nom.
maintenance		

Rating of Threats:

Current Management:

Grampians National Park Draft Management Plan (Parks Vic. 1998f)

Ensure that significant plants and communities are adequately protected from recreational activities, planned and unplanned fire, invasion by pest plants, over-grazing by pest animals, and inappropriate management activities, through implementation of the Environmental

Action Plan, and the Grampians-Black Range Park Fire Management Plan; undertake distribution mapping and monitoring of endangered and significant endemic species; encourage surveys of and research into significant flora (including rare or threatened species) and plant communities in the Park, and consider that information in all management actions.

Coast Dandelion Family: Asteraceae

Taraxacum cygnorum

Species Characteristics: Leaves c. oblong to linear-lanceolate, c. 4-12 cm long, glabrescent; lobes 4-7 on each side, short, obtusely to acutely deltoid, distal margins denticulate to lobulate; petioles usually pale, very narrowly winged. Scapes 3-5 cm long; capitula 1.5-2 cm diam.; outer bracts appressed to inner series, ovate to ovate-lanceolate, usually apiculate with a small dark callus, white-bordered; ligules pale lemon-yellow; outer ligules subequal to inner bracts. Cypselas narrow-fusiform, dark red to blackish-purple; cone cylindric, beak 4-6 mm long, subequal to cypsela body (Walsh unpub.)

Conservation Status:

ROTAP: Vulnerable VROTS: endangered FFG: listed ESP: listed

RESERVATION STATUS			RARITY
% of CRA population	% of CRA population	% of CRA population	% Australian
in biological	in other public land	on private land	population within RFA
conservation reserve			Region
100	0	0	51-75

Distribution in Western RFA Region: Currently known only from Lower Glenelg National Park and Bats Ridge Faunal Reserve (SAC, 1996, final rec.).

Habitat: Confined to coastal areas on limestone with red-brown sandy loam soils with average rainfall between 860 and760 mm per annum. It has been recorded in woodlands dominated by Swamp Gum (*Eucalyptus ovata*), Manna Gum (*E. viminalis*), Messmate (*E. obliqua*) and Brown Stringybark (*E. baxteri*), with a sclerophyll shrub understorey commonly including Coast Beardheath (*Leucopogon parviflorus*), Coast Wattle (*Acacia sophorae*) and Silver Banksia (*Banksia marginata*), and a diverse herbaceous ground layer (Scarlett, 1984).

Life History: Sexual reproduction and subsequent establishment from seeds. Post fire response is unknown. Natural disturbances are tolerated but regeneration is not dependent on them (VRFAF).

Threatening Processes operating in Western RFA Region:

- Perhaps competition from introduced rosetted herbs (Scarlett, 1984).
- Sites are accessible to vehicles (Scarlett, 1984).

Rating of Threats:

Disturbance	Rating	Source
Introduced plants	1	Scarlett 1984

Current Management:

Lower Glenelg National Park Management Plan (DCE 1991a):

• Protect and manage identified threatened species; train Park staff to undertake monitoring programs; conduct surveys to determine the distribution and abundance of rare or threatened species in the Park; prepare improved management prescriptions based on detailed ecological study for rare or threatened plants species; maintain the natural influence of fires on ecological processes; monitor, control, and where possible eradicate introduced plants and animals, and isolate any Cinnamon Fungus occurrence in the Park.

Metallic Sun-orchid Family: Orchidaceae

Thelymitra epipactoides

Species Characteristics: Terrestrial geophyte. Leaf single, lanceolate, to 25 cm x 25 mm, erect, thick and fleshy, channelled, green with a reddish base. Flower stem to 50 cm tall, stout, brownish-green, with several large, loosely sheathing bracts. Flowers 5-20, to 40 mm across, bronze, pink, green, blue or reddish with a metallic lustre; column yellow-tipped, hair tufts white. Perianth segments very broadly ovate, thick textured (Backhouse & Jeanes, 1995).

Conservation Status:

ROTAP:	Endangered
VROTS:	endangered
FFG:	listed
ESP:	listed

RESERVATION STATUS			RARITY
% of CRA population	% of CRA population	% of CRA population	% Australian
in biological	in other public land	on private land	population within RFA
conservation reserve			Region
80	20	0	76-100

Distribution in Western RFA Region: Most populations are located in the west of Victoria: Port Campbell National Park, Bay of Islands Coastal Reserve, a Flora Reserve near Casterton, and very small populations at Glenisla in the Grampians region and Lower Glenelg National Park. Outside the study area it is found in a Flora Reserve near Little Desert National Park and in the Gippsland Lakes Coastal Park (SAC, 1989, nom.). Also found in South Australia (Backhouse & Jeanes, 1995)

Habitat: Open heathland communities (SAC, 1989, nom.). The habitat ranges through mallee broombush, shrubby woodlands to wet heaths. At Port Campbell National Park, the species grows in gaps between a dense shrubland dominated by Coast Beard-heath (*Leucopogon parviflorus*) (VrotPop). Plants primarily grow on sandy duplex soils which are waterlogged in winter and water deficiency in summer (Calder *et al.*, 1989).

Life History: Facultative annuals, biennials or short-lived perennials. Plants die back annually in the warm dry weather to underground tuberoids. Shoots emerge in response to autumn rains, and flowers appear in October and November. Flowering is enhanced by fires in the preceding summer, but this is not essential (Backhouse & Jeanes, 1995). Reduction of competition appears to be crucial to the species survival, either by burning during the dormant period or other forms of vegetation removal (Calder *et al* 1989). Seeds are short-lived (VrotPop). Sexual reproduction, with establishment from seeds, occurs only occasionally. It requires occasional major natural disturbance for the rare opportunity to establish and spread. In response to fire the species is an optional root resprouter; most plants survive fire and resprout from dormant buds, but there is also significant re-establishment from seed germination (VRFAF).

Threatening Processes operating in Western RFA Region:

- Extensive clearing of habitat has reduced numbers (SAC, 1991, final rec.).
- Collection by orchid enthusiasts of both flowers and entire plants (SAC, 1989, nom., VrotPop).
- Most populations are small or surrounded by alienated land and so are vulnerable to local extinction from sudden catastrophic events, such as grazing, bacterial infections, water-logging, accidental physical damage, inappropriate fire regimes (SAC, 1989, nom.).
- Competition from shrubs and perennial grasses in the absence of fire may eliminate suitable sites for seedling establishment and reduction of adult population numbers (SAC, 1989, nom., VrotPop).

- Grazing by cattle in the past has affected some populations (SAC, 1989, nom.).
- Rabbits are a significant threat (SAC, 1989, nom.).
- The natural pollinator for the species, a native bee, appears to be absent from some sites on the coast where diversity of plants is lacking due to elimination of fire (SAC, 1989, nom.).

Disturbance	Rating	Source
Clearing of native vegetation	3	SAC, 1989, nom.
Fragmentation of native veg.	3	SAC, 1989, nom.
Lack of fire	2	SAC, 1989, nom.
Introduced animals	3	SAC, 1989, nom.
Introduced plants	2	VrotPop
Grazing/trampling	2	SAC, 1989, nom.
Deliberate collecting/ harvesting	3	SAC, 1989, nom.
Vandalism/human disturbance	2	VrotPop; SAC, 1989, nom
Dams/alteration to water regimes	2	VrotPop
Reproductive problems	2	SAC, 1989, nom.
Other: plant competition	2	VrotPop

Rating of Threats:

Current Management:

Lower Glenelg National Park Management Plan (DCE 1991a)

• Protect and manage identified threatened species; train Park staff to undertake monitoring programs; conduct surveys to determine the distribution and abundance of rare or threatened species in the Park; prepare improved management prescriptions based on detailed ecological study for rare or threatened plants species; maintain the natural influence of fires on ecological processes; monitor, control, and where possible eradicate introduced plants and animals, and isolate any Cinnamon Fungus occurrence in the Park; conduct surveys annually to monitor the population of Metallic Sun-orchid; manage vegetation at known sites of Metallic Sun-orchid by rotational slashing or prescribed burning.

Port Campbell National Park and Bay Of Islands Coastal Park Management Plan (Parks Vic. 1998h):

• Monitor threatened plant populations and significant sites using the monitoring system VrotPop, in conjunction with NRE, Friends groups and naturalists; monitor populations of plants susceptible to collecting by fanciers, and in conjunction with NRE take necessary steps to prevent collecting; encourage research on significant plant species and communities; identify, map and protect as necessary, sites of botanical significance in the Parks; actively manage vegetation to retain habitat and community diversity by giving priority to the control of pest plants and the implementation of ecologically appropriate fire regimes; ensure that records of all significant species in the Parks are incorporated into the Flora Information System; ensure that the potential impacts on flora of any future developments in the Parks are fully assessed in the planning phase, are avoided or minimised by appropriate siting and design, and undertake necessary surveys at appropriate times of year to ensure seasonal species are identified; manage and monitor Metallic Sun-orchid using either fire or slashing of vegetation, combined with soil disturbance until Action Statement is prepared.

Otway Forest Management Area Forest Management Plan (DCE 1992a):

 monitor all known occurrences of this species and encourage research into its ecology and distribution.

Winter Sun-orchid

Thelymitra hiemalis

Family: Orchidaceae

Species Characteristics: Single, lanceolate, erect, fleshy, channelled leaf, to 20 cm. Flower stem to 30 cm tall, bearing up to four large flowers, to 45 mm across. Petals and labellum pale blue, sepals greenish, petals have scattered dark spots. Column white with reddish, yellowtipped collar and white hair tufts (Jones & Clements, 1998).

Conservation Status:

ROTAP: VROTS: endangered FFG: preliminary listing ESP:

RESERVATION STATUS			RARITY
% of CRA population	% of CRA population	% of CRA population	% Australian
in biological	in other public land	on private land	population within RFA
conservation reserve			Region
k	k	k	76-100

Distribution in Western RFA Region: Confined to the Portland area, and known only from Kentbruck State Forest, Mt Richmond National Park and private property at Gorae (Jones & Clements, 1998).

Habitat: Heathy woodlands on grey sandy loam soils (SAC, 1999, nom.).

Life History: Flowers in winter (Jones & Clements, 1998).

Threatening Processes operating in Western RFA Region:

- Extensive vegetation clearing and fragmentation has reduced habitat (SAC, 1999, nom.).
- Reproductive difficulties are likely because there are only single plants at each site
- Stock grazing on private land (SAC, 1999, nom.).
- Rabbit grazing
- Roadside disturbance
- Coast wattle invasion (SAC, 1999, nom.).
- Lack of fire may be a threat
- Ground disturbance during timber harvesting may be a threat

Rating of Threats:

Disturbance	Rating	Source
Clearing of native vegetation	3	SAC, nom
Fragmentation of native veg.	3	SAC, nom
Timber harvesting	1	
Lack of fire	1	
Introduced animals	3	
Grazing/ trampling	3	SAC, nom
Road/ rail construction/	2	
maintenance		
Reproductive problems	2	
Other: native plant competition	1	SAC, nom

Current Management:

Brilliant Sun-orchid Family: Orchidaceae

Thelymitra mackibbinii

Species Characteristics: Leaf single, lanceolate, to 10 cm x 9 mm, erect, channelled, broad and stem-sheathing at base then rapidly narrowing, dark green with a purplish base. Flower stem to 30 cm tall, slender, greenish red, with several small sheathing bracts. Flowers one to three, to 25 mm across, purple to pinkish with darker stripes, sepals usually darker-coloured than petals; column with a yellow tip, column arms yellow and glandular (Backhouse & Jeanes, 1995).

Conservation Status:

ROTAP: Vulnerable VROTS: endangered FFG: ESP: listed

RESERVATION STATUS			RARITY
% of CRA population	% of CRA population	% of CRA population	% Australian
in biological	in other public land	on private land	population within RFA
conservation reserve			Region
50	50	0	51-75

Distribution in Western RFA Region: Occurs near Stawell on public land. Confined to several sites in the western Goldfields, including Maryborough (Backhouse & Jeanes, 1995).

Habitat: Favours woodlands, particularly those dominated by Eucalyptus leucoxylon (Yellow Gum), where it grows in well-drained, shallow gravelly sand and clay loams (Backhouse & Jeanes, 1995).

Life History: Facultative annuals, biennials or short-lived perennials. Plants die back annually in the warm dry weather to underground tuberoids. Shoots emerge in response to autumn rains, and flowers appear in September and October. Flowering is enhanced by fires in the preceding summer, but this is not essential (Backhouse & Jeanes, 1995). Sexual reproduction, with establishment from seeds, occurs only occasionally. It tolerates occasional natural disturbance. In response to fire the species is an obligate root resprouter; many plants survive and resprout from dormant buds, but there is minimal re-establishment from seed germination (VRFAF).

Threatening Processes operating in Western RFA Region:

- Illicit collection is a major threat (Backhouse & Jeanes, 1995).
- Damage for gold exploration and mining has a serious effect on the species (Backhouse & Jeanes, 1995).

Disturbance	Rating	Source
Fragmentation of native veg.	2	
Mining/ quarrying	3	Backhouse & Jeanes 1995
Deliberate collecting/ harvesting	3	Backhouse & Jeanes 1995

Rating of Threats:

Current Management:

Spiral Sun-orchid Family: Orchidaceae

Thelymitra matthewsii

Species Characteristics: Terrestrial geophyte. Leaf single, to 10 cm x 10 mm, erect, ovate, rapidly narrowing to become linear, spirally twisted, dark green with purplish base, finely hairy. Flower stem to 20 cm tall, slender, dark green, basal half often reddish. Flower solitary, to 20 mm across, petals and labellum deep bluish-purple with darker stripes; sepals reddish-purple with darker stripes, column purplish with yellow apex (Backhouse & Jeanes, 1995).

Conservation Status: ROTAP: Vulnerable VROTS: vulnerable FFG: listed ESP: listed

RESERVATION STATUS			RARITY
% of CRA population in biological conservation reserve	% of CRA population in other public land	% of CRA population on private land	% Australian population within RFA Region
60	20	20	51-75

Distribution in Western RFA Region: It is found in lowland areas of southern Victoria and extends inland to the Grampians. The majority of sites occur in the northern Grampians, but also known from Angahook-Lorne State Park (Parks Victoria, 1999) and private land. The species is also known to occur in South Australia and New Zealand (SAC, 1993, nom.; Backhouse & Jeanes, 1995; SAC, 1993, final rec.).

Habitat: The species is found in open forests and woodlands, growing in well-drained sand and clay loams. It appears to grow best in areas where there has been disturbance (Backhouse & Jeanes, 1995).

Life History: Facultative annuals, biennials or short-lived perennials. Plants die back annually in the warm dry weather to underground tuberoids. Shoots emerge in response to autumn rains, and flowers appear in August and September. Flowering is enhanced by fires in the preceding summer, but this is not essential (Backhouse & Jeanes, 1995). Sexual reproduction, with establishment from seeds, occurs only occasionally. Asexual reproduction is unknown. Regeneration is habitat dependent on particular rare or unpredictable events, and between such events plants may appear to be absent. It requires occasional major natural disturbance for the rare opportunity to establish and spread. In response to fire the species is an optional root resprouter; most plants survive fire and resprout from dormant buds, but there is also significant re-establishment from seed germination (VRFAF).

Threatening Processes operating in Western RFA Region:

- The species occurs in small disjunct populations and is susceptible to unpredictable environmental catastrophes (SAC, 1993, final rec.).
- Total plant recruitment is from seed and apparently can only occur in areas with recent soil disturbance, and may die out in the absence of suitable conditions (SAC, 1993, nom.).
- However if soil disturbance is too severe, seedlings could be outcompeted by environmental weeds (SAC, 1993, nom.).
- Little is known of the biology of the species and hence management strategies are difficult to formulate (SAC, 1993, nom.).
- The species takes five years to mature, flower and produce seed and so is particularly susceptible to the loss of entire colonies before plants are able to reproduce (SAC, 1993, nom.).

- Inappropriate fire regimes are a potential threat (SAC, 1993, nom.).
- Illegal collection by orchid enthusiasts threatens the species (SAC, 1993, final rec.).

Disturbance	Rating	Source
Fragmentation of native veg.	2	SAC, 1993, nom.
Lack of fire	2	SAC, 1993, nom.
Introduced plants	2	SAC, 1993, nom.
Deliberate collecting/ harvesting	2	SAC, 1993, final rec.
Reproductive problems	2	SAC, 1993, nom.
Other:lack of suitable disturbance	2	SAC, 1993, nom.
for recruitment		

Rating of Threats:

Current Management:

• NRE fencing and monitoring

Angahook-Lorne State Park Management Plan (Parks Vic. 1999)

• Rare or threatened species: encourage surveys and research on significant plant species and their ecology; document known sites; monitor threatened plant populations; identify priority weed control areas including habitats of significant species; control key invasive plants and animals; promote habitat of threatened species using fire; encourage research into ecological burning requirements.

Grampians National Park Draft Management Plan (Parks Vic. 1998f)

• Ensure that significant plants and communities are adequately protected from recreational activities, planned and unplanned fire, invasion by pest plants, over-grazing by pest animals, and inappropriate management activities, through implementation of the Environmental Action Plan, and the Grampians-Black Range Park Fire Management Plan; undertake distribution mapping and monitoring of endangered and significant endemic species; encourage surveys of and research into significant flora (including rare or threatened species) and plant communities in the Park, and consider that information in all management actions.

Merran's Sun-orchid Family: Orchidaceae

Thelymitra merraniae

Family: Orchidaceae

Species Characteristics: Leaf single, lanceolate, to 20 cm x 8 mm, erect, fleshy, channelled, ribbed,dark green with a reddish base. Flower stem to 40 cm tall, slender, green, with several reddish sheathing bracts. Flowers one to six, to 25 mm across, rich blue to purplish, dorsal sepal and petals with a few scattered darker spots; column bluish, yellow-tipped, with cream hair tufts. Perianth segments to 12 mm long, ovate, spreading tardily on warm days. Column arms with a terminal tuft of long, straggly hairs (Backhouse & Jeanes, 1995).

Conservation Status: ROTAP: VROTS: endangered FFG: listed ESP:

RESERVATION STATUS			RARITY
% of CRA population in biological conservation reserve	% of CRA population in other public land	% of CRA population on private land	% Australian population within RFA Region
k	k	k	0-25

Distribution in Western RFA Region: Known with certainty only from the Aireys Inlet and Anglesea areas (on a shire reserve and private land) and outside the Region on the Mornington Peninsula. Also found in South Australia, Tasmania (Backhouse & Jeanes, 1995).

Habitat: Peaty soils, which may be seasonally inundated. Heathland, often with grasses and sedges in the understorey (SAC, 1993, nom.). Grows in heathlands, woodlands and open forests, sometimes in moist depressions and around swamp margins. Soils include well-drained sand and clay loams and heavier moist, peaty loams (Backhouse & Jeanes, 1995).

Life History: Facultative annuals, biennials or short-lived perennials. Plants die back annually in the warm dry weather to underground tuberoids. Shoots emerge in response to autumn rains, and flowers appear in October and November. Flowering is enhanced by fires in the preceding summer, but this is not essential (Backhouse & Jeanes, 1995). Sexual reproduction, with establishment from seeds, occurs only occasionally. It requires occasional major natural disturbance for the rare opportunity to establish and spread. In response to fire the species is an optional root resprouter; most plants survive fire and resprout from dormant buds, but there is also significant re-establishment from seed germination (VRFAF).

Threatening Processes operating in Western RFA Region:

- The rarity of this species makes it susceptible to unpredictable environmental catastrophes (SAC, 1994, final rec.).
- The only known population is threatened by habitat disturbance through a proposal to subdivide the area (SAC, 1994, final rec.).
- Rabbit grazing threatens the species

Disturbance	Rating	Source
Clearing of native vegetation	3	SAC final rec
Fragmentation of native veg.	2	SAC final rec
Introduced animals	2	

Rating of Threats:

Current Management:

NRE monitoring

Com Name Family:

Sci Name

Species Characteristics:

Conservation Status:

ROTAP: VROTS: FFG: ESP:

RESERVATION STATUS			RARITY
% of CRA population in biological conservation reserve	% of CRA population in other public land	% of CRA population on private land	% Australian population within RFA Region

Distribution in Western RFA Region:

Habitat:

Life History:

Threatening Processes operating in Western RFA Region:

Rating of Threats:

Disturbance	Rating	Source
Clearing of native vegetation		
Fragmentation of native veg.		
Timber harvesting		
Firewood collection		
Fuel reduction burning		
Unplanned fire		
Lack of fire		
Introduced animals		
Introduced plants		
Grazing/ trampling		
Pest control		
Weed control		
Disease		
Road/ rail construction/		
maintenance		
Recreation		
Mining/ quarrying		
Deliberate collecting/ harvesting		
Vandalism/ human disturbance		
Dams/ alteration to water regimes		
Reproductive problems		
Other:		

Current Management:

APPENDIX F: Life History Parameters - Fauna Species

Under the heading THREATS, disturbances are scored for each species. Assessments were made recognising that practices on public land follow minimum prescriptions required under the Code of Forest Practices for Timber Production (NRE 1996) and various State Acts and Regulations and that practices on private land are in accord with the Planning and Environment Act 1987 and the Catchment and Land Protection Act 1994. However, the assessments do not take account of additional protection afforded in various Action Statements, Park management plans, nor any additional measures that may be established in the West Forest Management Plan which is currently in preparation. Disturbances are scored for each species as follows:

- Effect unknown:
- 0 Processes not likely to be operating as a threat or there is no information to suggest that it is a threat:
- 1 Process is a minor threat, which by itself is unlikely to lead to broad scale decline of the species;
- Process is a moderate threat, which is likely to lead to some decline of the species, especially if it 2 operates in combination with other threatening processes; and
- 3 Process is a major threat, which if not checked poses a significant risk to the viability of the species in the West.

Broad-toothed Rat

Mastacomys fuscus

RARITY

- a) Geographic Range Classification of range size within the West region: Small
 - Distribution of records within the West region: Within the Otway Ranges Number of 5 minute grid cells recorded from: 17
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: Unknown
- Density: Unknown, dependent on habitat
- Home Range (m²): Female 1044-1614 (1390), Male 996-2703 (1620), differences are seasonal Source: Bubela *et al.* (1991), Atlas of Victorian Wildlife

c) Habitat Specificity

- Classification of habitat specificity: Medium Vegetation types inhabited in the region: Wet sclerophyll forest (Mountain Ash *Eucalyptus* regnans, Messmate *E. obliqua*), grassy forest, wet heath and dense tussock grassland. Vegetation always includes a dense ground layer of grasses, sedges and herbs.
- Source: Seebeck (1971), Wallis *et al.* (1982), DCE (1992a) **DYNAMICS**

Population Trend in Last Decade

Increasing, stable or declined: Unknown, probably declined due to a decrease in available habitat

Source: J. Seebeck pers. comm. Population trend since discovery by Europeans

- Increasing, stable or declined: Declined Source: P. Menkhorst pers. comm.

SPATIAL DYNAMICS a) Population variability

- Classification of population variability: Unknown,
- probably low Source: Happold (1989)

b) Dispersal

- Classification of powers of dispersal: Unknown, possibly high as may have to travel long distances to find suitable habitat
- Average distances dispersed: Unknown
- Maximum distance dispersed: Unknown
- Source: J. Seebeck pers. comm.
 LIFE HISTORY PARAMETERS

- a) Reproductive output
- Classification of reproductive output: Medium
- Age of sexual maturity (mths): 10-12 Mean clutch/litter/brood size: 1-3
- Mean no of clutches/litters/broods per year: 1-2, depends on site quality
- Time of year young born/hatch: November-March
- Source: Calaby and Wimbush (1964), Happold (1989), J. Seebeck pers. comm.

b) Longevity

- Classification of lifespan: Considered long-lived for an Australian rodent
- Average lifespan (yrs): 2-3
- Maximum lifespan (yrs): Unknown
- Source: Happold (1989), J. Seebeck pers. comm.

c) Morphology

- Adult body size Weight (g): Female 110-130(118), Male 122-144(131)
- Length (mm): Female 154, Male 172 Source: Wallis *et al.* (1982)

- d) Social organisation
- Colonial or non-colonial: Known to be colonial during winter in subalpine regions Territoriality: Females territorial
- Source: Happold (1989), Bubela and Happold (1993)
- e) Other
- Nomadic, migratory, sedentary: Sedentary
- Diet: Herbivore (mainly monocotyledons) .
- Source: Calaby and Wimbush (1964), Carron *et al.* (1990)

THREATS

1. Clearing of Native Vegetation: Ranking (2) J. Seebeck pers. comm.

2. Timber Harvesting: Ranking (2) P. Menkhorst and J. Seebeck pers. comm.

3. Fuel Reduction Burning: Ranking (1) P.

Menkhorst pers. comm.

4. Firewood Collection: Ranking (1) P. Menkhorst pers. comm.

5. Unplanned Fire: Ranking (2) P. Menkhorst and J. Seebeck pers. comm.

6. Introduced Species: Ranking (3) Mansergh and Marks (1993), J. Seebeck pers. comm.

7. Grazing/Trampling: Ranking (2) J. Seebeck pers. comm.

8. Pest Control: Ranking (0) P. Menkhorst and J. Seebeck pers. comm.

9. Road Construction and Maintenance: Ranking (1) P. Menkhorst pers. comm.

10. Mining/Quarrying: Ranking (0) P. Menkhorst and J. Seebeck pers. comm.

- 11. Tree Dieback: Ranking (-)
- 12. Recreation: Ranking (-)

13. Illegal Collecting/Harvesting: Ranking (0) P.

Menkhorst and J. Seebeck pers. comm.

14. Vandalism: Ranking (0) P. Menkhorst and J.

Seebeck pers. comm.

15. Dams/Impoundments: Ranking (2) P.

Menkhorst pers. comm.

Current Management:

The Broad-toothed Rat is classified as "lower risk -near threatened" in Victoria (NRE 1999). Under the Otway Forest Management Plan some of this species habitat, the Wet Heath community and a portion of grassy forest, is protected from timber harvesting activities (DCE 1992a).

Species characteristics: The Broad-toothed Rat is a specialist herbivore feeding mainly on grasses and sedges (monocotyledons), with dicotyledon leaf and small amounts of bark, seed and fungi making up the remainder of its diet (Watts and Aslin 1981, Carron *et set* 1000). Postricted to areas where the annual al. 1990). Restricted to areas where the annual rainfall exceeds 1000 mm (Watts and Aslin 1981), this species has been found in a variety of environments from alpine herbfield to coastal tussock grassland. A common feature of these habitats is the presence of a dense ground layer of grasses, sedges and herbs (Menkhorst 1995f). Habitat includes wet sclerophyll forest dominated by Mountain Ash *Eucalyptus regnans* or Messmate *E. obliqua* (Seebeck 1971).

Distribution in the West CRA region: In the West the Broad-toothed Rat has been recorded only from the Otway Ranges including near Forrest, Barrumunga, Lavers Hill and within Otway National Park. There are 30 records of this species (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the West CRA region: The Broad-toothed Rat is under threat by disturbances that destroy or degrade its habitat such as clearing, timber harvesting and fuel reduction burning. Within the Otway Ranges, Mountain Ash and Messmate are important hardwood production species (Brinkman and Farrell 1990) and loss of habitat as a result of timber harvesting is considered a moderate threat to Broad-toothed Rat populations. As populations of this species are small and disjunct, they are also extremely vulnerable to local declines and extinction as a result of stochastic events such as wildfire (Bennett 1990). Predation, particularly by foxes, is considered a serious threat to Broad-toothed toxes, is considered a serious threat to Broad-toothed Rat populations (Mansergh and Marks 1993, J. Seebeck pers. comm.). Dam construction in the riparian habitat of this species has the potential to have a large impact on populations (P. Menkhorst pers. comm.) through habitat loss, flooding and fragmentation. Road construction and maintenance can also fragment habitat and is regarded as a minor threat (P. Menkhorst pers. comm.) threat (P. Menkhorst pers. comm.).

Spot-tailed Quoll

Dasyurus maculatus

RARITY

- a) Geographic Range
 Classification of range size within the West
- region: Large Distribution of records within the West region: Records are scattered across the region with most concentrated around the Mt Eccles-Lake Condah area and the Otway Ranges
- Number of 5 minute grid cells recorded from: 51 Source: Atlas of Victorian Wildlife
- b) Abundance
- Classification of abundance: Low Population Estimate: Unknown Density: Unknown

- Home Range (ha): females 614 1067, males up to 4500
- Source: Mansergh (1984), Belcher (1995b), Belcher (1997) c) Habitat Specificity
- Classification of habitat specificity: Wide
- Vegetation types inhabited in the region: Wet sclerophyll forest, Manna Gum *Eucalyptus viminalis* woodland and open-forest (especially important in the Mt Eccles-Lake Condah area) and Messmate E. obliqua open-forest. Critical habitat components are not known.

Source: Menkhorst and Beardsell (1982), Mansergh (1995), C. Belcher pers. comm. Population Trend in Last Decade

- Increasing, stable or declined: Declined; record numbers have declined despite a relatively
- constant survey effort. Source: Atlas of Victorian Wildlife, C. Belcher pers. comm.
 Population trend since discovery by Europeans
 Increasing, stable or declined: Declined

- Source: Atlas of Victorian Wildlife, Mansergh (1984), C. Belcher pers. comm. SPATIAL DYNAMICS a) Population variability
- Classification of population variability: Low Source: Belcher (1995b)

b) Dispersal

- Classification of powers of dispersal: Unknown, presumably high Average distances dispersed: Unknown
- Maximum distance dispersed: Unknown
- Source: Belcher (1995b), C. Belcher pers.

LIFE HISTORY PARAMETERS

- a) Reproductive output
 Classification of potential reproductive output: Medium
- Age of sexual maturity (yrs): 2
- Mean clutch/litter/brood size: 5; actual number weaned is unknown
- Mean no of clutches/litters/broods per year: 1; however, no female has been recorded breeding in successive years
- Time of year young born/hatch: July-August (in East Gippsland and south-east NSW)
- Source: Fleay (1940), Settle (1978), Green and Scarborough (1990), C. Belcher unpublished data

- b) Longevity
 Classification of lifespan: Unknown
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): 5
- Source: C. Belcher unpublished data

c) Morphology Adult body size

- Weight (g): Females 1500-2200 (2000) max.
- 4000, males 1900-4100 (3000) max. 7000 Length (mm): Females 350-450, males 380-759
- Source: Belcher (1995b), Edgar and Belcher (1995), Belcher (1997)

d) Social organisation

- Colonial or non-colonial: Non-colonial
- Territoriality: Females maintain exclusive female territories (but tolerate juvenile females), male territories overlap with other male and female
- territories at least during the breeding season Source: Belcher (1995b), C. Belcher unpublished data

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Diet: Primarily a carnivore, juveniles also prey on invertebrates
- Source: Belcher (1995a,b)

THREATS

1. Clearing of Native Vegetation: Ranking (2) Mansergh and Belcher (1992), C. Belcher pers. comm.

2. Timber Harvesting: Ranking (3) Mansergh and Belcher (1992), C. Belcher and P. Menkhorst pers. comm

3. Fuel Reduction Burning: Ranking (3) Catling (1991), C. Belcher pers. comm.

4. Firewood Collection: Ranking (2) C. Belcher and P. Menkhorst pers. comm.

5. Unplanned Fire: Ranking (3) C. Belcher pers. comm

6. Introduced Species: Ranking (3) Mansergh (1984), Mansergh and Belcher (1992), C. Belcher pers. comm.

7. Grazing/Trampling: Ranking (1) C. Belcher and P. Menkhorst pers. comm.

8. Pest Control: Ranking (3) Mansergh and Belcher (1992), Belcher (1995c), Belcher (1998), C. Belcher and P. Menkhorst pers. comm.

9. Road Construction and Maintenance: Ranking (1) C. Belcher pers. comm.

10. Mining/Quarrying: Ranking (1) C. Belcher and P. Menkhorst pers. comm.

11. Tree Dieback: Ranking (1) C. Belcher and P. Menkhorst pers. comm.

12. Recreation: Ranking (0) C. Belcher pers. comm.

13. Illegal Collecting/Harvesting: Ranking (0) C.

Belcher and P. Menkhorst pers. comm. 14. Vandalism: Ranking (0) C. Belcher and P.

Menkhorst pers. comm.

15. Dams/impoundments: Ranking (1) C. Belcher and P. Menkhorst pers. comm.

Current Management:

The Spot-tailed Quoll is classified as "endangered" in Victoria (NRE 1999) and is listed under the Victorian Victoria (NRE 1999) and is listed under the Victorian Flora and Fauna Guarantee Act 1988. Within Wombat State Forest (Midlands Forest Management Area) there are a number of areas included in Special Protection Zones as Spot-tailed Quoll habitat (NRE 1996b). However, given the large home range size required by this species, the area covered by such zones is considered inadequate for quoll conservation within Wombat State Forest (C. Belcher pars, comm). The Otwaye Forest Management Plan pers. comm.). The Otways Forest Management Plan pers. comm.). The Otways Forest Management Plan proposes actions such as the exclusion of harvesting and burning operations from known denning and latrine sites, and avoiding the use of pest-control poisons in areas where Spot-tailed Quolls are known to exist (DCE 1992a). An Action Statement has been prepared for this species Mansergh and Belcher 1992) which includes the following proposed actions: maintenance of viable populations of the Spot-tailed maintenance of viable populations of the Spot-tailed Quoll within its remaining range, the recording of all sightings on the Atlas of Victorian Wildlife and the protection of sites of importance for scientific research such as latrine or den sites, by a minimum 200 m interim buffer zone pending formal management prescriptions.

Species characteristics:

Species characteristics: The Spot-tailed Quoll scavenges and preys on mammals, birds and reptiles. Medium-sized mammals (500 g-5 kg) are the major diet component for adult quolls (Belcher 1995a, Belcher 1997). Prey are stalked on the ground (e.g. rabbits) and arboreally (e.g. Greater Glider, Ringtail Possum) (Settle 1978, Belcher 1997). Juveniles are more dependent on small mammals, reptiles and invertebrates (Belcher 1995a, Belcher pers. comm.). Spot-tailed Quolls are forest dependent and appear to be restricted to areas where rainfall exceeds 600 to be restricted to areas where rainfall exceeds 600 mm per year and to riparian vegetation along the Murray River (Mansergh 1984). They have been recorded from a variety of habitat types around the state including wet sclerophyll forest, dry sclerophyll forest, woodland and heathland (Mansergh 1984, Edgar and Belcher 1995). Specific habitat Edgar and Belcher 1995). Specific habitat requirements are not known (C. Belcher pers. comm.). Den sites include tree hollows, logs, windrows, burrows, rock crevices, caves and boulder tumbles with many different sites being used within a home range (Belcher 1997). Spot-tailed Quolls, although seemingly solitary creatures, use common defecation sites: 'latrines', which appear to have an important social function such ac communication of important social function such as communication of female reproductive condition (Belcher 1994). Information on juvenile dispersal and reproductive success is limited; further research in these areas is required.

Distribution in the West CRA region: Records of the Spot-tailed Quoll in the region are mainly concentrated in two areas; the Otway Ranges, including the Otway National Park, and the Mt Eccles-Lake Condah area including sites within Mt Eccles National Park Eccles National Park. Other records are from locations scattered widely across the region including Wombat State Forest, Mount Macedon, the Cressy

vicinity, and Torquay and west of Heywood. Over half the records from the West region are pre-1970 (Atlas of Victorian Wildlife). The species was recently recorded from Cobboboonee State Forest north of Portland, where a quoll scat was found (A. Rovanstone pers. comm.) and from the Otways National Park where two individuals were trapped (C. Belcher pers. comm.).

Disturbances and potentially threater processes operating in the West CRA region: threatening processes operating in the West CRA region: Spot-tailed Quolls have large home ranges and require extensive areas of habitat to sustain populations. Major threats to this species relate to fragmentation and degradation of habitat and reduction of suitable foraging habitat and den sites which can be caused by clearing of vegetation (particularly for pine plantations), timber harvesting, fuel reduction burning and wildfire Catling 1991, Mansergh and Belcher 1992). Firewood collection can also result in a reduction in den sites through the removal of logs. The mountain and foothil forests of removal of logs. The mountain and foothill forests of the Otway Ranges are major timber production areas and are considered a stronghold of the Spot-tailed Quoll (Brinkman and Farrell 1990); existing populations are therefore potentially at risk from timber harvesting activities. The Spot-tailed Quoll is susceptible to non-target poisoning from 1080-poisoned baits used to control pest animals (rabbits, poisoned baits used to control pest animals (rabbits, wild dogs and foxes); such poisoning, which may result in the death of individuals or local populations, is regarded as a major threat to the existence of this species in the West region (Mansergh and Belcher 1992, Belcher 1995c, Belcher 1998, Murray 1998, C. Belcher and P. Menkhorst pers. comm.). Secondary poisoning can also occur through ingestion of poisoned rabbits. Foxes and feral cats represent a potential threat to the Spot-tailed Quoll via competition for prey items (Mansergh 1984, Mansergh and Belcher 1992) and the spread of disease (C. Belcher pers. comm.).

Eastern Bent-wing Bat

Miniopteris schreibersii oceanensis RARITY

a) Geographic Range

- Classification of range size within the West region: Medium
- Distribution of records within the West region: Distribution of records within the West region: Records scattered over lower part of region from Wombat State Forest to Nelson including sites at Cape Otway and Warrnambool, where there is a breeding colony (Lake Gillear cave) Number of 5 minute grid cells recorded from: 31 Source: Dwyer and Hamilton-Smith (1965), Atlas of Victorian Wildlife, L. Lumsden pers.
- comm.

b) Abundance

- Classification of abundance: Low
- Population Estimate: Unknown; there is an estimated 10,000 to 20,000 bats at the Lake Gillear maternity site which would include most of the breeding females from the West RFA region
- Density: Unknown
- Home Range (ha): Unknown Source: L. Lumsden pers. comm.

- Source: L. Lumsden pers. comm.
 c) Habitat Specificity
 Classification of habitat specificity: Narrow; depends on caves for roosting.
 Vegetation types inhabited in the region: Usually forage over forested areas but also known to forage along beaches
- Source: Menkhorst and Lumsden (1995a) DYNAMICS Population Trend in Last Decade

- Increasing, stable or declined: Unknown, possibly declined. There is concern about population levels particularly around the Lake Gillear area as numbers appear to be declining; this requires further investigation.

Source: L. Lumsden pers. comm.
Population trend since discovery by Europeans

- Increasing, stable or declined: Unknown, likely to have declined. A disused cave at Skipton is thought to have been the main maternity site before been abandoned due to guano mining in . the 1880's. Lake Gillear is considered to be a suboptimal alternative as breeding success is
- very low. Source: E. Hamilton-Smith pers. comm. SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: Low
- Source: Lumsden pers. comm.
 b) Dispersal
- Classification of powers of dispersal: High Average distances dispersed: Approximately 200km; juveniles disperse this distance from Nargun's Cave, East Gippsland to the Central Highlands.
- Maximum distance dispersed: Hundreds of kilometers.
- Source: Lumsden *et al.* (1991), Dwyer (1995), Atlas of Victorian Wildlife.
 LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity (yrs): 2 females, 1 males Mean clutch/litter/brood size: 1
- Mean no of clutches/litters/broods per year: 1
- Time of year young born/hatch: December
- Source: McKean and Hamilton-Smith (1967), Dwyer (1963)
- b) Longevity
- Classification of lifespan: Long-lived
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): 20
- Source: Purchase (1982)
 c) Morphology

- Adult body size Weight (g): 13-17
- Length (mm): 52-58
 Source: Dwyer (1995)
 d) Social organisation

- Colonial or non-colonial: Colonial
- Territoriality: Unknown
- Source: Dwyer (1966) Other e)
- Nomadic, migratory, sedentary: Adult females are migratory, most migrate seasonally to Lake Gillear maternity cave at Warrnambool; some migrate to Naracoorte (South Australia). Males and first year females are largely sedentary although long distance movements are sometimes made.
- Diet: Insectivore (flying insects)
- Source: Dwyer and Hamilton-Smith (1965), Vestjens and Hall (1977), L. Lumsden pers. comm.

THREATS

1. Clearing of Native Vegetation: Ranking (1) L.

Lumsden pers. comm. 2. Timber harvesting: Ranking (-) Law (1996), L. Lumsden pers. comm.

3. Fuel Reduction Burning: Ranking (-) L. Lumsden pers. comm

4. Firewood Collection: Ranking (-) L. Lumsden pers. comm

5. Unplanned Fire: Ranking (-) L. Lumsden pers. comm

6. Introduced Species: Ranking (2) Hall (1982), Menkhorst and Lumsden (1995a), L. Lumsden pers. comm.

7. Grazing/Trampling: Ranking (0) L. Lumsden pers. comm.

8. Pest Control: Ranking (2) Dunsmore et al. (1974), Menkhorst and Lumsden (1995a), L.

Lumsden pers. comm. 9. Road Construction and Maintenance: Ranking (0)

L. Lumsden pers. comm. 10. Mining/Quarrying: Ranking (2) L. Lumsden

pers. comm.

11. Tree Dieback: Ranking (-) L. Lumsden pers.

comm. 12. Recreation: Ranking (3) L. Lumsden pers. comm

13. Illegal Collection/Harvesting: Ranking (1) L.

Lumsden pers. comm. 14. Vandalism/Disturbance by Humans: Ranking (3) Seebeck and Hamilton-Smith (1967), Hall (1982 Menkhorst and Lumsden (1995a), L. Lumsden pers.

comm. 15. Dams/Impoundments: Ranking (0) L. Lumsden

pers. comm. 16. Other: Collapse of mineshafts and overgrown entrances: Ranking (3) L. Lumsden pers. comm.

Current Management:

Current Management: The Eastern Bent-wing Bat is classified as "vulnerable" in Victoria (NRE 1999) and is listed under the Victorian *Flora and Fauna Guarantee Act* 1988. The Otway Forest Management Plan (FMP) recommends the investigation into effects of activities such as fuel reduction burning and grazing on this species (DCE 1992a). Under the Midlands FMP Special Management Zones are to be established around roosting and over-wintering sites with around roosting and over-wintering sites with activities likely to disturb bats, such as timber harvesting and road construction, excluded during over-wintering periods (NRE 1996a). An Action Statement is under preparation for this species (Clunie in prep.).

Species characteristics:

The Eastern Bent-wing Bat is a fast flying, highly mobile aerial insectivore. Female Eastern Bent-wing Bats congregate in large breeding colonies to give birth; only two sites are known for Victoria, one near Nowa Nowa, and the other near Warnambool (Dwyer and Hamilton-Smith 1965). Roosting habitats include caves, mines, and tunnels and the species is restricted to areas of southern Victoria where there are suitable roost sites. Roost sites are usually near well timbered areas where bats forage for aerial insects, primarily moths, both above and below the canopy (Menkhorst and Lumsden 1995a). Males and first year females use these sites all year round while adult females travel to maternity sites from December to March then return to overwinter. Although relatively widespread, Eastern Bent-wing Bats are considered threatened due to their dependence on a small number of maternity caves and overwintering sites (L. Lumsden pers. comm.). Most available information is related to roosting; very little is known about other habitat requirements and ecology.

Distribution in the West CRA Region:

Records of the Eastern Bent-wing Bat are scattered over the lower portion of the West CRA region. Locations of sites include Wombat State Forest, (where there is a breeding colony), Portland, Dunkeld and Nelson (Atlas of Victorian Wildlife).

Disturbances and potentially threatening process operating in the West CRA Region: Eastern Bent-wing Bats go into torpor over winter. The species is particularly vulnerable to disturbances which rouse them during torpor; human disturbance (direct vandalism and recreational cave exploring) of torpid het is known to have accurated significant larges torpid bats is known to have caused significant losses and abandonment of roost sites (Seebeck and Hamilton-Smith 1967, L. Lumsden pers. comm.). The deliberate closure of mineshaft entrances for safety reasons near areas of human habitation, can also cause losses. Collapse of mineshafts, blockage of entrances by vegetation which inhibits bat access, and the reworking of mines are also threats to the species (Lumsden pers. comm.). Bats have been recorded being taken by feral cats as they leave roosts, and poisoning through cumulation of pesticides (Menkhorst and Lumsden 1995a) are also threats to the species. Clearing of native vegetation for agriculture can physically destroy or damage caves and surrounding habitat and may alter the caves and surrounding habitat and may after the composition and abundance of insects. Fuel reduction burning, grazing and recreational activities may affect habitat; this requires further investigation (DCE 1992a). The effects of forestry practices such as timber harvesting and fuel reduction burning on this species and its prey, are unknown (Law 1996, L. Lumsden pers comm.) Lumsden pers. comm.).

Southern Myotis

Myotis macropus

RARITY

- a) Geographic Range
 Classification of range size within the West region: Large
- Distribution of records within the West region: Few widely spaced records from east of Mount Macedon in the east of the region to Casterton and Nelson in the west.
- Number of 5 minute grid cells recorded from: 12 Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low

- Classification of abundance. Low
 Population Estimate: Unknown
 Density: Unknown
 Home Range (ha): Unknown; individuals are known to regularly forage 10-15 km from roosts.
 Source: L. Lumsden pers. comm.
 Classification of habitat specificity: Narrow ; always appreciated with permonent water badies

- always associated with permanent water bodies. Vegetation types inhabited in the region:
- Generally recorded from a wide range of vegetation communities associated with water Source: Lumsden and Menkhorst (1995), L.
- Lumsden pers. comm.

DYNAMICS Population Trend in Last Decade

 Increasing, stable or declined: Unknown
 Source: L. Lumsden pers. comm.
 Population trend since discovery by Europeans
 Increasing, stable or declined: Unknown, possibly declined; caves in the south-west of the region were deserted soon after bats were recorded there in the 1960's and haven't been re-inhabited since.

Source: L. Lumsden SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: Low
- Source: L. Lumsden pers. comm.
- b) Dispersal
- Classification of powers of dispersal: Unknown, but no recorded long-distance movements Average distances dispersed: Unknown
- Maximum distance dispersed: Unknown
 Source: L. Lumsden pers. comm.
 LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity (yrs): 1 or 2
- Mean clutch/litter/brood size: 1
- Mean no of clutches/litters/broods per year: 1 or
- Time of year young born/hatch: Usually November or December; heavily pregnant females have been recorded in October and lactating females in mid-March and it is unclear whether there is an extended and unsynchrous birthing season or if there are two distinct periods when births occur.
- Source: Lumsden and Menkhorst (1995), Richards (1995), McKean and Hamilton-Smith (1967), L. Lumsden pers. comm.
- b) Longevity
 Classification of lifespan: Long-lived
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): Unknown
- Source: L. Lumsden pers. comm.

c) Morphology

- C) Morphology
 Adult body size
 Weight (g): 10-14
 Length (mm): 52-56 (54)
 Source: Richards (1995), L. Lumsden pers.

d) Social organisation

- Colonial or non-colonial: Colonial
- Territoriality: Unknown closely related to a Queensland species whose males are territorial.
- Source: Seebeck and Hamilton-Smith (1967), Dwyer (1970)

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Source: Vestjens and Hall (1977), Robson (1984), Jansen (1987)

THREATS

- 1. Clearing of Native Vegetation: Ranking (1) L.
- Lumsden pers. comm.

2. Timber harvesting: Ranking (2) Campbell and

Doeg (1989), L. Lumsden pers. comm. 3. Fuel Reduction Burning: Ranking (-) L. Lumsden pers. comm.

4. Firewood Collection: Ranking (-) L. Lumsden pers. comm.

5. Unplanned Fire: Ranking (-) L. Lumsden pers.

6. Introduced Species: Ranking (1) L. Lumsden pers. comm. 7. Grazing/Trampling: Ranking (1) L. Lumsden

pers. comm. 8. Pest Control: Ranking (2) L. Lumsden pers.

comm.

9. Road Construction and Maintenance: Ranking Lumsden pers. comm.
 Mining/Quarrying: Ranking (-) L. Lumsden pers.

comm. 11. Tree Dieback: Ranking (-) L. Lumsden pers.

comm

12. Recreation: Ranking (1) L. Lumsden pers. comm

13. Illegal Collection/Harvesting: Ranking (0) L.

14. Vandalism/Disturbance by Humans: Ranking (1) Seebeck and Hamilton-Smith (1967), L. Lumsden

pers. comm. 15. Dams/Impoundments: Ranking (0) L. Lumsden pers. comm.

Current Management:

Current Management: The Southern Myotis is classified as "lower risk - near threatened" in Victoria (NRE 1999). Under the Code of Forest Practices for Timber Production (NRE 1996a) the water quality and riparian vegetation of permanent streams are protected by a buffer on either side of the stream of a minimum width of 20m. Trace must not be falled within or into huffer strips Trees must not be felled within or into buffer strips and machinery must not enter other than for construction and use of approved stream crossings. Such prescriptions afford some protection to the habitat and food resource of the Southern Myotis.

Species characteristics: The Southern Myotis *Myotis macropus,* formerly known *as Myotis adversus macropus,* is a newly recognised species (Kitchener *et al.* 1995). The The species is always associated with permanent, usually slow flowing water bodies, and is found in a wide range of vegetation communities associated with water (Lumsden and Menkhorst 1995). The Southern Myotis feeds close to the surface of the southern highly the surface of the surface of the water, using its large, recurved clawed feet to rake across the surface and along with the tail membrane, to scoop up aquatic insects and sometimes small fish. Flying insects are also taken (Richards 1995, Robson 1984, Vestjens and Hall 1977). In Victoria the species has been found roosting in caves, tunnels, and tree hollows; one population is known to be roosting in dead trees in the middle of Lake Eidon. be roosting in dead trees in the middle of Lake Eildon (Seebeck and Hamilton-Smith 1967, McKean and Hall 1965, L. Lumsden and C. Caddle pers. comm.). There is a possibility dense vegetation may also be used (M. Schulz pers. comm. in Lumsden and Menkhorst 1995).

Distribution in the West CRA Region:

Records of the Southern Myotis are widely distributed from four localities within the region; near Monegeetta east of Mount Macedon, and near Little River, north of the You Yangs Forest Park, in the east, to Casterton and Nelson in the West. Most records are clustered around Casterton and Nelson (Atlas of Victorian Wildlife).

threatening Disturbances and potentially processes Region: West CRA operating within the

Disturbances which affect water quality may secondarily impact on the Southern Myotis through loss of prey. Pest control, mining/quarrying, timber harvesting and roading potentially affect water quality; chemicals used for pest control and mining may drain into the waterways, increased siltation of streams and changes to water temperature and flow regimes as a result of poor road construction and maintenance, and timber harvesting within stream and Doeg 1989, SAC 1991, SAC 1992). Although the relative dependence of the Southern Myotis on the relative dependence of the Southern Myotis on roost sites in caves versus tree hollows is unknown (Lumsden and Menkhorst 1995), timber harvesting may also impact on the species through loss of roosting habitat. Grazing of streamside reserves may impact on the Southern Myotis in the long-term by prevention of habitat regeneration and in the shortterm by simplifying vegetation structure making it unsuitable as roosting habitat and by affecting water quality. Although not a significant threat, recreational fishing may potentially impact on populations due to general disturbance of creek areas, such as trampling of vegetation (L. Lumsden pers. comm.).

Brush-tailed Phascogale

Phascogale tapoatafa

RARITY

a) Geographic Range

- Classification of range size within the West region: Large
- Distribution of records within the West region: Most records from the east of the region in the vicinities of the Brisbane Ranges, Cobaw State Forest and Wombat State Forest. Other concentrations of records include the area bounded by the Pyreenes Ranges, Beaufort and Ararat.

Number of 5 minute grid cells recorded from: 80 Source: Atlas of Victorian Wildlife

- b) Abundance
- Classification of abundance: Low
- Population Estimate: Unknown
- Density: 0.03 (males and females)/ha (Strathbogie Ranges); on average 0.01 breeding females/ha
- Home Range (ha): females 20-78 (41); males 68-152 (106), appears dependent on habitat quality, may be smaller in areas of high quality habitat
- Source: Soderquist (1995b), Downes et al. (1997), T. Soderquist and R. van der Ree pers. comm

c) Habitat Specificity

- Classification of habitat specificity: Wide, but requires hollows for nesting and shelter
- Vegetation types inhabited in the region: Dry sclerophyll forest and woodland, especially those with an association of box, ironbark and stringybark eucalypts. Some commonly utilised associations include Red Stringybark Eucalyptus macrorhyncha, Messmate E. obliqua, Red Box E. polyanthemos and Long Leaf Box E. goniocalyx; Yellow Box E. melliodora and Grey Box E. microcarpa.

Source: Soderquist (1995b), Menkhorst (1995a) DYNAMICS Population Trend in Last Decade

- Increasing, stable or declined: Declined
 Source: SAC (1991), T. Soderquist pers. comm.
 Population trend since discovery by Europeans
 Increasing, stable or declined: Declined; due to clearance and degradation of a large proportion of suitable habitat
- Source: Menkhorst and Gilmore (1979),

Humphries and Seebeck (1997) SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: High
 Source: Cuttle (1982a)
 b) Dispersal
- Classification of powers of dispersal: High

- Average distances dispersed: Males 6 km, Females average 2 km
- Maximum distance dispersed: Approximately 20 km for males, 5 km for females
- Source: Soderquist and Lill (1995), Rhind (1996), T. Soderquist pers. comm. LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: High
- Age of sexual maturity (mths): 10-11
- Mean clutch/litter/brood size: 7-8
- Mean no of clutches/litters/broods per year: 1
- Time of year young born/hatch: June-August Source: Cuttle (1982a), Soderquist (1993)
- b) Longevity
- Classification of lifespan: Short-lived
- Average lifespan (yrs): Females 1-2; males 1
- Maximum lifespan (yrs): Females 3; males 1 Source: Cuttle (1982a), Soderquist (1995a)

c) Morphology

Adult body size

- Weight (g): Females 106-212 (156); males 175-311(231)
- Length (cm): Females 148-233 (181); males 160-261 (199) Source: Soderquist (1995a)
- d) Social organisation Colonial or non-colonial: Non-colonial,
- occasionally nest together
- Territoriality: Females territorial (non-overlapping home ranges)
- Source: Soderquist (1995b), Soderquist and Ealey (1994)
- e) Other
- Nomadic, migratory, sedentary: Sedentary
- Diet: Insectivore (invertebrates), Nectarivore,
- occasionally small vertebrates Source: Cuttle (1982b), Traill and Coates (1993)

THREATS

1. Clearing of Native Vegetation: Ranking (3) Rhind (1996), Humphries and Seebeck (1997), T. Soderquist pers. comm.

2. Timber Harvesting: Ranking (2) Rhind (1996), Humphries and Seebeck (1997), T. Soderquist pers. comm.

3. Fuel Reduction Burning: Ranking (1) T. Soderquist pers. comm.

4. Firewood Collection: Ranking (2) Humphries and Seebeck (1997), T. Soderquist pers. comm. 5. Unplanned Fire: Ranking (2) P. Menkhorst and T.

Soderquist pers. comm. 6. Introduced Species: Ranking (2) Soderquist

(1993), Humphries and Seebeck (1997), P.

Menkhorst and T. Soderquist pers. comm. 7. Grazing/Trampling: Ranking (1) Humphries and

Seebeck (1997), T. Soderquist pers. comm. 8. Pest Control: Ranking (1) P. Menkhorst and T.

Soderquist pers. comm.

9. Road Construction and Maintenance: Ranking (1) T. Soderquist pers. comm

10. Mining/Quarrying: Ranking (1) Humphries and Seebeck (1997), P. Menkhorst and T. Soderquist pers. comm.

11. Tree Dieback: Ranking (1) T. Soderquist pers. comm.

12. Recreation: Ranking (0) T. Soderquist pers. comm.

13. Illegal Collecting/Harvesting: Ranking (0) P.

Menkhorst and T. Soderquist pers. comm.

14. Vandalism/Disturbance by Humans: Ranking (0)

P. Menkhorst and T. Soderquist pers. comm. 15. Dams/Impoundments: Ranking (0) P. Menkhorst and T. Soderquist pers. comm.

Current Management:

The Brush-tailed Phascogale is classified as "vulnerable" in Victoria (NRE 1999) and has been listed under the Victorian *Flora and Fauna Guarantee* Act 1988. Intended management actions under the

Midlands FMP include the retention of a proportion of known preferred Phascogale habitat in Special Protection Zones (SPZs) and conservation reserves and the establishment of Special Management Zones and the establishment of Special Management Zones (SMZs) and the development of prescriptions for these zones aiming to protect habitat quality and provide Fox and feral Cat control (NRE 1996a). SMZs are also intended to support a total of 100 breeding females within the Midlands Forest Management Area. However, population viability analysis indicates that this number is inadequate; 50 breeding females are needed ner single population breeding females are needed per single population for that population to be relatively secure (T. Soderquist pers. comm.). A survey to identify Phascogale localities to aid in establishment of SMZs was recently completed which identified four geographically separated populations (Nelson *et al.* 1997). An Action Statement has been published (Humphries and Seebeck 1997) outlining intended management actions including the preparation of a Recovery Plan for the Brush-tailed Phascogale in Public formation of a south-eastern Australia; formation of a Recovery Team to oversee and coordinate the implementation of the Recovery Plan and Action Statement; long-term monitoring of populations and the preparation of prescriptions for the protection and maintenance of Phascogale populations and their habitat in state forest.

Species characteristics: The Brush-tailed Phascogale is a nocturnal, mainly arboreal insectivore which requires large areas of habitat to sustain populations. Both males and females forage very widely with females occupying large intrasexual exclusive home ranges (average 41 ha) (Soderquist 1995b), hence the species occurs at very low population densities. However, in areas of optimal habitat, home range sizes have been found to be considerably amplited B, used dor Beag in prop. to be considerably smaller (R. van der Ree in prep.). Tree hollows are essential for nesting and shelter with many different sites used each year (Rhind 1996). If natural hollows are unavailable Brush-tailed Phascogales will inhabit nest boxes (Traill and Coates 1993). Brush-tailed Phascogales inhabit dry sclerophyll forest and woodland particularly where sclerophyll fórest and woodland particularly where there are box, ironbark and stringybark eucalypt associations. Important eucalypt associations include Red Stringy *Eucalyptus macrorhyncha*, Messmate *E. obliqua*, Red Box *E. polyanthemos* and Long Leaf Box *E. goniocalyx*; Yellow Box *E. melliodora* and Grey Box *E. microcarpa*; Red Ironbark *E. sideroxylon* and Yellow Gum *E. leucoxylon* (Menkhorst and Gilmore 1979, Menkhorst 1995a). A sparse understorey and ground cover consisting of grass, litter or an open shrub layer, is preferred (Menkhorst and Gilmore 1979). Life history of the Brush-tailed Phascogale is characterized by an of the Brush-tailed Phascogale is characterized by an annual male die-off: all males die after their first breeding season (Cuttle 1982a), therefore it is imperative that breeding is successful to avoid local population extinction. Additionally, mortality within litters and among lactating adult females can be high (Cuttle 1982a, Soderquist 1993).

Distribution in the West CRA region:

The majority of records of the Brush-tailed Phascogale in the West are from the east of the region between Dunneworthy State Forest, the Brisbane Ranges and Wombat State Forest, as well as further west from the Pyrenee Range, Avoca, Dunneworthy State Forest and Ararat. The species has also been recorded from Beaufort, Mt Buangor, Mt Cole State Forest and as far south as Streatham. There are some early records (pre-1970) near Geelong, Ocean Grove, Woolsthorpe and Orford. There are a scattering of sites in the west of the region between Digby, Apsley and Telangatuk East. Records are from private land, state forest, regional parks and national parks and include a number of readilitie (Atlea of Victories) Wildlife) roadkills (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the West CRA region:

There has been widespread clearing of the preferred habitat of the Brush-tailed Phascogale. Remaining habitat has been fragmented and modified by

processes such as timber harvesting, firewood collection, mining and grazing; these are continuing processes and are therefore ongoing threats (Alexander 1997, Humphries and Seebeck 1997, T. (Alexander 1997, Humphries and Seebeck 1997, I. Soderquist pers. comm.). Fragmentation and reduction of quality of habitat are major threats to the Brush-tailed Phascogale, which is particularly susceptible because of its inherent low population density, large foraging range and post-breeding annual male die-off (Menkhorst 1995a). Clearing of native vegetation and timber harvesting results in the removal of both live and dead trees which decreases the number of suitable bollows and reduces foraging the number of suitable hollows and reduces foraging the number of suitable hollows and reduces foraging substrate (Rhind 1996, Humphries and Seebeck 1997). The collection of fallen logs for firewood also removes an important source of invertebrate prey (Alexander 1997). Grazing can result in simplification of the vegetation structure, leading to a reduction in prey items due to lack of regeneration of suitable prey habitat (Humphries and Seebeck 1997). As large blocks of forest are of limited availability, remnants of suitable Brush-tailed Phascogale habitat provide important links and degradation of such provide important links and degradation of such areas threatens the viability of this species. Predation by Foxes and feral Cats is considered a significant threat Humphries and Seebeck 1997, Seebeck and Clunie 1997, P. Menkhorst and T. Soderquist pers. comm.). Improper burial of FOXOFF baits and the use of improvised Fox baiting techniques are considered a minor threat to this species (T. Soderquist pers. comm.). The annual die-off of males makes this species vulnerable to stochastic events such as wildfire which may lead to local population extinctions (Menkhorst 1995a). Competition for tree hollows with feral bees is considered a potentially threatening process although the effects of this requires further investigation (Alexander 1997).

Sauirrel Glider

Petaurus norfolcensis

RARITY

a) Geographic Range

- Classification of range size within the West region: Small
- Distribution of records within the West region: ٠ All records fall between Horsham and Stawell
- Number of 5 minute grid cells recorded from: 10 Source: Menkhorst *et al.* (1988), Atlas of
- Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: Unknown Density: 0.4 /ha in prime habitat in Chiltern Box Ironbark National Park
- Home Range (ha): 7-16 in prime habitat in Chiltern Box Ironbark National Park
- Source: Traill and Coates (1993), Traill (1995)
- c) Habitat Specificity Classification of habitat specificity: Wide, but depends on hollows for nesting and shelter
- nesting and shelter Vegetation types inhabited in the region: Dry forests and woodlands. Mature or mixed-aged stands of more than one eucalypt species including gum-barked species, or riparian open forest of River Red Gum typically containing mature Acacia dealbata or A. mearnsii. Appears restricted to relatively low lying moist areas where a winter flowering eucalypt is present (i.e. Yellow Gum, Eucalyptus leucoxylon), a large stand of Grey Box occurs nearby and forest stand of Grey Box occurs nearby and forest stand to Grey box occurs nearby and forest structure is open with a variety of age and size-classes including hollow trees.
 Source: Menkhorst *et al.* (1988), Menkhorst (1995d) , L. Rowley pers. comm. DYNAMICS
 Population Trend in Last Decade

- Increasing, stable or declined: Unknown, possibly declined due to continuing clearing and possibly declined due to continuing clearing ar timber removal within habitat.
 Source: R. van der Ree pers. comm.
 Population trend since discovery by Europeans
 Increasing, stable or declined: Declined
 Source: Menkhorst *et al.* (1988)
 SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: Unknown Source: R. van der Ree pers. comm. Dispersal
- b)
- Classification of powers of dispersal: High Average distances dispersed: Females
- observed to disperse 3-5 km
- Maximum distance dispersed: Unknown

- Maximum distance dispersed: Unknown
 Source: R. van der Ree pers. comm.
 LIFE HISTORY PARAMETERS
 a) Reproductive output
 Classification of reproductive output: Low
 Age of sexual maturity (yrs): 1
 Mean clutch/litter/brood size: 1-2
 Mean page of elutehoe littera/mende per use

- Mean no of clutches/litters/broods per year: 1-2 Time of year young born/hatch: Throughout year
- with a peak in June-July Source: Quin (1995), Traill (1995), R. van der Ree pers. comm.

b) Longevity

- Classification of lifespan: Short-lived
- Average lifespan (yrs): Unknown, possibly 4
- Maximum lifespan (yrs): at least 5-6 in sub-tropical woodland/forest in NSW
- Source: Quin (1995), R. van der Ree pers. Source: same comm.
 C) Morphology
 Adult body size
 Weight (g): 190-300 (230)
 Length (mm): 180-230 (210)
 Suckling (1995)

- Source: Suckling (1995)
- d) Social organisation
- Colonial or non-colonial: Colonial Territoriality: Preliminary data suggests that in linear road reserves they may display some level of territorality
- Source: Quin (1995), Traill (1995), R. van der Ree pers. comm. e) Other

- Nomadic, migratory, sedentary: Sedentary Diet: Plant exudates, nectarivore, insectivore
- (arboreal invertebrates) Source: Menkhorst and Collier (1988)

THREATS

1. Clearing of Native Vegetation: Ranking (3) R. van der Ree pers. comm

2. Timber Harvesting: Ranking (1) Maxwell et al. (1996), Weber (in prep.)

3. Fuel Reduction Burning: Ranking (2) Menkhorst et al. (1988), Maxwell et al. (1996), R. van der Ree pers. comm.

4. Firewood Collection: Ranking (2) Menkhorst et al. (1988), Alexander (1997), P. Menkhorst and R. van der Ree pers. comm.

5. Unplanned Fire: Ranking (3) Menkhorst et al. (1988), P. Menkhorst pers. comm.

6. Introduced Species: Ranking (1) Alexander (1981), P. Menkhorst and R. van der Ree pers. comm.

7. Grazing/Trampling: Ranking (2) Alexander (1981), Weber (in prep.), P. Menkhorst and R. van der Ree pers. comm.

8. Pest Control: Ranking (1) R. van der Ree pers. comm.

9. Road Construction and Maintenance: Ranking (2) Menkhorst et al. (1982), Weber (in prep.), P.

Menkhorst and R. van der Ree pers. comm. 10. Mining/Quarrying: Ranking (1) Maxwell et al.

(1996), R. van der Ree pers. comm.

11. Tree Dieback: Ranking (2) Weber (in prep.), P. Menkhorst and R. van der Ree pers. comm.

12. Recreation: Ranking (1) P. Menkhorst per. comm

13. Illegal Collecting/Harvesting: Ranking (0) P. Menkhorst pers. comm.

14. Vandalism: Ranking (0) P. Menkhorst and R. van

der Ree pers. comm.

15. Dams/Impoundments: Ranking (0)

16. Other: Loss of Genetic Diversity: Ranking (2) R. van der Ree pers. comm.

Current Management

The Squirrel Glider is classified as "endangered" in Victoria (NRE 1999) and is listed under the Victorian *Flora and Fauna Guarantee Act* 1988. Under the Midlands Forest Management Plan intended actions include the establishment of Squirrel Glider Special Management Zones and to manage these areas with the aim of maintaining key habitat elements such as posting bellows. species (NRE 1996a). An Action Statement is currently being prepared (Weber in prep.).

Species characteristics

The Squirrel Glider is a nocturnal, arboreal gliding possum that feeds on arboreal invertebrates (particularly caterpillars) and plant exudates (sap, gum, nectar, pollen) (Menkhorst and Collier 1988). This species is hollow-dependent, uses many hollows (in both live and dead trees) within a home range, (in both live and dead trees) within a nome range, requires large areas for foraging and is usually present in low densities (Bennett 1993, Menkhorst 1995d, Traill 1995, Weber in prep.). Squirrel Gliders are found in dry woodlands and open forests of mature and mixed-aged stands, often of more than one eucalypt species including gum-barked species. Reliable moisture appears to be an important habitat componant. Preferred habitat includes a mixture of box species dominated by Grey Box. *Eucalprotus* box species dominated by Grey Box *Eucalyptus* microcarpa, White Box *E. albens* and Yellow Box *E. melliodora.* Riparian open forest of River Red Gum *E. camaldulensis* is also important, high quality habitat. An understorey of mature *Acacia dealbata* is usually present, which provides an important food source (Menkhorst *et al.* 1988). These habitats need to be highly productive. Density and home range information is based on areas of prime habitat in Chiltern Box-Ironbark National Park; populations in other areas are likely to exhibit lower densities and larger home ranges (P. Menkhorst pers. comm.).

Distribution in the West CRA region

With the exception of a single sub-fossil record from With the exception of a single sub-fossil record from Byaduk Caves, all records of the Squirrel Glider in the West region fall between Stawell and Horsham in the vicinities of Dadswells Bridge, Glenorchy, Deep Lead, Bridge Inn and Lake Lonsdale. Most records are from roadside reserves, Deep Lead Flora and Fauna Reserve and the north-eastern edge of the Grampians National Park (Atlas of Victorian Wildlife). The species was recently recorded from Illawarra State Forest (L. Rowley pers. comm.).

Disturbances and potentially threatening processes operating in the West CRA Much of the preferred habitat of the Squirrel Glider has been cleared, largely restricting this species to isolated remnants of habitat amid cleared farmland and along roads or streams (Menkhorst et al. 1988, Menkhorst 1995d, Alexander 1997). There is little information on how this species uses such habitat; the population sizes that these remnants are able to support brings into doubt the long-term viability of this species (Weber in prep.). In the West CRA region Squirrel Glider populations are mostly recorded from isolated remnants of native vegetation in roadside reserves. Genetic isolation leading to loss of genetic diverging and escapitated interval and the second states of the second states o reserves. Genetic isolation leading to loss of genetic diversity and associated inbreeding effects is potentially a significant threat to the species (Alexander 1997, R. van der Ree pers. comm.). Other significant threats to Squirrel Glider populations include further loss of habitat, particularly hollow-bearing trees, fragmentation of habitat and reduction in habitat quality as a result of disturbances such as clearing of native vegetation, firewood collection, road maintenance and widening, fuel reduction burning, tree dieback and grazing (Menkhorst *et al.* 1988, Alexander 1997, Weber in prep.). The use of pesticides may reduce the availability of insect prey, particularly within remnant vegetation on agricultural particularly within remnant vegetation on agricultural land (R. van der Ree pers. comm.). The fragmented nature of Squirrel Glider habitat in the West region means that this species is especially vulnerable to

further loss of habitat, and disturbances and localised extinction resulting from catastophic events such as wildfire.

Common Dunnart

Sminthopsis murina

RARITY

- a) Geographic Range Classification of range size within the West region: Large
- Distribution of records within the West region: Scattered through-out region; the majority of records are from between south-east of Smythesdale to north-east of Lancefield and include the Brisbane Ranges and Wombat State Forest.
- Number of 5 minute grid cells recorded from: 29 Source: Atlas of Victorian Wildlife
- b) Abundance Classification of abundance: Low
- Population Estimate: Unknown

- Density: Unknown Home Range (ha): Unknown Source: Menkhorst (1995b), P. Menkhorst pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Narrow; appears to favour certain fire generated vegetation stages
- Vegetation types inhabited in the region: Dry forest and woodland. Brown Stringybark *Eucalyptus baxteri* open forest. Recorded from the following EVCs: Heathy Dry Forest, Low Rises Grassy Woodland Source: Fox (1982), Menkhorst and Beardsell (1982), Menkhorst (1995b), Silviera *et al.* (1997)
- DYNÀMICS

Population Trend in Last Decade

- Population Trend in Last Decade
 Increasing, stable or declined: Unknown, probably declined due to clearing of habitat
 Source: J. Seebeck pers. comm.
 Population trend since discovery by Europeans
 Increasing, stable or declined: Declined due to clearing of habitat
 Source: Silveira et al. (1997), P. Menkhorst pers. comm

- SPATIAL DYNAMICS
 a) Population variability
 Classification of population variability: Unknown
 Source: P. Menkhorst pers. comm.
- b) Dispersal
- Classification of powers of dispersal: Unknown
- Average distances dispersed: Unknown
- Maximum distance dispersed: Unknown
- Source: P. Menkhorst pers. comm. LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: High
- Age of sexual maturity (yrs): Unknown, thought to be 6 months based on similar life history characteristics of other closely related species Mean clutch/litter/brood size: 8 (4-10)
- Mean no of clutches/litters/broods per year: 2 Time of year young born/hatch: September-Januarv
- Source: Fox and Whitford (1982), Lee et al. (1982)

b) Longevity

- Classification of lifespan: Short-lived
- Average lifespan (yrs): 1
- Maximum lifespan (yrs): 2 (females) Source: Fox (1982)

c) Morphology

- Adult body size
- Weight (g): females 10-22 (14), males 16-28 (20)
- Length (mm): females 64-92 (76), males 76-104 (81)
- Source: Fox (1995)
- d) Social organisation
 Colonial or non-colonial: Unknown
- Territoriality: Unknown, males probably territorial during breeding season

- Source: Fox and Whitford (1982) e) Other
- Nomadic, migratory, sedentary: Unknown .
- Diet: Insectivore .
- Source: Fox and Archer (1984)

THREATS

1. Clearing of Native Vegetation: Ranking (2) J.

Seebeck and P. Menkhorst pers. comm.

2. Timber Harvesting: Ranking (2) J. Seebeck and Р Menkhorst pers. comm.

3. Fuel Reduction Burning: Ranking (2) J. Seebeck and P. Menkhorst pers. comm.

4. Firewood Collection: Ranking (3) P. Menkhorst pers. comm.

5. Unplanned Fire: Ranking (2) J. Seebeck pers. comm.

6. Introduced Species: Ranking (3) P. Menkhorst pers. comm.

7. Grazing/Trampling: Ranking (2) J. Seebeck and P. Menkhorst pers. comm

8. Pest Control: Ranking (0) J. Seebeck and P.

Menkhorst pers. comm.

9. Road Construction and Maintenance: Ranking (0) J. Seebeck and P. Menkhorst pers. comm.

10. Mining/Quarrying: Ranking (1) P. Menkhorst pers. comm.

11. Tree Dieback: Ranking (1) P. Menkhorst pers. comm.

12. Recreation: Ranking (0) J. Seebeck and P. Menkhorst pers. comm.

13. Illegal Collecting/Harvesting: Ranking (0) J.

Seebeck and P. Menkhorst pers. comm.

14. Vandalism: Ranking (0) J. Seebeck and P.

Menkhorst pers. comm.

15. Dams/Impoundments: Ranking (0) P. Menkhorst pers. comm.

Current Management The Common Dunnart is classified as "data deficient" in Victoria (NRE 1999). Within the Midlands Forest Management Area proposed actions include the establishment of Special Protection Zones around known Common Dunnart sites and managing these to protect the integrity of heathy understorey areas, particularly in regard to fuel reduction burning regimes (NRE 1996a).

Species characteristics

Species characteristics The Common Dunnart is a nocturnal marsupial that shelters during the day in a cup-shaped nest of dried leaves and grass. Nests are built in ground cover vegetation and debris such as fallen hollow logs, clumps of grass and grass trees (Xanthorrhoea sp.) (Fox 1995). Common Dunnarts inhabit dry forest, woodland, mallee and open heath that is usually characterised by a sparse cover of shrub and ground vegetation and a dense leaf and bark litter layer (Menkhorst 1995b). In heath and forest habitats in NSW this species is most abundant in post-fire mid-seral stages (Fox and McKay 1981, Fox 1982); however, there is little known about its response to seral stages (Fox and McKay 1981, Fox 1982); however, there is little known about its response to fire in relation to Victorian habitats. The Common Dunnart is an opportunistic insectivore feeding on a wide range of terrestrial arthropods, especially beetles, cockroaches and moths (Fox and Archer 1984). This species has a very short life-span (males live for only one year) (Fox 1982). There is a lack of ecological knowledge on the Common Dunnart.

Distribution in the West CRA region

Records of the Common Dunnart are scattered across the region (excluding southern areas), from Casterton, Edenhope, Dergholm and the Grampians National Park in the west, to Mt Erip , Mt Bunninyong, Linton, Bannockburn, the Brisbane Ranges, Wombat State Forest an Lancefield in the north-east. The most southerly records are from Mt Eccles National Park east of Heywood, and Bleakhose, south-west of Geelong. Records are from State forest, conservation reserves and private land (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the West CRA region

processes operating in the West CRA region The current status of the Common Dunnart in the West is unclear. Activities that disturb the ground layer such as timber harvesting, firewood collection and grazing have the potential to reduce foraging, shelter and nesting sites. Open forest of Brown Stringybark eucalypts are known to support this species (Menkhorst and Beardsell 1982). These forests are also an important source of timber in some areas of the West (Brinkman and Farrell 1990) and threatening processes related to timber and threatening processes related to timber harvesting including disturbance and loss of ground litter, may adversely impact on populations. Firewood collection is considered a major threat to this species as it results in a reduction in nest sites as well as disturbance to the ground layer. There appears to be a link between the post-fire vegetation successional stage and Common Dunnart abundance (Fox and McKay 1981, Fox 1982) and inappropriate fire regimes may be detrimental to local survival of this species. However, this requires further investigation. The short life-span of the Common Dunnart and its existence in small isolated populations makes this species particularly Common Dunnart and its existence in small isolated populations makes this species particularly vulnerable to localised extinctions from events causing large scale habitat destruction and/or death of individuals such as clearing and wildfire (Wilson 1996). Predation by introduced species is considered a major threat to Common Dunnart populations in the West (P. Menkhorst pers. comm.).

Heath Mouse

Pseudomys shortridgei

RARITY

- a) Geographic Range
- Classification of range size within the West region: Small
- Distribution of records within the West region: Concentrated around the Grampians National Park, Casterton and from Nelson to Heywood
- Number of 5 minute grid cells recorded from: 58 Source: Atlas of Victorian Wildlife
- b) Abundance
- Classification of abundance: Low for region, but may be locally common
- Population Estimate: Unknown
- Density: 4-7 individuals/ha in preferred habitat
- Home Range (mf): 4500; in heathland in the Grampians
- Source: Meulman (1993), P. Menkhorst pers. comm.

- c) Habitat Specificity
 Classification of habitat specificity: Narrow, optimum habitat appears strongly related to fire frequency
- Vegetation types inhabited in the region: Dry heath and woodland and forest with a heathy understorey. Brown Stringybark *Eucalyptus baxteri* open forest.
- Source: Menkhorst and Beardsell (1982), Menkhorst (1995c)

DYNAMICS Population Trend in Last Decade

- Increasing, stable or declined: Unknown, probably declined due to habitat alteration
- Source: J. Seebeck pers. comm.
 Population trend since discovery by Europeans
 Increasing, stable or declined: Declined
- Source: Cockburn (1995)
 SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: High
- Source: Cockburn et al. (1981)
- b) Dispersal
- Classification of powers of dispersal: Unknown Average distances dispersed: Unknown, dispersal may be influenced by the quality of habitat
- Maximum distance dispersed: Unknown
- Source: Cockburn *et al.* (1981) LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Medium
- Age of sexual maturity (yrs): 10-12 months; this may vary depending on habitat
- Mean clutch/litter/brood size: 3
- Mean no of clutches/litters/broods per year: Usually 1; may be 2 in optimal habitat
- Time of year young born/hatch: Late October to late December
- Source: Happold (1976), Cockburn et al. (1981) b) Longevity
- Classification of lifespan: Long-lived Average lifespan (yrs): Unknown, appears to depend on habitat quality Maximum lifespan (yrs): Up to 4 years
- Source: Cockburn *et al.* (1981), Cockburn (1995), J. Seebeck pers. comm.

c) Morphology Adult body size

- Weight (g): 55-90 (70) Length (mm): 90-120 (110)

Source: Cockburn (1995)

- d) Social organisation Colonial or non-colonial: Unknown
- Territoriality: Unknown Source: P. Menkhorst pers. comm.

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Diet: Generalist herbivore
- Source: Watts and Braithwaite (1978), Cockburn (1995)

THREATS

1. Clearing of Native Vegetation: Ranking (3) A. Govanstone pers. comm

2. Timber Harvesting: Ranking (2) P. Menkhorst pers. comm

3. Fuel Reduction Burning: Ranking (1) SAC (1993), A. Govanstone and P. Menkhorst pers. comm

4. Firewood Collection: Ranking (1) A. Govanstone and P. Menkhorst pers. comm.

5. Unplanned Fire: Ranking (2) P. Menkhorst pers. comm.

6. Introduced Species: Ranking (2) SAC (1993), Lee (1995), A. Govanstone and P. Menkhorst pers. comm.

7. Grazing/Trampling: Ranking (2) P. Menkhorst pers. comm.

8. Pest Control: Ranking (0) P. Menkhorst pers. comm.

9. Road Construction and Maintenance: Ranking (1) A. Govanstone pers. comm.

10. Mining/Quarrying: Ranking (1) A. Govanstone pers. comm.

11. Tree Dieback: Ranking (1) P. Menkhorst pers. comm.

12. Recreation: Ranking (0) A. Govanstone pers. comm

13. Illegal Collecting/Harvesting: Ranking (0) A.

Govanstone and P. Menkhorst pers. comm. 14. Vandalism: Ranking (0) A. Govanstone and P.

Menkhorst pers. comm. 15. Dams/Impoundments: Ranking (0) P. Menkhorst pers. comm.

Current Management

The Heath Mouse is classified as "lower risk - near threatened" in Victoria (NRE 1999) and is listed under the Victorian *Flora and Fauna Guarantee Act* 1988. The Lower Glenelg National Park Management Plan (DCE 1991a) outlines burning regimes to optimize Heath Mouse habitat.

Species characteristics

In Victoria the Heath Mouse is found only in the south-west of the state (Atlas of Victorian Wildlife). It is a generalist herbivore that feeds on flowers, seeds, berries and insects in the spring and summer, and grass, sedge stems and the fruit of underground fungi forming the bulk of the diet in the autumn and winter

(Watts and Braithwaite 1978). The Heath Mouse inhabits dry heath and woodlands and heathy forest, including Brown Stringybark (*Eucalyptus baxteri*) open forest, where it constructs nests in shallow burrows or amongst dense ground cover vegetation (Menkhorst and Beardsell 1982, Menkhorst 1995c). The availability of optimum habitat of this species appears to be strongly related to frequent fires; breeding strategy and survival of adults and juveniles seem to be influenced by the particular successional stage of vegetation that populations inhabit (Cockburn *et al.* 1981). Recently burnt heathlands are highly productive environments which provide optimal habitat for the Heath Mouse. Productivity and habitat quality declines as the heathland matures (Cockburn 1995). Patchy fires occurring between 10 and 20 years are thought to be required to maintain preferred Heath Mouse habitat (Menkhorst 1995c).

Distribution in the West CRA region

Records of the Heath Mouse are concentrated in two disjunct areas in the western part of the West CRA region. This species has been found throughout the Grampians National Park and from around Casterton down to Heywood and across to Nelson, including the Lower Glenelg National Park. It was last recorded in 1995 from the Grampians National Park. The West CRA region represents the whole Victorian range of the Heath Mouse (Atlas of Victorian Wildlife).

Disturbances and potentially threater processes operating in the West CRA region threatening

processes operating in the West CRA region The clearing of native vegetation is a major threat facing populations of the Heath Mouse in the West (A. Govanstone pers. comm.). The specialised habitat requirements and restricted distribution of this species makes it vulnerable to habitat loss, fragmentation and degradation associated with this disturbance. Development and implementation of suitable fire regimes may be essential for the survival of this species (Menkhorst 1995c), due to its dependence on recently burnt heathlands to provide adequate food and cover (SAC 1993, Cockburn dependence on recently burnt heathlands to provide adequate food and cover (SAC 1993, Cockburn 1995). Predation by foxes is a recognized threat to populations in Western Australia (SAC 1993) and may also cause population declines in the West region. Predation by feral Cats is also a potential threat that needs to be investigated (Lee 1995, SAC 1993). Grazing can lead to a reduction and simplification of understorey vegetation, degrading habitat and reducing protection from introduced predators. Brown Stringybark eucalyots are utilised predators. Brown Stringybark eucalypts are utilised for hardwood production (Brinkman and Farrell 1990); harvesting of this tree species has the potential to degrade Heath Mouse habitat resulting in a loss of shelter and foraging habitat. Unplanned fire also results in loss of shelter and foraging habitat. Mortality of individuals as a result of unplanned fire may also have a large impact on local populations. The effect of fire and logging on the availability of underground fungi, an important food source during autumn and winter, is unknown but has the potential to be severe.

Swamp Antechinus

Antechinus minimus

RARITY a) Geographic Range

- Classification of range size within the West region: Medium
- Distribution of records within the West region: Records are from two general areas; along the coast from Port Campbell to Anglesea (including some inland records from the Otways), and between Casterton, Nelson and Point Danger (Portland)
- Number of 5 minute grid cells recorded from: 45 Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low throughout region but can be locally common
- Population Estimate: Unknown
- Density: 14/ha in heathland near Anglesea

- Home Range (ha): Unknown, one individual
- tracked over a day moved within 0.53 ha Source: Wilson *et al.* (1986), Aberton *et al.* (1994), P. Menkhorst pers. comm.

- Classification of habitat specificity: Narrow
- Vegetation types inhabited in the region: Brown Stringybark *Eucalyptus baxteri* open-forest with
- a wet heath understorey, dense wet heath, tussock grassland or sedgeland Source: Wakefield and Warneke (1963), Menkhorst and Beardsell (1982), Menkhorst (1995e)

DYNÀMICS

DYNAMICS Population Trend in Last Decade Increasing, stable or declined: Unknown Source: P. Menkhorst pers. comm. Population trend since discovery by Europeans Increasing, stable or declined: Declined Source: P. Menkhorst pers. comm. PDATIAL DYNAMICS

SPATIAL DYNAMICS

- a) Population variability
- Classification of population variability: High, males die-off after breeding
- Source: Wilson *et al.* (1986)
 b) Dispersal
- - Classification of powers of dispersal: Low Average distances dispersed: Unknown
- Maximum distance dispersed: Unknown
- Source: P. Menkhorst pers. comm.
 LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: High
- Age of sexual maturity: 11 months Mean clutch/litter/brood size: 6-8
- Mean no of clutches/litters/broods per year: 1
- Time of year young born/hatch: July-August Source: Wilson (1986), Menkhorst (1995e)

b) Longevity

- Classification of lifespan: Short-lived
- Average lifespan (yrs): 1 Maximum lifespan (yrs): Males up to 16 mths; Females 3 years
- Source: Wilson and Bourne (1984), Wilson (1986), Menkhorst (1995e)

c) Morphology

- Adult body size Weight (g): Males 30-103 (65), females 24-65 (42)
- Length (mm): Males 103-140 (119), females 98-117 (107)
- Source: Wakefield and Warneke (1963), Wainer and Wilson (1995)

d) Social organisation

- Colonial or non-colonial:
- Territoriality: Territorial Source: Wainer and Wilson (1995)
- e) Other
- Nomadic, migratory, sedentary: Sedentary Diet: Insectivore
- Source: Wainer and Wilson (1995), P. Menkhorst pers. comm.

THREATS

1. Clearing of Native Vegetation: Ranking (3)

Maxwell et al. (1996), A. Govanstone pers. comm.

2. Timber Harvesting: Ranking (1) A. Govanstone and P. Menkhorst pers. comm.

3. Fuel Reduction Burning: Ranking (2) P. Menkhorst pers. comm.

4. Firewood Collection: Ranking (1) A. Govanstone and P. Menkhorst pers. comm.

5. Unplanned Fire: Ranking (2) Menkhorst (1995e), Maxwell et al. (1996), P. Menkhorst pers. comm

6. Introduced Species: Ranking (3) Menkhorst

(1995e), A. Govanstone pers. comm. 7. Grazing/Trampling: Ranking (2) A. Govanstone

and P. Menkhorst pers. comm.

8. Pest Control: Ranking (0) P. Menkhorst pers. comm.

9. Road Construction and Maintenance: Ranking (0) P. Menkhorst pers. comm.

10. Mining/Quarrying: Ranking (0) P. Menkhorst pers. comm.

11. Tree Dieback: Ranking (1) P. Menkhorst pers. comm

12. Recreation: Ranking (1) P. Menkhorst pers. comm.

13. Illegal Collecting/Harvesting: Ranking (0) P. Menkhorst pers. comm.

14. Vandalism: Ranking (0) P. Menkhorst pers. comm.

15. Dams/Impoundments: Ranking (0) P. Menkhorst pers. comm.

Current Management:

The Swamp Antechinus is classified as "lower risk near threatened" in Victoria (NRE 1999). Within the Otway Forest Management Area all areas of heath community vegetation, part of Swamp Antechinus habitat in the West region, are protected from timber harvesting (DCE 1992a).

Species characteristics:

The Swamp Antechinus forages for its insectivorous prey by digging in soil and litter (Wainer and Wilson 1995). It shelters in short burrows in the top-soil or beneath thick leaf litter (Menkhorst 1995e). The Swamp Antechinus is found in dense wet heath, tussock grassland, sedgeland, and Brown Stringybark (*Eucalyptus baxter*) forest with a wet Stringybark (*Eucalyptus baxter*) forest with a wet heath understorey (Wakefield and Warneke 1963, Menkhorst and Beardsell 1982). The life history of the Swamp Antechinus is characterised by an annual male die-off; all males die after breeding (Wilson and Bourne 1984). Few females survive to breed in a second year (Wilson 1986). It is therefore essential that breeding is successful each year for continuation of populations of populations.

Distribution in the West CRA region

The Swamp Antechinus has been recorded from two general areas in the West region. There are sites from Anglesea along the coast to Port Campbell including the Otway National Park, and sites scattered between Casterton, Nelson and Portland including within Lower Glenelg National Park.

Disturbances and potentially threatening processes operating in the West CRA region

A major threat to Swamp Antechinus populations in the West is the drainage of wetlands (Maxwell *et al.* 1996, A. Govanstone pers. comm.), a practice which usually includes clearing the area of existing vegetation. This is particularly a problem in the Portland FMA on the Glenelg plains, an important area for the species (A. Govanstone pers. comm.). Predation by cats and foxes is also considered a major threat to populations (A. Govanstone pers. comm.). Activities that disturb the top soil and litter comm.). Activities that disturb the top soil and littler layer are likely to affect this ground dwelling species and include grazing and fuel reduction burning. These activities may also lead to fragmentation of local populations and are regarded as moderate threats (A. Govanstone and P. Menkhorst pers. comm.). The Swamp Antechinus is known to inhabit Brown Stringybark forest (Menkhorst and Beardsell 1992) an important course of timber in the Weet 1982), an important source of timber in the West 1962), an important source of timber in the West region. Timber harvesting activities in this habitat have the potential to adversely impact on populations. The small, isolated nature of Swamp Antechinus populations make them particularly vulnerable to local declines as a result of wildfire and predation (Menkhorst 1995e). The annual male die-off adverset restrict of this appropriate averations. off characteristic of this species exacerbates the effects of any disturbances, especially if they occur during breeding.

Long-nosed Potoroo Potorous tridactylus

RARITY

- a) Geographic Range
 Classification of range size within the West region: Medium
- Distribution of records within the West region: Records are concentrated around four separate areas; Grampians, Lower Glenelg National Park and surrounds, Peterborough and the Otway Ranges.
- Number of 5 minute grid cells recorded from: 57
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Varies, can be high in selected areas; low for region
- Population Estimate: Unknown
- Density: 0.5-1/ha
- Home Range (ha): Female 1.4, male 2
- Source: Seebeck (1995), J. Seebeck pers.

- comm.
 c) Habitat Specificity
 Classification of habitat specificity: Wide; although a dense understorey is an essential component.
- Vegetation types inhabited in the region: Tall dense wet heath, woodland, open forest where the most common tree species are Messmate *Eucalyptus obliqua*, Brown Stringybark *E. baxteri*, Swamp Gum *E. ovata* and Manna Gum *E. viminalis*. Also found in *Everetiveocland* (besth certange) forest/woodland/heath ecotones.
- Source: Seebeck (1981), Menkhorst and Beardsell (1982)

DYNAMICS

Population Trend in Last Decade

- Increasing, stable or declined: Declined
- Source: Maxwell et al. (1996), Atlas of Victorian Wildlife

Population trend since discovery by Europeans Increasing, stable or declined: Declined

Source: Seebeck (1981), Maxwell *et al.* (1996)
 SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: Low
 Source: Seebeck *et al.* (1989)
 Dispersal
- Classification of powers of dispersal: Unknown
- Average distances dispersed: Unknown
- Maximum distance dispersed: Unknown
- Source: P. Menkhorst pers. comm.
 LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Medium
- Age of sexual maturity (yrs): 12 mths
- Mean clutch/litter/brood size: 1
- Mean no of clutches/litters/broods per year: 2.5-•
- Time of year young born/hatch: All year, peaks from late winter-early spring and early summer Source: Hughes (1962), Seebeck (1982),
- Seebeck et al. (1989)

b) Longevity

- Classification of lifespan: Long-lived
- Average lifespan (yrs): 4-5
- Maximum lifespan (yrs): At least 7 in the wild, 12 in captivity
- Source: Seebeck (1982), Johnston (1995)

c) Morphology Adult body size

- Weight (g): Male 740-1640 (1180), female 660-1350 (1020)
- Length (mm): Male 380, female 340
- Source: Johnston (1995)
- d) Social organisation
- Colonial or non-colonial: Non-colonial
- Territoriality: Non territorial
- Source: Seebeck (1995)

e) Other

- Nomadic, migratory, sedentary: Sedentary Diet: Omnivore; mainly fungi, also hard-bodied arthropods, vascular plant tissues, seeds and fleshy fruits
- Source: Bennett and Baxter (1989)

THREATS

1. Clearing of Native Vegetation: Ranking (2) J.

Seebeck and P. Menkhorst pers. comm.

2. Timber Harvesting: Ranking (2) J. Seebeck and P. Menkhorst pers. comm

3. Fuel Reduction Burning: Ranking (1) Maxwell *et al.* (1996), J. Seebeck and P. Menkhorst pers. comm. 4. Firewood Collection: Ranking (1) P. Menkhorst pers. comm.

5. Unplanned Fire: Ranking (3) P. Menkhorst pers. comm.

6. Introduced Species: Ranking (3) Maxwell et al. (1996), P. Menkhorst pers. comm.

7. Grazing/Trampling: Ranking (2) Maxwell et al.

(1996), J. Seebeck and P. Menkhorst pers. comm. 8. Pest Control: Ranking (1) P. Menkhorst pers.

comm.

9. Road Construction and Maintenance: Ranking (1) P. Menkhorst pers. comm.

10. Mining/Quarrying: Ranking (0) P. Menkhorst pers. comm.

11. Tree Dieback: Ranking (0) P. Menkhorst pers. comm.

12. Recreation: Ranking (1) P. Menkhorst pers. comm.

13. Illegal Collecting/Harvesting: Ranking (0) P. Menkhorst pers. comm.

14. Vandalism: Ranking (0) P. Menkhorst pers.

comm. 15. Dams/Impoundments: Ranking (0) P. Menkhorst pers. comm.

Current Management:

The Long-nosed Potoroo is classified as 'lower risk -near threatened' in Victoria (NRE 1999). The Otway Forest Management Plan includes Potoroo species as being mammals whose conservation requirements "require special consideration." Within the Otway Ranges protection for the Long-nosed Potoroo is in the form of a general system of retained habitat (DCE There are no specific threat ameliorating 1992). prescriptions for this species in the West region.

Species characteristics

The Long-nosed Potoroo is found in a range of habitats including wet heathland, woodland and mixed species open-forest where the most common tree species present (except in east Gippsland) are Messmate Eucalyptus obliqua, Brown Stringybark E. baxteri, Swamp Gum E. ovata and Manna Gum E. viminalis (Seebeck 1981, Menkhorst and Beardsell 1982). A dense understorey is required for shelter and can consist of ferns, heath or sclerophyllous shrubs. This species is often found in ecotones between forests, woodlands and heath. There is between forests, woodlands and heath. There is evidence that numbers of the Long-nosed Potoroo are influenced by habitat seral stages (Seebeck 1981). The Long-nosed Potoroo is an omnivore feeding on fungi, hard-bodied arthropods, vascular plant tissue, seeds and fleshy fruits. The major dietry item is fungi, particularly the sporocarps (fruiting bodies) of hypogeal (underground fruiting) fungi (Bennett and Baxter 1989). The Long-nosed Potoroo exists in a number of geographically discrete regional populations mainly in areas on or close to the coast, from the far west to the far east of Victoria (Atlas of Victorian Wildlife). Although this species may be Victorian Wildlife). Although this species may be locally abundant in some areas, all populations are small and isolated. The population in the Grampians in particular is considered to be at risk as most of its very localised habitat lies outside the National Park boundary (Seebeck 1981).

Distribution in the West CRA region

The Long-nosed Potoroo is present in the south-western part of the region around four separate areas. Most records are concentrated around three general locations; Lower Glenelg National Park and surrounds including Portland and Heywood; between Naringal, Peterborough and Cobden; within the vicinity of the Otway Ranges including Colac, Forrest and Anglesea. There are a few sites situated around

the Grampians. Records are from private land, state forest and National Park. Although there are over 400 records of the Long-nosed Potoroo within the region approximately 95% of these are more than ten years old. This species was last recorded in 1995 from Pomonal, near the Grampians (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the West CRA region

The ground-dwelling nature of the Long-nosed Potoroo makes it vulnerable to activities that disturb ground layer vegetation and soil. This species is identified as being sensitive to intense timber harvesting (DCE 1992) which is seen as a moderate threat (J. Seebeck and P. Menkhorst pers. comm.). Dense understorey is important for shelter sites; Dense understorey is important for shelter sites; simplification or degradation of this vegetation via disturbances such as timber harvesting, grazing and burning, reduces habitat quality; habitat alteration may lead to fragmentation of local populations (Maxwell *et al.* 1996). Compaction and disturbance of soil and reduction of litter as a result of these processes may affect hypogeal fungi availability (Thomas *et al.* 1994). Loss of understorey vegetation may lead to increased predation by the Fox and other introduced predators, and is considered a major threat to Long-nosed Potoroo populations (P. Menkhorst pers. comm.). Inappropriate fire regimes may affect population densities by reducing the availability of habitat in optimal seral stages (Seebeck 1981). However, recovery after severe wildfire may be rapid if there is no subsequent grazing or timber harvesting (Seebeck 1995).

Yellow-footed Antechinus

Antechinus flavipes

RARITY

- a) Geographic Range
- Classification of range size within the West region: Medium
- Distribution of records within the West region: Most records are from the west of the region between Nelson and Goroke and from the Grampians National Park
- Number of 5 minute grid cells recorded from: 70 Source: Atlas of Victorian Wildlife
 b) Abundance
- Classification of abundance: Low

- Population Estimate: Unknown Density: Probably low Home Range (ha): Unknown Source: Dickman (1980), Menkhorst (1995h) c) Habitat Specificity
- Classification of habitat specificity: Wide, but requires hollows for dens
- Vegetation types inhabited in the region: Dry forest and woodland communities including River Red Gum *E. camaldulensis* and Grey box *E. microcarpa*; Yellow Gum *E. leucoxylon*, Yellow Box *E. melliodora* and Ironbark *E. tricarpa*; Brown Stringybark *E. baxteri* heathy woodlands and open-forest and Manna Gum E. viminalis woodland. Understorey vegetation ranges from tall dense heath to sparse shrub and tussock grass.
- Source: Menkhorst and Gilmore (1979) Menkhorst and Beardsell (1982), Menkhorst

(1995h) DYNAMICS

- Population Trend in Last Decade
- Increasing, stable or declined: Unknown, possibly stable

- Source: P. Menkhorst pers. comm.
 Population trend since discovery by Europeans
 Increasing, stable or declined: Declined; based on past habitat removal and degradation.
 Source: Menkhorst and Gilmore (1979), Markhavet (400Ch)

- Source: Menkhorst and Gilmore (1979), Menkhorst (1995h)
 SPATIAL DYNAMICS

 a) Population variability
 Classification of population variability: High
 Source: Smith (1984)

b) Dispersal

- Classification of powers of dispersal: Unknown Average distances dispersed: Unknown, males
- disperse further than females (Queensland study)
- Maximum distance dispersed: Unknown

Source: Smith (1984) LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: High
- Age of sexual maturity: 11 months
- Mean clutch/litter/brood size: 4-10 (7.6)
- Mean no of clutches/litters/broods per year: 1
- Time of year young born/hatch: August to early September Source: Smith (1984), Menkhorst (1995h)
- b) Longevity
- Classification of lifespan: Short-lived
- Average lifespan (yrs): Males 1, Females 1-2
- Maximum lifespan (yrs): Males 1, Females 3.5 Source: Smith (1984), Menkhorst (1995h)

c) Morphology Adult body size

- Weight (g): Males 26-79 (56), Females 21-52 (34)
- Length (mm): Males 93-165 (121), Females 86-127 (105)
- Source: Van Dyck (1995)

d) Social organisation

- Colonial or non-colonial: Non-colonial
- Territoriality: Yes, although home-ranges can overlap
- Source: Smith (1984), Van Dyck (1995)
- e) Other
- Nomadic, migratory, sedentary: Sedentary
- Diet: Insectivore, carnivore, nectarivore
- Source: Smith (1984), Fleay (1949)

THREATS

1. Clearing of Native Vegetation: Ranking (2) P. Menkhorst pers. comm.

2. Timber Harvesting: Ranking (2) Menkhorst (1995h), P. Menkhorst pers. comm

3. Fuel Reduction Burning: Ranking (1) Catling (1991), P. Menkhorst pers. comm.

4. Firewood Collection: Ranking (2) Menkhorst (1995h), Silveira et al. (1997), P. Menkhorst pers. comm

5. Unplanned Fire: Ranking (1) P. Menkhorst pers. comm.

6. Introduced Species: Ranking (2) P. Menkhorst pers. comm.

7. Grazing/Trampling: Ranking (2) Menkhorst (1995h), P. Menkhorst pers. comm.

8. Pest Control: Ranking (1) P. Menkhorst pers. comm.

9. Road Construction and Maintenance: Ranking (1) P. Menkhorst pers. comm.

10. Mining/Quarrying: Ranking (1) Menkhorst (1995h), P. Menkhorst pers. comm

11. Tree Dieback: Ranking (2) P. Menkhorst pers. comm.

12. Recreation: Ranking (0) P. Menkhorst pers. comm.

13. Illegal Collecting/Harvesting: Ranking (0) P. Menkhorst pers. comm.

14. Vandalism: Ranking (0) P. Menkhorst pers. comm.

15. Dams/Impoundments: Ranking (0) P. Menkhorst pers. comm.

Current Management

The Yellow-footed Antechinus is not considered threatened in Victoria (NRE 1999). There are no current management prescriptions for this species in the West.

Species characteristics

The Yellow-footed Antechinus is found in dry forest and woodland communities including River Red Gum E. camaldulensis and Grey box E. microcarpa; Yellow Gum *E. leucoxylon*, Yellow Box *E. melliodora* and Ironbark *E. tricarpa*, Brown Stringybark *E. baxteri* heathy woodlands and open-forest and Manna Gum *E. viminalis* woodland. Understorey vegetation ranges from tall dense heath to sparse shrub and tussock grass (Menkhorst and Gilmore 1979, Menkhorst and Beardsell 1982, Menkhorst 1995h). Specific habitat requirements are not known (Menkhorst 1995h). Its distribution in Victoria follows a diagonal band stretching from the south-west to the north-east (Atlas of Victorian Wildlife). The Yellow-footed Antechinus uses dry eucalyptus leaves to construct a bulky nest in tree hollows, stumps or rock footed Antèchinus uses dry eucalyptus leaves to construct a bulky nest in tree hollows, stumps or rock crevices (Menkhorst 1995h). This species survives on a diet consisting of insects, nectar and small vertebrates including lizards and mice, for which it forages in ground litter, stumps and trees and logs; both alive and dead (Fleay 1949). The life history of this species is characterised by an annual male die-off: all males die after mating (Smith 1984), which occurs in July (Menkhorst 1995h). Continued existence of populations is therefore dependent on successful breeding each year.

Distribution in the West CRA region

Most records of the Yellow-footed Antechinus are from the west of the region between Nelson and Goroke in the vicinities of Dartmoor, Casterton, Edenhope, and Dergholm, and from the Grampians National Park and the eastern side of the park near Dadswells Bridge, Fyans Creek, Lake Fyans and Pomonal. Further east the species has been recorded from the Pyrenee Range, Mt Langi Ghiran, Mt Cole and Mount Beckworth (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the West CRA region

The forests and woodlands inhabited by the Yellow-footed Antechinus have been subjected to widespread clearing. Remaining habitat is continually degraded and removed by practices such as timber harvesting, firewood collection, and grazing/trampling; these disturbances are seen as significant threats to this species (P. Menkhorst pers. comm.). The loss of hollows is of particular concern as old-growth areas are replaced by coppiced stands (Menkhorst 1995h). Inappropriate fire regimes can reduce and eventually eliminate undergrowth, degrading foraging habitat and increasing the risk of predation by foxes and cats (Catling 1991). The life history strategy of the Yellow-footed Antechinus makes this species particularly vulnerable to local The forests and woodlands inhabited by the Yellowmakes this species particularly vulnerable to local extinction and so exacerbates the effects of any disturbances, especially if they occur during the breeding season. The extent of habitat deterioration in the West region is such that the long-term survival of the species is not certain (Menkhorst 1995h).

Yellow-bellied Glider

Petaurus australis

RARITY

- a) Geographic Range
 Classification of range size within the West region: Medium
- Distribution of records within the West region: Most records concentrated around the Otway Ranges and Lower Glenelg National Park area including Cobboboonee State Forest. Other records are from around Edenhope and Mt Cole State Forest.
- Number of 5 minute grid cells recorded from: 61
 - Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: Unknown; estimated

- 1000+ animals in Portland FMA Density: 0.05-0.14/ha in preferred habitat, probably related to food availability Home Range (ha): 30-65 Source: Craig (1985), Goldingay and Kavanagh (1991), Russell (1995), A. Govanstone pers. comm

c) Habitat Specificity

Classification of habitat specificity: Wide, but needs hollows for dens

- needs hollows for dens Vegetation types inhabited in the region: Prefer wet mixed-species eucalypt forest with a predominance of smooth-barked trees. In the Portland FMA, highest densities of gliders are found in forest dominated by Messmate *E. obliqua*. Also recorded from Brown Stringybark obliqua. Also recorded from Brown Stringybark Eucalyptus baxteri open-forest where Manna Gum E. viminalis, Scent Bark, E. aromaphloia and Swamp Gum E. ovata are present; tall open-forest co-dominated by Mt Grey Gum E. cypellocarpa and Blue Gum E. globulus, and Yellow Gum E. leucoxylon woodland.
- Source: Menkhorst and Beardsell (1982), Conole and Baverstock (1983a), Kavanagh (1987), J. Nelson pers. comm.
 DYNAMICS_

Population Trend in Last Decade

- Increasing, stable or declined: Possibly declined; an isolated population at Rennick is thought to be in decline.
- Source: Maxwell et al. (1996), S. Carthew pers. comm.

 Population trend since discovery by Europeans
 Increasing, stable or declined: Most likely declined due to widespread loss of habitat resulting from clearing for agriculture and past uncontrolled exploitative forest management practices.

Source: Newman (1961), Recher et al. (1975)
 SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: Low Source: Goldingay and Kavanah (1990)
 b) Dispersal
- Classification of powers of dispersal: High
- Average distances dispersed: Unknown
- Maximum distance dispersed: Unknown
 Source: Goldingay and Kavanagh (1991)
 LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity (yrs): 2 Mean clutch/litter/brood size: 1
- Mean no of clutches/litters/broods per year: 1; breeding may occur in alternate years
- Time of year young born/hatch: Through-out year
- Source: Henry and Craig (1984), Craig (1986), Goldingay and Kavanagh (1990)

b) Longevity

- Classification of lifespan: Long-lived
- Average lifespan (yrs): Unknown Maximum lifespan (yrs): Unknown, 6 year-old individuals known from the wild, can live up to 14 years in captivity
- Source: Goldingay and Kavanagh (1990), Slater (1997

c) Morphology

- Adult body size
- Weight (g): 450-700 Length (mm): 270-480 (433)
- Source: Russell (1995)
- d) Social organisation
- Colonial or non-colonial: Colonial
- Territoriality: Family groups occupy large
- Source: Henry and Craig (1984), Goldingay and Kavanagh (1991)
- e) Other
- Nomadic, migratory, sedentary: Sedentary
- Diet: Plant exudates, insectivore
- Source: Russell (1995)

THREATS

1. Clearing of Native Vegetation: Ranking (2)

Goldingay and Kavanagh (1991), Henry (1995), Maxwell *et al.* (1996), A. Govanstone and S. McDougall pers. comm.

2. Timber Harvesting: Ranking (3) Goldingay and Kavanagh (1991), Henry (1995), Maxwell *et al.* (1996), S. McDougall pers. comm.

3. Fuel Reduction Burning: Ranking (1) A.

Govanstone and S. McDougall pers. comm. 4. Firewood Collection: Ranking (2) S. McDougall pers. comm.

5. Unplanned Fire: Ranking (2) Goldingay and

Kavanagh (1991), S. McDougall pers. comm. 6. Introduced Species: Ranking (1) S. McDougall pers. comm

pers. comm.

8. Pest Control: Ranking (1) S. McDougall pers. comm.

9. Road Construction and Maintenance: Ranking (1) A. Govanstone and S. McDougall pers. comm.

10. Mining/Quarrying: Ranking (1) A. Govanstone and S. McDougall pers. comm.

11. Tree Dieback: Ranking (1) S. McDougall pers. comm.

12. Recreation: Ranking (1) A. Govanstone and S. McDougall pers. comm.

13. Illegal Collecting/Harvesting: Ranking (0) A.

Govanstone and S. McDougall pers. comm.

14. Vandalism: Ranking (0) A. Govanstone and S. McDougall pers. comm.

15. Dams/Impoundments: Ranking (1) S. McDougall pers. comm.

Current Management

The Yellow-bellied Glider is not considered threatened in Victoria (NRE 1999). Under the Otway Forest Management Plan known nest trees and feed-(DCE 1992). However, existing prescriptions for habitat retention are considered inadequate, particularly in habitat where Yellow-bellied Gliders are known to be present (A. Govanstone pers. comm.).

Species characteristics

Species characteristics The Yellow-bellied Glider is an arboreal marsupial that feeds on arthropods and insect and plant exudates (sap, nectar, honeydew and manna) (Craig 1985, Russell 1995). Eucalypt sap appears to be the most important food resource. A wide variety of eucalypt species are used for foraging, with different substrates (such as shedding bark) being utilised as they become seasonally available (Kavanagh 1987). About 90% of time spent outside the den is dedicated to foraging (Goldingay 1989). The Yellow-bellied Glider occurs in low densities (Craig 1985) in tall, mature, wet eucalypt forests (Russell 1995) where there is both a predominance of smooth barked eucalypts and a mixture of eucalypt species (Kavanagh 1987). Within Victoria there are patchy populations in the south-western part of the state with the main continuous distribution being from the Central Highlands to East Gippsland. Preferred tree species vary with location; forest types and species utilised include Brown Stringybark *E.baxteri* open-forest where Manna Gum *E. viminalis*, Scent Bark *E. aromaphloia* and Swamp Gum *E. ovata* are present, Yellow Gum *E. leucoxylon* woodland, Messmate (*E. obliqua*), Apple Box (*E. bridgesiana*), Mountain Grey Gum (*E. cypellocarpa*) and Red Bloodwood (*E. gummifera*) (Norris *et al.* 1979, Menkhorst and Beardsell 1982, Conole and Baverstock 1983a). Large hollows are used as dens and many are used within a home area (Craig 1985). Yellow-bellied Gliders pair for life and maintain large exclusive family home ranges (30-65 ha) (Henry and Craig 1984, Goldingay and Kavanagh 1991). The Yellow-bellied Glider is an arboreal marsupial

Distribution in the West CRA region

The Yellow-bellied Glider exists in isolated populations in the West region with records mainly in isolated concentrated in the Otway Ranges, Cobboboonee State Forest, Annya State Forest, the Mt Clay and Glenaulin forest blocks and around Lower Glenelg National Park. There are also records from a few sites around Edenhope and Mt Cole State Forest. The majority of records are from large blocks of State forest and conservation reserves (Atlas of Victorian Wildlife, A. Govanstone pers. comm.).

7. Grazing/Trampling: Ranking (1) S. McDougall
Disturbances and potentially threatening processes operating in the West CRA region The major threat to the Yellow-bellied Glider in the West is habitat loss, alteration and framentation resulting from timber harvesting (Goldingay and Kavanagh 1991, Henry 1995, A. Govanstone and S. Mc Dougal pers. comm.). This disturbance results in the loss of critical food resources and den trees, a rise in the time spent forgating and consequently. rise in the time spent foraging and consequently, rise in the time spent foraging and consequently, increased exposure to predation (Goldingay and Kavanagh 1991). Other processes that can degrade habitat include fuel reduction burning, wildfire and grazing (Goldingay and Kavanagh 1991). This species requires large hollows (which only occur in large old trees), large foraging ranges and habitat consisting of a mixture of eucalypt species; long-term survival depends on maintaining the integrity of large areas of forest (Russell 1995). Available habitat in areas of forest (Russell 1995). Available habitat in the West region is limited, with the majority of preferred habitat in State forests utilised for timber preterred habitat in State forests utilised for timber production. Fragmentation of habitat is a major threat and can be caused by the clearing of vegetation, timber harvesting and the construction of roads, mines/quarries and dams. Firewood cutters often target large old trees, especially dead ones, which are an important component of Yellow-bellied Glider habitat, and firewood collection is considered a moderate, threat. (S. McDourgall, pers, comm.) Glider habitat, and inewood collection is considered a moderate threat (S. McDougall pers. comm.). Yellow-bellied Gliders have been reported using corridors between suitable patches of habitat; these links may be an important management consideration although more research in this area is required (Goldingay and Kavanagh 1991). It has been suggested that the sensitivity of this species to babitat ditorsting its dependence on ballways and its habitat alteration, its dependence on hollows and its wide distribution makes the Yellow-bellied Glider a suitable management indicator species (Goldingay and Kavanagh 1993). However, if this were to be the case, extensive on-going research is required to clarify the status of this species in the West; records from Mt Cole State Forest, for example, are over 15 years old (from 1976 and 1982). The long-term persistence of populations in the region is not assured (Henry 1995, Maxwell *et al.* 1996).

White-footed Dunnart

Sminthopsis leucopus

RARITY

- a) Geographic Range
 Classification of range size within the West
- region: Medium
- Distribution of records within the West region: Mainly along sections of the coast from Lower Glenelg National Park to Anglesea, including Port Campbell and Cape Otway. Other records are from near Dartmoor and around Forrest.
- Number of 5 minute grid cells recorded from: 23 Source: Atlas of Victorian Wildlife
- b) Abundance
- Classification of abundance: Unknown
- Population Estimate: Unknown
- Density: Unknown
- Home Range (ha): 0.917 in coastal dry heathland; 0.4 in coastal forest
- Source: Lunney and Leary (1989), Laidlaw et al.

- (1996)
 c) Habitat Specificity
 Classification of habitat specificity: Wide
- Vegetation types inhabited in the region: Vegetation types inhabited in the region: Coastal dry heathland, open forest (including Brown Stringybark *Eucalyptus baxteri* or Messmate *E. obliqua*) with a dense understorey, tussock grassland Source: Morton *et al.* (1980), Menkhorst and Beardsell (1982), Laidlaw *et al.* (1996)
- DYNAMICS

Population Trend in Last Decade

- Increasing, stable or declined: Declined; the majority of records are from the 1980s

- Source: Atlas of Victorian Wildlife
 Population trend since discovery by Europeans
 Increasing, stable or declined: Unknown; probably declined

- Source: J. Seebeck pers. comm.
 SPATIAL DYNAMICS

 a) Population variability
 Classification of population variability: Unknown
 Source: J. Seebeck pers. comm.
- b) Dispersal
- Classification of powers of dispersal: High
- Average distances dispersed: Unknown Maximum distance dispersed: One male
- observed to move 1025 meters over 24 hours

Source: Lunney and Leary (1989) LIFE HISTORY PARAMETERS

- a) Reproductive output
- Classification of reproductive output: High
- Age of sexual maturity (yrs): 11 mths
- Mean clutch/litter/brood size: 7-10 Mean no of clutches/litters/broods per year: 1
- Time of year young born/hatch: Late August to
- September Source: Woolley and Ahern (1983), Lunney and Ashby (1987)

b) Longevity

- Classification of lifespan: Short-lived
- Average lifespan (mths): Females 24, Males 15
- Maximum lifespan (mths): Unknown
- Source: Woolley and Ahern (1983)

c) Morphology

- Adult body size
- Weight (g): Female 19, Male 26
- Length (mm): Female 67-74, Male 82-98
- Source: Lunney (1995)

d) Social organisation

- Colonial or non-colonial: Probably non-colonial
- Territoriality: One study found that females home ranges were exclusive while another study concluded that as both male and female home ranges overlapped territoriality was probably low Source: Lunney and Leary (1989), Laidlaw *et al.*
- (1996)

Other e)

- Nomadic, migratory, sedentary: Sedentary
- Diet: Primarily an insectivore; preys on a wide variety of invertebrates, also known to take small lizards
- Source: Lunney et al. (1986), Lunney and Leary (1989)

THREATS

1. Clearing of Native Vegetation: Ranking (2) J. Seebeck pers. comm.

2. Timber Harvesting: Ranking (2) Lunney and

Ashby (1987), J. Seebeck pers. comm.

3. Fuel Reduction Burning: Ranking (2) J. Seebeck pers. comm

4. Firewood Collection: Ranking (0) J. Seebeck pers. comm.

5. Unplanned Fire: Ranking (2) Lunney and Ashby (1987), J. Seebeck pers. comm.

6. Introduced Species: Ranking (2) J. Seebeck

pers. comm. 7. Grazing/Trampling: Ranking (2) J. Seebeck pers. comm.

8. Pest Control: Ranking (0) J. Seebeck pers. comm. 9. Road Construction and Maintenance: Ranking (0)

J. Seebeck pers. comm. 10. Mining/Quarrying: Ranking (0) J. Seebeck pers. comm.

11. Tree Dieback: Ranking (0) J. Seebeck pers.

comm.

12. Recreation: Ranking (0) J. Seebeck pers. comm. 13. Illegal Collecting/Harvesting: Ranking (0) J.

- Seebeck pers. comm.

14. Vandalism: Ranking (0) J. Seebeck pers. comm. 15. Dams/Impoundments: Ranking (0) J. Seebeck pers. comm.

Current Management

The White-footed Dunnart is not considered threatened in Victoria (NRE 1999). There are no

threat-ameliorating prescriptions for this species in the region.

Species characteristics

The White-footed Dunnart is restricted to areas of intermediate annual rainfall (600-1100 mm). It is found in a wide variety of habitats including coastal dry heathland and sedgeland, wet heath and forest (e.g. Brown Stringybark *Eucalyptus baxteri* or Messmate *E. obliqua* open forest) or woodland with a dense heathy understorey or mid-storey vegetation (Morton et al. 1980, Menkhorst and Beardsell 1982, Menkhorst 1995g, Laidlaw et al. 1996). Within its habitat it has been found in underground burrows, tree hollows and under bark or small logs (Lunney and Leary 1989, Laidlaw *et al.* 1996). There appears to be some relationship between presence of this to be some relationship between presence of this species and the seral stages of various vegetation communities; this requires further investigation (Menkhorst 1995g). Although males of this species do not survive to breed in a second season they do not exhibit 'die-off' immediately after breeding, but are still present up to one month after young become independent (Woolley and Ahern 1983). The short lifespan of this species means that successful breeding each year is essential for the continued existence of populations. The White-footed Dunnart mainly feeds on a wide range of ground-dwelling invertebrates but also preys on small lizards (Lunney *et al.* 1986). et al. 1986).

Distribution in the West CRA region

The White-footed Dunnart has been recorded from north of Dartmoor to Anglesea, mainly along the coast. Coastal sites are from around Heathmere, then from just south of Nullawarre to Cape Otway. Other sites are scattered around the Otway Ranges including near Forrest. Records are from State forest and National park. The White-footed Dunnart is uncommonly recorded, with less than 90 records on the Atlas of Victorian Wildlife. The most recent record of this species is dated 1995 from Port Campbell National Park (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the West CRA region

Disturbances that result in dense regrowth appear to Disturbances that result in dense regrowth appear to have a deleterious effect on the White-footed Dunnart. A study in NSW found that a population living in a forest subjected to timber harvesting and wildfire was unable to persist after these disturbances due to dense regrowth making habitat unsuitable after a few years (Lunney and Ashby 1987). Brown Stringybark and Messmate Stringbark, are important timber production species (Brinkman and Farrell 1990); harvesting in these forest types is a potential threat to resident White-footed Dunnart populations. Other disturbances that result in modification of ground layer vegetation include fuel reduction burning and grazing; these may alter prey availability or reduce cover that provides protection against introduced predators. Inappropriate fire regimes could prevent the continued presence of habitat that is at a suitable seral stage; more research is required in relation to such habitat requirements (Menkhorst 1995g). Clearing of vegetation, roading and timber harvesting removes and fragments habitat which may adversely impact on populations. Although not considered threatened, the White-footed Dunnart is Although not not often recorded and the current status of this species in the region is unclear.

Inland Broad-nosed Bat

Scotorepens balstoni

RARITY a) Geographic Range

- Classification of range size within the West region: Medium
- Distribution of records within the West region: Recorded from three widely seperated localities: near Edenhope, the Grampians, and close to Melbourne (including near Kalkallo and Parwan)

Number of 5 minute grid cells recorded from: 18 Source: Atlas of Victorian Wildlife

- b) Abundance
- Classification of abundance: Low Population Estimate: Unknown Density: Unknown

- Home Range (ha): Unknown Source: Lumsden and Bennett (1995), L.

- C) Habitat Specificity
 Classification of habitat specificity: Wide; but
- Vegetation types inhabited in the region: Dry forest and woodland including River Red Gum (*Eucalyptus camaldulensis*), box-ironbark forests and Yellow Gum (*E. leucoxylon*) woodland
- Source: Menkhorst and Beardsell (1982), Lumsden and Bennett (1995) DYNAMICS

Population Trend in Last Decade

- Increasing, stable or declined: Unknown
 Source: L. Lumsden pers. comm.
 Population trend since discovery by Europeans
- Increasing, stable or declined: Most likely declined due to massive forest clearance through-out its range
- Source: L. Lumsden pers. comm. SPATIAL DYNAMICS

- a) Population variability
- Classification of population variability: Low Source: L. Lumsden pers. comm.

b) Dispersal

- Classification of powers of dispersal: High
- Average distances dispersed: Unknown
- Maximum distance dispersed: Unknown
- Source: Lumsden and Bennett (1995), L.

Lumsden pers. comm. LIFE HISTORY PARAMETERS a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity (yrs): Unknown
- Mean clutch/litter/brood size: 1-2
- Mean no of clutches/litters/broods per vear: 1
- Time of year young born/hatch: October -November .
- Source: McKean and Hamilton-Smith (1967 Lumsden and Bennett (1995), Parnaby (1995)
- b) Longevity
- Classification of lifespan: Long-lived
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): Unknown
- Source: L. Lumsden pers. comm. c) Morphology

- Adult body size
- Weight (g): 9-15 Length (mm): 42-60
- Source: Parnaby (1995), L. Lumsden pers. comm. d) Social organisation
- Colonial or non-colonial: Pregnant females form maternity colonies
- Territoriality: Not likely to be territorial Source: Lumsden and Bennett (1995), L.
- Lumsden pers. comm.
- e) Other
- Nomadic, migratory, sedentary: Sedentary
- Diet: Insectivorous Source: Vestjens and Hall (1977), L. Lumsden
- pers. comm.

THREATS

- 1. Clearing of Native Vegetation: Ranking (3) L. Lumsden pers. comm.
- 2. Timber Harvesting: Ranking (2) Law (1996), L. Lumsden pers. comm.
- 3. Fuel Reduction Burning: Ranking (-) L. Lumsden pers. comm.
- 4. Firewood Collection: Ranking (2) L. Lumsden pers. comm.
- 5. Unplanned Fire: Ranking (-) Law (1996), L. Lumsden pers. comm.

6. Introduced Species: Ranking (1) L. Lumsden pers. comm. 7. Grazing/Trampling: Ranking (1) L. Lumsden

pers. comm.

8. Pest Control: Ranking (2) L. Lumsden pers.

9. Road Construction and Maintenance: Ranking (1) L. Lumsden pers. comm.

10. Mining/Quarrying: Ranking (0) L. Lumsden pers. comm.

11. Tree Dieback: Ranking (1) L. Lumsden pers. comm.

12. Recreation: Ranking (0) L. Lumsden pers. comm. 13. Illegal Collecting/Harvesting: Ranking (0) L.

Lumsden pers. comm.

14. Vandalism: Ranking (0) L. Lumsden pers. comm. 15. Dams/Impoundments: Ranking (0) L. Lumsden pers. comm.

Current Management:

The Inland Broad-nosed Bat is not considered threatened in Victoria (NRE 1999). There are currently no threat-ameliorating management prescriptions for the species in the West CRA region.

Species characteristics

The Inland Broad-nosed Bat is an uncommonly The Inland Broad-nosed Bat is an uncommonly recorded species occurring in northern and western Victoria. The species has undergone relatively recent taxonomic revision which established its specific status (Kitchener and Caputi 1985, Baverstock *et al.* 1987). The Inland Broad-nosed Bat inhabits a wide range of dry forest and woodland habitats including River Red Gum (*Eucalyptus camaldulensis*), box-ironbark forests and Yellow Gum (*E. leucoxylon*) woodland (Menkhorst and Beardsell 1982 Lumsden and Bennett 1995). Boost sites are 1982, Lumsden and Bennett 1995). Roost sites are usually tree hollows; buildings are occasionally utilised (Lumsden and Bennett 1995). Small groups of this species are sometimes found roosting with colonies of Southern Freetail-bats (Parnaby 1995). The Broad-nosed Bat is insectivorous, eating both winged and wingless species indicating prey may be taken both aerially and from the ground or foliage (Vestjens and Hall 1977, Lumsden and Bennett 1995). There is little information on breeding characteristics for this species.

Distribution in the West CRA region

Records of the Inland Broad-nosed Bat are from three widely separate localities in the West region: near Edenhope, the Grampians National Park and near Wartook and Mount Bepcha on the western edge of the Grampians, and from Coimadai, Parwan, Kalkallo, Bald Hills and Oaklands Junction in the east of the region, north-west of Melbourne (Atlas of Victorian Wildlife).

Disturbances and potentially threate processes operating in the West CRA region threatening

processes operating in the West CRA region The Inland Broad-nosed Bat is threatened by disturbances that result in the loss of tree hollows as this reduces the availability of roosting sites. Such disturbances include clearing of native vegetation, considered a major threat, and timber harvesting (L. Lumsden pers. comm.). These processes may also have an affect on insect availability although to what extent is not clear (Law 1996). Firewood collection may reduce important foraging habitat and is seen as a moderate threat to the species (L. Lumsden pers. comm.). Poisoning of the Inland Broad-nosed Bat can occur via the ingestion of insect prey contaminated by pest control chemicals; this is regarded as a moderate threat (L. Lumsden pers. comm.). It is unknown what impact fuel reduction burning and wildfire may have on populations of this species (L. Lumsden pers. comm.). There is limited information on the ecology of the Inland Broad-nosed Bat; it is not often recorded and its conservation status in the West region is unclear (Lumsden and Bennett 1995).

Eastern False Pipistrelle

Falsistrellus tasmaniensis

RARITY

a) Geographic Range
Classification of range size within the West

- region: Large
- Distribution of records within the West region: Records are from a number of geographically isolated locations including the Grampians, Pyrenee Range, Wombat State Forest, Otway Ranges and Lower Glenelg National Park.
- Number of 5 minute grid cells recorded from: 37
 Source: Atlas of Victorian Wildlife
 b) Abundance

- Classification of abundance: Low

- Population Estimate: Unknown Density: Unknown Home Range (ha): Unknown; has been recorded flying 12 km between foraging and roosting sites
- source: Parnaby and Cherry (1992), Menkhorst and Lumsden (1995b), L. Lumsden pers. comm.
 c) Habitat Specificity
 Classification of habitat specificity: Narrow; needs tree hollows for roosting
 Vegetation types inhabited in the region: Open-forcet and tall accent forcet. Profers wat habitat

- forest and tall open-forest. Prefers wet habitats particularly riparian or high rainfall areas. Recorded from Manna Gum (*Eucalyptus viminalis*) open-forest and an unusual occurance in a woodland of Yellow Gum (*E. leucoxylon*) and River Red Gum (*E.* camaldulensis) at Inverleigh Common
- Source: Menkhorst and Beardsell (1982), Conole and Baverstock (1983b), Menkhorst and Lumsden (1995b)

DYNAMICS

Population Trend in Last Decade

- Increasing, stable or declined: Unknown
 Source: L. Lumsden pers. comm.
 Population trend since discovery by Europeans
 Increasing, stable or declined: Most likely declined due to agricultural clearing and timber harvesting of mature forests upon which this species depende species depends
- Source: L. Lumsden pers. comm.
 SPATIAL DYNAMICS
 a) Population variability

- Classification of population variability: Low
- Source: L. Lumsden pers comm.
 b) Dispersal
- Classification of powers of dispersal: High
- Average distances dispersed: Unknown
- Maximum distance dispersed: Unknown

Source: Phillips (1995) LIFE HISTORY PARAMETERS a) Reproductive output

- Classification of reproductive output: Low Age of sexual maturity (yrs): Likely to be 1-2 vears
- Mean clutch/litter/brood size: Likely to be 1
- Mean no of clutches/litters/broods per year: 1
- Time of year young born/hatch: December
- Source: L. Lumsden pers. comm.
- ongevity. b) L
- Classification of lifespan: Long-lived Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): Unknown
- Source: L. Lumsden pers. comm.
- c) Morphology

Adult body siz

- Weight (g): 16-28 (20)
- Length (mm): 55-70
- Source: Phillips (1995), L. Lumsden pers.

comm. d) Social organisation

- Colonial or non-colonial: Females thought to form maternity colonies during summer
- Territoriality: Not likely to be territorial
- Source: Phillips et al. (1985), L. Lumsden pers. comm.

e) Other

- Nomadic, migratory, sedentary: Likely to be sedentary; it has been suggested that they migrate to lower altitudes for winter, however it is more likely that they go into torpor during this time.
- Diet: Insectivorous
- Source: Hall (1981), Phillips *et al.* (1985), O'Neill and Taylor (1989), L. Lumsden pers. comm.

THREATS

1. Clearing of Native Vegetation: Ranking (1) L. Lumsden pers. comm.

2. Timber Harvesting: Ranking (2) Law (1996), L. Lumsden pers. comm.

3. Fuel Reduction Burning: Ranking (-) L. Lumsden pers. comm.

4. Firewood Collection: Ranking (-) L. Lumsden pers. comm.

5. Unplanned Fire: Ranking (-) L. Lumsden pers.

comm.

6. Introduced Species: Ranking (0) L. Lumsden pers. comm.

7. Grazing/Trampling: Ranking (0) L. Lumsden pers. comm.

8. Pest Control: Ranking (1) L. Lumsden pers. comm.

9. Road Construction and Maintenance: Ranking (0) L. Lumsden pers. comm.

10. Mining/Quarrying: Ranking (0) L. Lumsden pers. comm.

11. Tree Dieback: Ranking (1) L. Lumsden pers. comm.

12. Recreation: Ranking (0) L. Lumsden pers. comm. 13. Illegal Collecting/Harvesting: Ranking (0) L.

Lumsden pers. comm.

14. Vandalism: Ranking (0) L. Lumsden pers. comm. 15. Dams/Impoundments: Ranking (0) L. Lumsden pers. comm.

Current Management:

The Eastern False Pipistrelle is not considered threatened in Victoria (NRE 1999). There are currently no threat-ameliorating management prescriptions for the species in the West CRA region.

Species characteristics

Apart from subfossil specimens, the Eastern False Pipistrelle was not formally recorded in Victoria until 1974 (Parnaby 1976). The use of certain capture techniques such as harp traps has increased the numbers of records and it has been found to have a numbers of records and it has been found to have a wide distribution in the state (Menkhorst and Lumsden 1995b, Atlas of Victorian Wildlife). However, capture rates are low, and the species is considered to be uncommon. The Eastern False Pipistrelle appears to prefer wet habitats, particularly where the trees are more than 20 m tall; in the west of the state its distribution corresponds to areas of high rainfall (Menkhorst and Lumsden 1995b). It has been recorded from Manna Gum (*Eucalyptus viminalis*) open-forest and woodland of Yellow Gum (*E. leucoxylon*) and River Red Gum (*E. camaldulensis*) (Menkhorst and Beardsell 1982, Conole and Baverstock 1983b, Menkhorst and Lumsden 1995b). There hollows are used for roosting (Menkhorst and Lumsden 1995b). There is limited information on the movements of this species with Hall (1981) suggesting that the bats move to lower attitudes for winter while Phillips *et al.* (1985) suggest that hibernation occurs during this time. The Eastern False Pipistrelle forages for insects around or just False Pipistrelle forages for insects around or just below the tree canopy (O'Neill and Taylor 1989, Menkhorst and Lumsden 1995b).

Distribution in the West CRA region

Records of the Eastern False Pipistrelle are from around Lower Glenelg National Park, the Grampians, Pyrenee Range, Wombat State Forest, Inverleigh Common Flora Reserve, Otway Ranges, Enfield State Park and Framingham The majority of State Park and Framlingham. The majority of

records are from the 1980's (Atlas of Victorian Wildlife).

Disturbances and potentially threate processes operating in the West CRA region threatening

The major threat to Eastern False Pipistrelle populations is considered to be timber harvesting (L. populations is considered to be timber harvesting (L. Lumsden pers. comm.), which results in the loss of hollow bearing trees thereby reducing roosting sites. This disturbance also has the potential to degrade feeding habitat and reduce insect abundance (Law 1996). Other disturbances that may affect the species include the accumulation of poisons via ingestion of insects contaminated with pest control chemicals, degradation of habitat due to eucalypt dieback and total habitat removal as a result of clearance of native vegetation. These disturbances are regarded as minor threats to the species in the clearance of native vegetation. These disturbances are regarded as minor threats to the species in the West CRA region (L. Lumsden pers. comm.). The impact of fuel reduction burning, wildfire and firewood collection on this species, are unknown (L. Lumsden pers. comm.). Although not classified as threatened in Victoria, the Eastern False Pipistrelle is considered uncommon in the West (Menkhorst and Lumsden 1995b).

Regent Honeyeater

Xanthomyza phrygia

RARITY

- a) Geographic Range
 Classification of range size within region: Large
 Distribution of records within region: Scattered, patchy distribution, the majority of records are from the east of the region and are pre-1970.
- Number of 5 minute grid cells recorded from: 26 Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low Population Estimate: Approximately 200 birds in Victoria
- Density: Unknown, exhibits low population density throughout range and distribution is extremely patchy.
- Home Range (ha): Unknown

- Home Range (ha): Unknown
 Source: Franklin *et al.* (1987), Webster and Menkhorst (1992), Menkhorst (1997)
 C) Habitat Specificity
 Classification of habitat specificity: Narrow, appears to rely on nectar from a few key eucalypt species: Mugga Ironbark *Eucalyptus sideroxylon*, White Box *E. albens*, Yellow Box *E. melliodora* Yellow Gum *E. leucoxylon* and Blakely's Red Gum *E. blakelyi*.
 Vegetation types inhabited in the region: Inhabits eucalypt woodlands and dry open-forest, as well as treed farmland and urban
- forest, as well as treed farmland and urban areas.
- Source: Franklin et al. (1989), Menkhorst (1997)
- DYNAMICS
 Population Trend in Last Decade
- Increasing, stable or declined: Declined Source: Franklin *et al.* (1987), Webster and
- Menkhorst (1992) Population trend since discovery by Europeans
- Increasing, stable or declined: Declined
 Source: Webster and Menkhorst (1992), Garnett (1992a), Menkhorst (1997)
 SPATIAL DYNAMICS
 a) Population variability

- Classification of population variability: High Source: Menkhorst (1993)

b) Dispersal

- Classification of powers of dispersal: High, nomadic
- Average distances dispersed: Unknown one bird was recorded travelling 270km
- Maximum distance dispersed: Unknown, possibly 100s of kms Seasonal patterns of abundance and breeding linked to regional patterns of flowering of key eucalypt species.
- Source: Menkhorst (1997), P. Menkhorst pers. comm

LIFE HISTORY PARAMETERS a) Reproductive output

Classification of reproductive output: Low

- Age of sexual maturity (yrs): 1 Mean clutch/litter/brood size: 2-3
- Mean no of clutches/litters/broods per year: 1, occasionally more
- Time of year young born/hatch: July-February (mainly November-January) Source: Menkhorst (1993), Ley *et al.* (1996), •
- Menkhorst (1997)
- b) Longevity
 Classification of lifespan: Unknown
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): 7 years
- Source: P. Menkhorst pers. comm. c) Morphology
- Adult body size
- Weight (g): 43 Length (mm): 225
- Source: Longmore (1991)
- d) Social organisation
- Colonial or non-colonial: Nest in pairs, non-
- breeding may form loose flocks Territoriality: Yes, nest tree and feeding site defence
- Source: Franklin and Robinson (1989), Webster and Menkhorst (1992), Davis and Recher (1993) e) Other
- Nomadic, migratory, sedentary: Nomadic/Migratory. Movement poorly understood. May be linked to food availability and could include semi-migratory longer distance movements between regions and local wanderings.
- Diet: Nectivore, insectivore Source: Franklin et al. (1989), Ley et al. (1996)

Clearing of Native Vegetation: Ranking (2)
 Menkhorst (1997), P. Menkhorst pers. comm.
 Timber harvesting: Ranking (2) Garnett (1992b), Robinson (1994), Menkhorst (1997), P. Menkhorst

a. Fuel Reduction Burning: Ranking (1) P.

Menkhorst pers. comm. **4. Firewood Collection: Ranking (2)** Ley and Williams (1992), Garnett (1992b), Menkhorst (1993), P. Menkhorst pers. comm.

5. Unplanned Fire: Ranking (1) P. Menkhorst pers.

comm.

6. Introduced Species: Ranking (1) Menkhorst

(1997), P. Menkhorst pers. comm.
7. Grazing/Trampling: Ranking (2) Landsberg *et al.* (1990), Ford (1993), Grey (1995), P. Menkhorst pers. comm.

8. Pest Control: Ranking (0) P. Menkhorst pers. comm.

9. Road Construction and Maintenance: Ranking

(2) P. Menkhorst pers. comm. 10. Mining/Quarrying: Ranking (1) P. Menkhorst pers. comm. 11. Tree Dieback: Ranking (2) P. Menkhorst pers.

comm

12. Recreation: Ranking (1) P. Menkhorst pers.

comm. 13. Illegal Collection/Harvesting: Ranking (0) P.

Menkhorst pers. comm.

 Vandalism/Disturbance by Humans: Ranking (-)
 Dams/Impoundments: (0) P. Menkhorst pers. comm.

16. Other: Interspecific competition: Ranking (2) Franklin and Robinson (1989), Ford *et al.* (1993), Menkhorst (1993), Grey *et al.* (1997), P. Menkhorst pers. comm.

Current Management:

The Regent Honeyeater is classified as "critically endangered" in Victoria (NRE 1999), and is listed under the Victorian Flora and Fauna Guarantee Act 1988 and the Commonwealth Endangered Species Protection Act 1992. An Action Statement (Menkhorst 1993) and Recovery Plan (Menkhorst 1997) have been prepared for this species. On public land intended management actions include the exclusion of timber harvesting, mining and grazing

from all known regularly used sites. Exclusion areas include a 100m wide disturbance-free zone surrounding the site, and a further 150m wide zone within which at least 10 habitat trees per hectare should be retained. Management of all public land containing the key eucalypt species will aim to at least maintain and preferrably increase the number of mature trees. Road reserves currently being grazed under license within the species distribution will be re-assessed and where one or more of the key eucalypt species are locally indigenous licensees will be assisted in the protection of the vegetation. vegetation the Protection of roadside and development of roadside management plans by local shires will be encouraged (Menkhorst 1993). Actions specified within the Recovery Plan relate to habitat management, population monitoring, ecological research, extension and captive management. On public land the management of all areas containing the key eucalypt species will be reassessed and where practicable their habitat value for the Regent Honeyeater will be enhanced (Menkhorst 1997).

Species characteristics:

The Regent Honeyeater is a highly mobile species that feeds on nectar and insects. It is most frequently recorded from box-ironbark habitat containing key eucalypt species such as Mugga Ironbark E. sideroxylon, White Box E. albens, Yellow Box E. melliodora, and Yellow Gum E. leucoxylon. Stands of these species growing on high-quality sites where nectar production is copious and relatively predictable appear to be critical to the survival of the Regent Honeyeater. Movements appear to be more regular than previously thought, with seasonal patterns of abundance and breeding related to the regional flowering patterns of the key eucalypt species (Franklin *et al.* 1989, Ley 1990). Little is known about the life history of the Regent Honeyeater. Although the regular occurrence of the species at some sites is well known, there is a current lack of understanding of movement patterns or the whereabouts of birds when they are absent from these known regular sites (Menkhorst 1997).

Distribution within the West CRA region:

Records of the Regent Honeyeater are sparsely distributed within the West with the majority originating pre-1970. Post 1970 records are from near Clunes, Beaufort, Mt Beckworth, Mount Cole State Forest and Elliminyt in the Otway Ranges. Other scattered records span the region from Tooborac in the north-east, Stawell, Hamilton, Edenhope, Bringalbert, Apsley and Heathmere in the south-west of the region. The species has been recorded from roadside reserves and remnant patches of woodland vegetation on private land as well as more extensive patches of State forest (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes within the West CRA region:

A large proportion of the preferred habitat of the Regent Honeyeater has been cleared for agriculture and many of the remaining stands have been heavily harvested for timber (Menkhorst 1997). Sites are now found in small isolated remnants growing in farmland as well as a few more extensive patches on public land. Threats relate to further loss and degradation of existing habitat which may be caused by disturbances such as clearing, firewood collection, fence post cutting and tree dieback (Garnett 1992b, Robinson 1994, Menkhorst 1997). Larger trees appear to be selected for nectar feeding (Webster and Menkhorst 1992) and birds are often recorded in small remnants that have not experienced intensive

silviculture (including loss of large trees). Grazing by stock and rabbits prevents the regeneration of habitat. The presence of stock also contributes to tree dieback by causing elevated nutrient levels leading to an abundance of defoliating insects (Landsberg *et al* 1990). The loss of high quality sites and habitat fragmentation creates the potential for competition for nectar with other honeyeater species and from the introduced Honey Bee (Franklin et al. 1989, Franklin and Robinson 1989).

Painted Honeyeater

Grantiella picta

RARITY

- a) Geographic Range
 Classification of range size within region: Medium
- Distribution of records within region: Records are mainly confined to the eastern half of the region where the distribution is thin and patchy
- Number of 5 minute grid cells recorded from: 18
 Source: Atlas of Victorian Wildlife
 b) Abundance
- Classification of abundance: Low
- Population Estimate: Unknown, probably in the hundreds.
- Density: Variable; known to occur in high densities at certain times in areas of abundant food although absent or in low numbers at the same site in different seasons. Home Range (ha): Unknown Source: Eddy (1961), Garnett (1992a), D.
- Construction of the state of th

- Vegetation types inhabited in the region: Dry sclerophyll open-forest and woodland including box-ironbark forests and ironbark-stringybark. forests.
- Source: Emison et al. (1987), Robinson (1991,

DYNAMICS

- Population Trend in Last Decade Increasing, stable or declined: Unknown, possibly declined
- Source: Garnett (1992a), Robinson (1994)
 Population trend since discovery by Europeans
 Increasing, stable or declined: Unknown,
- Increasing, stable or declined: Unknown, probably declined commensurate with broad-scale habitat clearance earlier this centuary
 Source: Garnett (1992a), Robinson. (1994)
 SPATIAL DYNAMICS

 a) Population variability
 Classification of population variability: High
 Source: Garnett (1992a), D. Robinson pers.

- comm.

b) Dispersal

- Classification of powers of dispersal: High
- Average distances dispersed: Unknown
- Maximum distance dispersed: Hundreds to thousands of kilometers between wintering and summer breeding grounds Source: Blakers *et al.* (1984), Robinson (1994),
- D. Robinson pers. comm. LIFE HISTORY PARAMETERS a) Reproductive output

- Classification of reproductive output: High
- Age of sexual maturity (yrs): Unknown Mean clutch/litter/brood size: 2
- Mean no of clutches/litters/broods per year: 2
- Time of year young born/hatch: October-March Source: Eddy (1961)

b) Longevity

- Classification of lifespan: Unknown
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): Unknown
- Source: D. Robinson pers. comm. c) Morphology

Adult body size

- Weight (g): 23 Length (mm): 160
- Source: Longmore (1991)

- d) Social organisation
 Colonial or non-colonial: Typically breeds in scattered groups of 10-12 pairs. Outside the breeding season usually occurs in pairs or in small flocks.
- Territoriality: Males defend nesting territories
- Source: Eddy (1961), Longmore (1991)
- Other e)
- Nomadic, migratory, sedentary: Migratory Diet: Primarily a frugivore, although also insectivore and nectivore
- Source: Eddy (1961), Keast (1968), Longmore (1991)

THREATS

1. Clearing of Native Vegetation: Ranking (3) Garnett 1992

2. Timber harvesting: Ranking (2) D. Robinson pers. comm

3. Fuel Reduction Burning: Ranking (1) Robinson (1994) D. Robinson pers. comm

4. Firewood Collection: Ranking (2) D. Robinson 5. Unplanned Fire: Ranking (2) D. Robinson pers.

comm.

6. Introduced Species: Ranking (-)
 7. Grazing/Trampling: Ranking (2) Landsberg et al. (1990), D. Robinson pers. comm.

(1990), D. Robinson pers. comm.
8. Pest Control: Ranking (-)
9. Road Construction and Maintenance: Ranking (-)
10. Mining/Quarrying: Ranking (-)
11. Tree Dieback: Ranking (2) Eddy (1961),
Landsberg et al. (1990), D. Robinson pers. comm.
12. Recreation: Ranking (0)
13. Illegal Collection/Harvesting: Ranking (0)
14. Vandalism/Disturbance by Humans: Ranking (0)
15. Dams/Impoundments: (0)
16. Other: Interspecific competition: Ranking (2)

16. Other: Interspecific competition: Ranking (2) Robinson (1994), Grey et al. (1997), M. Clarke pers. comm

Current Management:

The Painted Honeyeater is classified as "vulnerable" in Victoria (NRE 1999) and is listed under the Victorian *Flora* and *Fauna Guarantee Act* 1988. There are no current management prescriptions for the species in the West. Some Regent Honeyeater recovery actions and management actions will also benefit the Painted Honeyeater.

Species characteristics:

There is very little known about the biology, ecology, population dynamics and movements of the Painted Honeyeater. The species migrates to Victoria to breed over the spring and summer, and occurs primarily in dry forests and woodlands on the inland primarily in dry forests and woodlands on the inland slopes and adjacent plains of the Great Dividing Range. The Painted Honeyeater is a specialist feeder of mistletoe fruit. In Victoria it is generally associated with Drooping Mistletoe *Amyema pendulum* and Box Mistletoe *A. miqueli*, and throughout its range its presence and movements are usually associated with the fruiting and flowering of mistletoes in different localities (Longmore 1991, Blakers *et al.* 1984). Within the West eucalyot mistletoes in different localities (Longmore 1991, Blakers *et al.* 1984). Within the West, eucalypt species typically parasitised by these mistletoes and hence are food sources for Painted Honeyeaters include: Red Ironbark *Eucalyptus sideroxylon*, Red Stringybark *E. macrorhyncha*, Grey Box *E. microcarpa*, and Red Box *E. polyanthemos* (D. Robinson pers. comm.).

Distribution within the West CRA region: Records of the Painted Honeyeater in the West region are mostly confined to the east of the region from near Bacchus Marsh, Durrdidwarrah and Steiglitz at the base of the Brisbane Ranges, Bannockburn, Yandoit, Clunes, Mount Beckworth, Beaufort, Happy Valley and Scarsedale. Westerly records include the Horsham vicinity, Wartook and Edenhope (Atlas of Victorian Wildlife).

Disturbances and potentially th processes within the West CRA region: threatening

Although there have been local increases in the abundance of mistletoes in many parts of the woodland region, numbers of Painted Honeyeaters appear to be declining (Robinson 1994). Little is known about the movement patterns of Painted Honeyeaters; however, they do appear to exhibit a degree of site fidelity. As a result the species is particularly vulnerable to disturbances which reduce the habitat quality of these sites (D. Robinson pers. comm.) Woodland remnants on private land provide the habitat quality of these sites (D. Robinson pers. comm.). Woodland remnants on private land provide important habitat and disturbances such as firewood collection, clearing for agriculture, habitat fragmentation and lack of habitat regeneration as a result of grazing could accelerate any long-term decline (Garnett 1992a). Tree decline may be exacerbated by pasture improvement activities that contribute to habitat degradation and loss (Landsberg *et al.* 1990). Wildfire may result in loss of important habitat. Trees with heavy infestations of mistletoe may be selected by post cutters (J. Macdonald pers. comm.) resulting in the loss of the food resource. comm.) resulting in the loss of the tood resource. Timber harvesting also results in loss of habitat and is considered a moderate threat. Inappropriate fire regimes may contribute to habitat degradation. Exclusion from areas of suitable habitat by Noisy Miners *Manorina melanocephala*, particularly from fragmented woodland remnants, may also be contributing to the Painted Honeyeater's decline (Grey *et al.* 1997, M. Clarke pers. comm.).

Swift Parrot

Lathamus discolor

RARITY

- a) Geographic Range
 Classification of range size within region within
- region: Large Distribution of records within region: Majority of records in the east of the region, north and north- west of Melbourne, the Bellarine Penninsular in the vicinity of Geelong, the You Yangs, and Brisbane Ranges.
- Number of 5 minute grid cells recorded from: 53
 Source: Atlas of Victorian Wildlife
 b) Abundance
- Classification of abundance: Low
- Population Estimate: Unknown, probably less than 2000 birds in Victoria; 1277 birds were recorded in Victoria during the 1996 over-winter survey with the greatest concentrations in the central and north east of the state, particularly central Victoria.

- central Victoria.
 Density: Unknown
 Home Range (ha): Nomadic, migratory species.
 Source: Brown (1989), Tzaros and Davidson (1996), Tzaros (1997), C. Tzaros pers. comm. **C) Habitat Specificity**Classification of habitat specificity: Narrow
 Vegetation types inhabited in the region: Eucalypt forests and woodlands; favour habitats containing the winter flowering eucalypt species: Grey Box *Eucalyptus microcarpa*, Red Ironbark *E. tricarpa*, Mugga Ironbark *E. sideroxylon*, Yellow Gum *E. leucoxylon* and White Box *E. albens*. The species may also occur in wooded farmlands and suburban parks. Rarely seen in treeless areas, rainforests and wet forests. treeless areas, rainforests and wet forests. Source: Emison *et al.* (1987), Webster (in prep),
- C. Tzaros pers. comm. DYNAMICS Population Trend in Last Decade

- Increasing, stable or declined: Declined Australia wide population census 1320 pairs (1989), 940 pairs (1995) Source: Brereton (1996)
- Population trend since discovery by Europeans
- Increasing, stable or declined: Declined Source: SAC (1991), Garnett (1992b), Brereton
- (1996) SPATIAL DYNAMICS

a) Population variability

Classification of population variability: High Presence linked to flowering patterns of eucalypts and presence/absence of lerp or other alternative food sources.

- Source: Robinson (1994), Tzaros and Davidson (1996), Tzaros (1997)
 b) Dispersal
- Classification of powers of dispersal: High Average distances dispersed: Birds migrate from Tasmania to south eastern Australia each winter
- Maximum distance dispersed: 100s km

Source: Brereton (1996) LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: High. Breeding success is variable as it is dependent on Blue Gum flowering in Tasmania
- Age of sexual maturity (yrs): Possibly 2 years Mean clutch/litter/brood size: 4-5 eggs
- Mean no of clutches/litters/broods per year: 1
- Time of year young born/hatch: October-
- December Source: Forshaw and Cooper (1981), Brereton
- (1996)

b) Longevity

- Classification of lifespan: Unknown, possibly long-lived
- Average lifespan (yrs): 6-7 years Maximum lifespan (yrs): Unknown
- Source: R. Brereton in Tasmanian-Commonwealth RFA (1996) Commonwealth RFA (1996) Commonwealth RFA (1996)

- Adult body size Weight (g): 77 Length (mm): 236
- Source: Brereton (1996)
- d) Social organisation
- Colonial or non-colonial: Non-colonial; nesting pairs, also gregarious and occasionally flock at rich over-wintering food and roost sites.
- Territoriality: No Source: Brereton (1996), S. Kennedy and C. Tzaros pers. comm.
- e) Other
- Nomadic, migratory, sedentary: Non-breeding winter migrant to Victoria
- Diet: Primarily nectivore, also eats psyllids and lerps, wattle racemes and eucalypt fruits, buds and shoots.
- Source: Brereton (1996), Tzaros and Davidson (1996), Tzaros (1997)

THREATS

1. Clearing of Native Vegetation: Ranking (2) Brown (1989), Garnett (1992b), S. Kennedy pers.

- comm. 2. Timber harvesting: Ranking (2) Garnett (1992b),
- S. Kennedy pers. comm.
- Fuel Reduction Burning: Ranking (-)
 Firewood Collection: Ranking (2) Robinson (1994), Garnett (1992b), S. Kennedy pers. comm.
 Unplanned Fire: Ranking (-)
- 6. Introduced Species: Ranking (1) S. Kennedy pers. comm.

7. Grazing/Trampling: Ranking (2) Landsberg *et al.* (1990), Robinson (1994), S. Kennedy pers. comm.

8. Pest Control: Ranking (-) 9. Road Construction and Maintenance: Ranking

9. Road Construction and Maintenance: Ranking (1) C. Tzaros pers. comm.
10. Mining/Quarrying: Ranking (1) Tzaros (1997), Webster (in prep), S. Kennedy pers. comm.
11. Tree Dieback: Ranking (2) Landsberg et al. (1990), Webster (in prep), S. Kennedy pers. comm.
12. Recreation: Ranking (-)
13. Illegal Collection/Harvesting: Ranking (-)
14. Vandalism/Disturbance by Humans: Ranking (-)
15. Dams/Impoundments: Ranking (0) C. Tzaros pers. comm. pers. comm.

 Other: Interspecific Competition: Ranking (-) Brown (1989), Tzaros and Davidson (1996), C. Tzaros pers. comm.

Current Management:

The Swift Parrot is classified as "endangered" in Victoria (NRE 1999), and is listed under the Victorian Flora and Fauna Guarantee Act 1988. An Action Statement is currently being prepared (Webster in

The species is also listed under the prep). Commonwealth Endangered Species Protection Act 1992 and an Australia wide Recovery Plan has been published (Brereton 1996). Recovery objectives for overwintering population include the the identification, mapping and management of foraging habitat, and population monitoring. In Victoria, overwinter surveys commenced in 1995 and will run for at least 3 more years. This survey will concentrate on sites where Swift Parrots have been regularly recorded as well as sites which contain the preferred winter flowering eucalypts, and includes foraging habitat in the central, north east and south east of the West CRA region (Tzaros and Davidson 1996, Tzaros 1997). Within the Midlands Forest Management Area conservation guidelines for the species include: protection of a minimum of 30% of dry forest and woodland in Special Protection Zones (SPZ) and conservation reserves, avoiding disturbance by forest management activities in the vicinities of flocks, and the protection of large, spreading trees as part of the implementation of habitat tree prescriptions (NRE 1996a).

Species characteristics:

The Swift Parrot is a gregarious arboreal nectivore that breeds in Tasmania and overwinters on the mainland. The species is generally recorded in Victoria from March to October (Tzaros and Davidson 1996). Its distribution is restricted to areas of autumn and winter flowering eucalypts particularly Grey Box Eucalyptus microcarpa, Red Ironbark E. tricarpa, Mugga Ironbark E. sideroxylon, Yellow Gum E. leucoxylon and White Box E. albens (Hindwood and Sharland 1964, Brown 1989, Robinson 1994). The movements and presence of birds in an area is variable and appears related to the flowering of these key eucalypt species. Within Victoria, the greatest concentrations of Swift Parrots are from the northeast and central regions of the state, centered on the box-ironbark forests (Blakers et al. 1984, Emison et al. 1987, Tzaros and Davidson 1996).

Distribution within the West CRA region:

The majority of Swift Parrot records from the West are from north and north-west of Melbourne near Wallan, Oaklands Junction, Greenvale and Mickleham, Toolern Vale, Exford and West Melton, and Parwan and Rowsley near Bacchus Marsh. Also concentrated on the Bellarine Peninsula in the vicinity of Geelong, the You Yangs, Balliang, Anakie, and Lethbridge (Atlas of Victorian Wildlife). These records are most likely of birds moving between Tasmania and areas of preferred foraging habitat in the center and north-east of the region (C. Tzaros pers. comm.). Further west, records are from Bullarook, Yandoit Hill, Clunes, Linton, Langi Ghiran State Park, near Stawell and Horsham, Deep Lead Flora and Fauna Reserve, the Grampians National Park, Casterton, Colerain and Morrison Hill (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating within the West CRA region: threatening There has been a substantial loss of overwintering habitat within Victoria as a result of past clearing for agriculture and the survival of Swift Parrots is now largely dependent on the habitat quality of the remaining stands (Webster in prep). Large old trees which produce high nectar yields in winter are a significant food resource in Victoria (Brereton 1996). Disturbances such as clearing of native vegetation, and forest management activities such as post cutting and firewood collection result in habitat loss, particularly of large old trees, and are significant threats to the species within the North East. Disturbances which contribute to the degradation of

habitat remnants such as inappropriate fire regimes, salinity, tree dieback and grazing, (Landsberg et al. 1990) also constitute significant threats to the species. Drainage lines may constitute important habitat for Swift Parrots and gold mining activities which often focus on drainage lines may result in loss of habitat (Tzaros 1997, Webster in prep.). However, in the West region this disturbance is not likely to be significant. Illegal harvesting, and displacement by aggressive nectar feeding birds may constitute threats to the species although the significance of these disturbance are unknown (C. Tzaros pers. comm.).

Red-tailed Black-Cockatoo

Calyptorhynchus banksii graptogyne

RARITY a) Geographic Range

- Classification of range size within region within region: Small
- Distribution of records within region: All records are from the west of the region, records are more scattered in the south-west.
- Number of 5 minute grid cells recorded from: 120
- Source: Atlas of Victorian Wildlife
- b) Abundance
- Classification of abundance: Low
- Population Estimate: Less than 1000 individuals and no more than 100 breeding pairs estimated in 1991
- Density: Birds appear fairly evenly distributed throughout suitable habitat and although generally uncommon they can be locally common in response to food availability.
- Home Range (ha): Nomadic
- Home Range (na): Nornalic
 Source: Joseph (1982a), Joseph *et al.* (1991)
 c) Habitat Specificity Classification of habitat specificity: Narrow; feeds predominantly on the seed of Brown Stringybark *Eucalyptus baxteri*, Buloke *Allocasuarina luehmannii* may also be important is pome viscon in some years.
- Vegetation types inhabited in the region: Inhabits areas of Brown Stringybark woodlands in association with River Red Gum *E*. in association with River Red Gum E. camaldulensis, Yellow Gum E. leucoxylon, Swamp Gum E. ovata, Buloke, and occasional patches of Pink Gum E. fasciculosa.
 Source: Joseph (1982a), Joseph et al. (1991), Venn and Fisher (1993), R. Hill pers. comm.

Population Trend in Last Decade

- Increasing, stable or declined: Unknown, possibly declined as loss of habitat is continuing
- Source : Joseph (1982a), Joseph *et al.* (1991), Garnett (1992b), Baker-Gabb (1995), R. Hill pers. comm.

Population trend since discovery by Europeans Increasing, stable or declined: Declined

- Source: Wheeler (1967), Emison *et al.* (1987), Garnett (1992b), Venn and Fisher (1993)
 SPATIAL DYNAMICS
 a) Population variability

- Classification of population variability: High Source: Joseph (1982a, b)
- b) Dispersal
- Classification of powers of dispersal: High
- Average distances dispersed: Nomadic foragers with movements related to food availability, may be a post-breeding seasonal movement north depending on the area.
 Source: Joseph (1982a, b)
 LIFE HISTORY PARAMETERS
 a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity (yrs): 4
- Mean clutch/litter/brood size: 1
- Mean no of clutches/litters/broods per year: 1, although may not breed every year
- Time of year young born/hatch: Spring-Summer; active nests have been found in all months

between 19 October and 3 April, and as late as late-July

- Source: Attiwill (1960), Forshaw and Cooper (1981), Joseph (1982a), Joseph *et al.* (1991), Venn and Fisher (1993), R. Hill pers. comm.
- b) Longevity
- Classification of lifespan: Long-lived
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): Unknown Source: Forshaw and Cooper (1981)Venn and Fisher (1993)

c) Morphology

- Adult body size
- Weight (g): Approximately 700
- Length (mm): 600 (*C. magnificus*) Source: Forshaw and Cooper (1981)
- d) Social organisation
- Colonial or non-colonial: Non-colonial, nesting pairs although appears to often nest in small groups. Forms feeding flocks
- Territoriality: No
- Source: Forshaw and Cooper (1981), Joseph et al. (1991), R. Hill pers. comm. e) Other
- Nomadic, migratory, sedentary: Nomadic
- Diet: Feeds predominantly on the seeds of Brown Stringybark, Buloke seeds may also be important. Food (as yet unidentified) taken from other plants eg. *Banksia marginata* although seemingly taken rarely could be important in the diet of nestlings. Source: Joseph (1982a), Joseph *et al.* (1991)

THREATS

1. Clearing of Native Vegetation: Ranking (3) Joseph (1982a,b), Joseph *et al.* (1991), Garnett (1992b), Venn and Fisher (1993), R. Hill pers. comm. **2. Timber harvesting: Ranking (3)** Joseph *et al.*

Imber narvesting: Ranking (3) Joseph *et al.* (1991), Venn and Fisher (1993)
 Fuel Reduction Burning: Ranking (3) Joseph *et al.* (1991), Garnett (1992b), Venn and Fisher (1993)
 Firewood Collection: Ranking (3) Garnett (1992b), Venn and Fisher (1993), Baker-Gabb (1995)
 Unplanned Fire: Ranking (3) Venn and Fisher (1995)

(1993)
 Introduced Species: Ranking (-) R. Hill pers. comm.
 7. Grazing/Trampling: Ranking (2) Joseph (1982a), Venn and Fisher (1993), Baker-Gabb (1995)
 8. Pest Control: Ranking (0)
 9. Road Construction and Maintenance: Ranking

(2) Joseph (1982a), Baker-Gabb (1995) 10. Mining/Quarrying: Ranking (2) Venn and Fisher

(1993) 11. Tree Dieback: Ranking (2) R. Hill pers. comm.

12. Recreation: Ranking (0) 13. Illegal Collection/Harvesting: Ranking (3) Garnett (1992b), SAC (1991), Venn and Fisher

(1993) 14. Vandalism/Disturbance by Humans: Ranking (1) R. Hill pers. comm. 15. Dams/Impound

5. Dams/Impoundments: Ranking (0)

Other:Interspecific competition: Ranking (2) Joseph et al. (1991), Venn and Fisher (1993)

Current Management:

The Red-tailed Black-Cockatoo is classified as "endangered" in Victoria (NRE 1999) and is listed under the Victorian Flora and Fauna Guarantee Act 1988. An Action Statement for this species has been published (Venn and Fisher 1993). Intended management actions include: ongoing survey and monitoring, investigate the effect of honey bee hives taking over nest hollows, and methods of eradication, continued liasion with land holders and South Australian National Parks and Wildlife Service in relation to protection of feed and nesting habitat, investigate the availability of future nest sites and the use of artificial nest hollows, once all areas of habitat type have been identified prepare a critical habitat determination, evaluate the effect of past burning practices and assess the effect of fuel reduction burns on seed yield of Brown Stringybark to develop

more sensitive fire management regimes, and provide ongoing input into fire protection works, ensure conservation objectives are met in relation to applications to clear cockatoo habitat, propose an amendment to the regional section of the relevant planning schemes to protect identified areas of habitat, particularly scattered dead trees in the Southern Grampians and Glenelg Shires, and ensure timber licensing on Crown Land to minimise negative impacts on the species, particularly in relation to minor forest produce (Venn and Fisher 1993). This species is also listed as "endangered" under the Commonwealth Endangered Species Protection Act 1992. Recovery actions include: investigation of breeding initiation and success, protection of nest sites, determine population size, movements, effects of fire, community education, and habitat protection and regeneration. Environment Australia have funded a five year project (managed by Birds Australia in conjunction with NRE and the South Australian Department of Environment, Heritage and Aboriginal Affairs) to implement recovery actions (R. Hill pers. comm.).

Species characteristics:

The south-eastern population of the Red-tailed Black-Cockatoo is genetically isolated from populations in northern and western Australia and is considered a distinct sub-species (Schodde 1988). Its range is limited to an area extending just north of the Little Desert and Robe in South Australia, east to Horsham and south to the Lower Glenelg National Park in Victoria (Venn and Fisher 1993). Its habitat includes areas of Brown Stringybark Eucalyptus baxteri woodland and scrub in association with River Red Gum E. camaldulensis, Yellow Gum E. leucoxylon, Swamp Gum E. ovata, Buloke Allocasuarina Luehmannii, and occasional patches of Pink Gum E. fasciculosa (Joseph 1989). The Red-tailed Black-Cockatoo has a specialised diet which consists almost exclusively of the seeds of Brown Stringybarks; seeds of Buloke may also be important. Feeding habitat is concentrated on public land and consists of fragmented blocks of Crown Land varying from less than 100 to 1100 ha (Venn and Fisher 1993). The species forms permanent pairs and requires large, deep hollows for nesting; most known nest sites have been in hollows of dead River Red Gums located in pasture although nest sites have been recorded in Brown Stringybark forest and Yellow Gum woodland. (Attiwill 1960, Joseph et al. 1991, R. Hill pers. comm.). Of the nest trees recorded by recent surveys, 25% were located on public land (R. Hill pers. comm.). Roosts are generally in large trees with a spreading canopy and include Brown Stringybark, River Red Gum, Yellow Gum and introduced pines (*Pinus radiata*). Dense copses of young River Red Gums are mostly used in the West region (R. Hill pers. comm.).

Distribution in the West CRA region:

Records of the Red-tailed Black-Cockatoo are mainly concentrated in forests south of Goroke and Minimay and in the Edenhope and Casterton areas. Birds have also been recorded further south from the Lower Glenelg National Park and in the vicinity of Nelson. There are scattered records east of these areas from near Connangorach, Quantong and Wonwondah North, the Grampians National Park, Rocklands Reservoir and Tarrington. There are historical records of the species from near Ballarat (1896) and from near Redstone hill (1906), 30 km north-west of Melbourne (Atlas of Victorian Wildlife, Joseph 1982a,b). Although breeding records are concentrated around Edenhope, breeding may take place throughout its range (R. Hill unpublished data).

Disturbances and potentially threatening processes in the West CRA region:

Past clearance of former habitat for agriculture and softwood plantations has greatly reduced numbers of the Red-tailed Black-Cockatoo. Available habitat continues to decline through vegetation clearance and is a major threat to the population (Joseph 1982a, Joseph *et al.* 1991, Venn and Fisher 1993). It appears availability of nest trees may be a limiting factor in breeding success; a significant proportion of nesting habitat includes remnant trees on private land and loss of this critical habitat element as a result of felling for firewood is a major threat to the population. Dead trees which make up the majority of known nest sites on private land, are particularly vulnerable (Joseph et al. 1991, Garnett 1992b, Venn and Fisher 1993). Grazing by stock and rabbits has allowed little regeneration of young trees to replace the old trees as they die and collapse. Wildfire results in loss of feeding, nesting and roosting habitat; River Red Gum and Yellow Gum are generally killed by fire. Extensive hot fires which burn the forest canopy may reduce the availability of Brown Stringbark fruit for up to five years limiting the cockatoo's food supply (R. Hill pers. comm.). Fuel reduction burning may similarly threaten feeding habitat (Joseph et al. 1991, Venn and Fisher 1993, Baker-Gabb 1995). Timber harvesting also results in loss of feeding and roosting habitat, and of nest sites. Seeds of Buloke are thought to be particularly important for newly flying young birds. Buloke are now found mainly on roadsides and fire prevention activities, grazing and road construction and maintenance activities may have a negative impact on this potentially critical food supply. Red-tailed Black-Cockatoos are highly valued in the illegal bird trade making them a target for bird trappers. This could be a significant threat given the small size of the population (Garnett 1992b, Baker-Gabb 1995). Competition for nest sites with the Yellow-tailed Black-Cockatoo, Slender-billed Corellas, Galahs and feral Honey Bees may have a significant impact on breeding, particularly as nest sites are limiting (Joseph et al. 1991, Venn and Fisher 1993). Invasion of Brown Stringbark forests by Pinus radiata and Acacia longifolia is a potential threat to the species although the significance of this threat is currently unknown (R. Hill pers. comm.).

Rufous Bristlebird

Dasyornis broadbenti

RARITY

- a) Geographic Range
- Classification of range size within region within region: Small
- Distribution of records within region: All records are from the south of the region, the majority are close to the coast and are mainly concentrated in the south-west and south-east. There is a gap in the distribution near Warnambool.
- Number of 5 minute grid cells recorded from: 71 Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: Unknown
- Population Estimate: Unknown Density: 12 birds known from a 3 x 0.2 km strip at Airey's Inlet in 1983, 19 home ranges were found in a 20 km stretch between Ironbark Basin and Eastern View in 1990, in Port Campbell National Park, 23 individuals were recorded within 100 ha in 1991.
- Home Range (ha): Unknown, may be less than 1 hectare
- Source: Garnett (1992a), Chapman (1999)

- c) Habitat Specificity
 Classification of habitat specificity: Narrow
- Vegetation types inhabited in the region: Tall shrubland on coastal dunes dominated by Coast Wattle Acacia longifolia and limestone cliffs dominated by tea-tree Leptospermum and she-oaks Allocasuarina and in Woolly Tea-tree L. lanigerum thickets in coastal gullies and freshwater wetlands. Near Portland it occupies coastal scrub in sheltered gullies lined with Woolly Tea-tree and lowland forest and in the Otway Ranges wet forests containing Myrtle Beech Nothofagus cunninghamii or Mountain Ash Eucalyptus regnans, moist foothill forest, lowland forest and coastal scrub.
- Source: Emison *et al.* (1987), Garnett (1992a), Newell *et al.* (1999)

DYNAMICS Population Trend in Last Decade

- Increasing, stable or declined: Declined
- Increasing, stable or declined: Declined
 Source : Garett (1992a), Reilly (1991a,b)
 Population trend since discovery by Europeans
 Increasing, stable or declined: Declined
 Source: SAC (1991)
 SPATIAL DYNAMICS
 a) Population variability
 Classification of population variability

- Classification of population variability: Unknown, probably low • Source: Smith and Baker-Gabb (1993) b) Dispersal

- Classification of powers of dispersal: Low Average distances dispersed: Unknown,
- sedentary species with a weak flying ability Source: Reilly (1991a,b), Garnett (1992a),

Chapman (1999) LIFE HISTORY PARAMETERS a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity (yrs): Unknown Mean clutch/litter/brood size: 2 although 1 egg is often infertile
- Mean no of clutches/litters/broods per year: 1
- Time of year young born/hatch: September-December
- Source: Schodde and Tidemann (1986) b) Longevity
- Classification of lifespan: Long-lived
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): Unknown Source: Chapman (1999)

c) Morphology

- Adult body size
- Weight (g): Unknown Length (mm): 230-270
- Source: Schodde and Tidemann (1986), Smith and Baker-Gabb (1993)

d) Social organisation

- Colonial or non-colonial: Non-colonial Territoriality: Yes, established pairs occupy small territories
- Source: Schodde and Tidemann (1986)
- e) Other
- Nomadic, migratory, sedentary: Sedentary Diet: Primarily ground-dwelling invertebrates. Seeds and berries are also taken from the ground and lower shrub layer. Source: Reilly (1991a,b), Smith and Baker-Gabb
- (1993)

THREATS

Clearing of Native Vegetation: Ranking (3) Bennett (1982), Garnett (1992a), Smith and Baker-Gabb (1993), Chapman (1999)
 Timber harvesting: Ranking (1) Brinkham (1990)
 Fuel Reduction Burning: Ranking (3) Reilly (1991a,b), Smith and Baker-Gabb (1993), Chapman

- (1999)

4. Firewood Collection: Ranking (0)
5. Unplanned Fire: Ranking (3) Reilly (1991a,b), Smith and Baker-Gabb (1993), Chapman (1999)
6. Introduced Species: Ranking (3) Garnett (1992a), Smith and Baker-Gabb (1993), Chapman

(1999)

7. Grazing/Trampling: Ranking (2) Bennett (1982), Smith and Baker-Gabb (1993), Chapman (1999)

8. Pest Control: Ranking (0)
 9. Road Construction and Maintenance: Ranking (-)
 10. Mining/Quarrying: Ranking (0)
 11. Tree Dieback: Ranking (0)

12. Recreation: Ranking (1) Smith and Baker-Gabb 1993

Ilegal Collection/Harvesting: Ranking (0)
 Vandalism/Disturbance by Humans: Ranking (-)
 Dams/Impoundments: Ranking (0)

16. Other:Intersp ecific competition: Ranking ()

Current Management:

The Rufous Bristlebird is classified as "lower risk near threatened " in Victoria (NRE 1999) and is listed under the Victorian Flora and Fauna Guarantee Act 1988. An Action Statement for this species has been published (Smith and Baker-Gabb 1993). Intended management actions include: survey of range to establish population densities and distribution; determine critical habitat requirements; determine appropriate fire regimes for reserves if found to be fire dependent; determine appropriate connecting habitat corridors in terms of widths, habitat quality and continuity; establish and enhance a system of gully corridors linking populations; develop extension material highlighting the results of research, survey and monitoring and the deleterious impact of some management activities and disseminate to park managers, local government bodies, community groups, CFA and landholders; monitor approximately 10 sites throughout the specie's Victorian range including disturbed and undisturbed areas; inform and involve interested groups in monitoring and research programs; liaise with local government and VicRoads to erect slow down signs where foraging areas of established pairs are dissected by minor roads; and encourage reporting of Rufous Bristlebird sightings to the Atlas of Victorian Wildlife database (Smith and Baker-Gabb 1993).

Species characteristics:

The Rufous Bristlebird is a weak-flying primarily ground-dwelling songbird. It has a restricted distribution with several disjunct populations in southwestern Victoria, mainly along the coast. It inhabits dense heathy areas and coastal thickets. In the Otways it occurs up to 40 km inland in sheltered foothill gully forests, rainforest gullies dominated by Myrtle Beech Nothofagus cunninghamii and wet scrubs under Mountain Ash Eucalyptus regnans forests. It has also been observed in suburban gardens near thick natural vegetation (Emison et al. 1987, Brinkman and Farrell 1990, Garnett 1992a, Smith and Baker-Gabb 1993). The essential components of suitable habitat are unclear, although all occupied habitats contain patches of very dense vegetation. Rufous Bristlebird nest close to the ground in tussocks and low shrubs. Its feeds primarily on ground-dwelling invertebrates although details of its diet are not well known (Smith and Baker-Gabb 1993).

Distribution in the West CRA region:

Records of the Rufous Bristlebird are from east of Anglesea west to near the Glenelg River. There is a gap of approximately 60 km in its distribution near Warrnambool (Emison et al. 1987, Garnett 1992a). Development at Anglesea now appears to have isolated a small population to the east of the town (Garnett 1992a). It is generally recorded close to the coast although it occurs up to 40 kms inland in the Otway Ranges. Inland records from the Otways include: Whoorel, Benwerrin, Barongarook West, Kawarren, Gellibrand, Chapple Vale and Wyelangta. It has also been recorded and in heavily vegetated gullies near Timboon, Scotts Creek, Ecklin South, Garvoc and Framlingham. Other inland records

include near Inverleigh on the Hamilton Highway, Gnarwarre approximately 20 km west of Geelong and Wurdiboluc south of Winchlesea. In the south-west of the region the species has been recorded inland as far as Lyons north-west of Heywood. Records are from conservation reserves (eg. Otway National Park, Port Campbell National Park, Mt. Richmond National Park, Lower Glenelg National Park and Discovery Bay Coastal Park), State forest and private land (Atlas of Victorian Wildlife).

Disturbances and potentially processes in the West CRA region: threatening

Loss of habitat as a result of clearing for development in coastal areas is a major threat to the Rufous Bristlebird. Clearing also results in fragmentation of the population; development at Anglesea now appears to have isolated a small population east of the town (Garnett 1992a, Smith and Baker-Gabb 1993, Chapman 1999). Rufous Bristlebirds have a restricted distribution and suitable habitat is limited. As a result the species is particularly vulnerable to disturbances such as wildfire; recolonisation of areas burnt by the 1983 wildfires is known to have taken at least two years (Reilly 1991a,b). Undergrowth and litter are important elements of Rufous Bristlebirds habitat and fire prevention activities such as slashing of heathland and controlled burning which remove these habitat components are also likely to have a negative impact on the population (Garnett 1992a, Smith and Baker-Gabb 1993, Chapman 1999). Being a weak-flying ground-dwelling species, Rufous Bristlebirds are likely to be particularly vulnerable to predation by Cats and Foxes (Garnett 1992a, Chapman 1999). In areas where housing density is high, predation of eggs and young by Black Rats Rattus rattus is also a potential threat (Smith and Baker-Gabb 1993). The effects of weed invasion and grazing by rabbits on Rufous Bristlebird habitat is unknown but may be significant in some areas (Smith and Baker-Gabb 1993). Rufous Bristlebirds have been recorded from regrowth forest of all ages and it appears that timber harvesting is not a major threat (Brinkham 1990).

Bush Stone-curlew

Burhinus grallarius

RARITY

- a) Geographic Range
 Classification of range size within the West region: Large
- Distribution of records within the West region: (ha): Records sparsely distributed across the region, the majority of post-1970 records are from the west of the region.
- Number of 5 minute grid cells recorded from: 181
- Source: Atlas of Victorian Wildlife
- b) Abundance
- Classification of abundance: Low Population Estimate: Victorian estimate 500-1000 breeding pairs, Northern Plains estimate
- (species stronghold) 300-330 breeding birds on private land. Fewer pairs in the West. Density: The Northern Plains survey area a density of approximately one bird per 34 km² was recorded. More sparsely distributed in the West region.
- Home Range (ha): 250-600 ha, breeding territory of 10-25 ha Source: Schodde and Mason (1981), Wilson (1989), Robinson (1994), Johnson and Baker-Gabb (1994), Webster and Baker-Gabb (1994)
- c) Habitat Specificity
- Classification of habitat specificity: Narrow
- Vegetation types inhabited in the region: Lowland grassy woodland and open forest.

In the Northern Plains, predominant tree found within day shelters was Grey Box *Eucalyptus microcarpa*, either in pure stands or mixed with other species, Burley Stands of Mixed with other species, particularly Yellow Box *E. melliodora* and River Red Gum *E. camaldulensis*. EVCs recorded from: Box Ironbark Forest, Alluvial Terraces Herb-rich Woodland, Plains Grassy Woodland.
 Source: Johnson and Baker-Gabb (1994),

Robinson (1994), NRE BioMap (November

DYNAMICS

Population Trend in Last Decade

Increasing, stable or declined: Declined Recent surveys of 72 sites in the Northern
 Plains showed a 42% decline in abundance over a 6

year period.
Source: Webster and Baker-Gabb (1994)

- Population trend since discovery by Europeans
 Increasing, stable or declined: Declined.
 Source: Webster and Baker-Gabb (1994), Robinson (1994)
 SPATIAL DYNAMICS
 Demulation weich litter

a) Population variability

Classification of population variability: Low Source: Robinson (1994)

- b) Dispersal
- Classification of powers of dispersal: Unknown, probably low
- Average distances dispersed: Unknown
- Average distances dispersed. Unknown
 Maximum distance dispersed: Unknown
 Source: Emison *et al.* (1987), Marchant and Higgins (1993), Robinson (1994)
 LIFE HISTORY PARAMETERS
 a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity (yrs): No information,
- possibly 1 or 2 years Mean clutch/litter/brood size: 2
- Mean no of clutches/litters/broods per year: 1
- Time of year young born/hatch: August-March (primarily November-January)
- Source: Anderson (1991), Marchant and Higgins (1993), Johnson and Baker-Gabb (1994)
- b) Longevity
- Classification of lifespan: Long-lived
- Average lifespan (yrs): 10-30
- Maximum lifespan (yrs): At least 25 years
- Source: Johnson and Baker-Gabb (1994), Robinson and Johnson (1997)

c) Morphology

- Adult body size Weight (g): males 670, females 625 Length (mm): 540-600

- Source: Marchant and Higgins (1993) d) Social organisation
- Colonial or non-colonial: Usually pairs, occasionally unpaired birds
- Territoriality: Territories defended during breeding season
- After breeding may form loose flocks Source: Johnson and Baker-Gabb (1994)
- e) Other
- Nomadic, migratory, sedentary: Sedentary
- Diet: Primarily insectivorous but also eats seeds, small fruit, spiders, centipedes, molluscs, frogs, small reptiles and rodents.
- Source: Johnson and Baker-Gabb (1994), Robinson and Johnson (1994)

THREATS

1. Clearing of Native Vegetation: Ranking (3) Marchant and Higgins (1993), Johnson and Baker-Gabb (1994), D. Robinson pers. comm. **2. Timber harvesting: Ranking (1)** D. Robinson

pers. comm. 3. Fuel Reduction Burning: Ranking (1) D.

4. Firewood Collection: Ranking (3) Johnson and Baker-Gabb (1994), Robinson and Johnson (1997),

D. Robinson pers. comm. 5. Unplanned Fire: Ranking (-) 6. Introduced Species: Ranking (3) Johnson and Baker-Gabb (1994), D. Robinson pers. comm.

7. Grazing/Trampling: Ranking (2) Marchant and Higgins (1993), Johnson and Baker-Gabb (1994), D. Robinson pers. comm.

8. Pest Control: Ranking (2) Johnson and Baker-Gabb (1994), Robinson and Johnson (1997), D. 9. Road Construction and Maintenance: Ranking

 Road Construction and Maintenance. Naming
 D. Robinson pers. comm.
 Mining/Quarrying: Ranking (-)
 Tree Dieback: Ranking (1) Landsberg et al. (1990), Johnson and Baker-Gabb (1994), Robinson and Johnson (1997), D. Robinson pers. comm.
 Recreation: Ranking (0) D. Robinson pers. comm

 Ja. Illegal Collection/Harvesting: Ranking (1)
 Johnson and Baker-Gabb (1994), D. Robinson pers. comm.

14. Vandalism/Disturbance by Humans: Ranking (1) Johnson and Baker-Gabb (1994), D. Robinson

15. Dams/Impoundments: Ranking (0) D. Robinson pers. comm.

16. Other: Pasture Improvement: Ranking (3) Webster and Baker-Gabb (1994), D. Robinson pers. comm.

Current Management:

The Bush Stone-curlew is classified as "endangered" in Victoria (NRE 1999), is listed under the Victorian Flora and Fauna Guarantee Act 1988 and an Action Statement has been published (Robinson and Johnson 1997). Intended management actions for public land include: identification and protection of important Crown land reserves, prohibition of firewood collection at key sites, review of grazing licenses on Crown land with populations of Bush Stone-curlews, feral predator control programs, and provide conservation guidelines to golf courses within the species' range. Private land management strategies and actions for districts or habitats identified as having comparatively dense populations of the species include land holder and community extension services relating to the Bush Stone-curlew, encourage land holders to implement fox control, control stray cats, encourage land holders to leave ground debris beneath trees, fence woodland remnants in unimproved pasture to control grazing, and increase the size of remnants by replantings. Survey, monitoring and research aims to survey the distribution and abundance of the species in western Victoria, along the Murray valley and on Crown land reserves throughout the species' range, particularly water frontages, Bushland Reserves and State forests, investigate the effects of fox predation on survivorship and nesting success in rural districts and investigate appropriate grazing strategies (Robinson and Johnson 1997).

Species characteristics:

The Bush Stone-curlew occurs primarily in lowland grassy woodland and open forest remnants in northern and western Victoria. During the day birds shelter in lightly timbered habitats amoungst fallen tree debris with a sparse cover of low grass. Eggs are laid directly on the ground; nests consist of a simple scrape or clearing. Nest sites are typically located in woodland patches or on the edge of patches with good ground-level visibility in all directions. Birds forage at night in paddocks, swamps or woodland remnants, sometimes travelling up to three kilometers from daytime roosts. Bush Stone-curlews are primarily insectivorous although seeds, small fruit, spiders, centipedes, molluscs, frogs, small reptiles and rodents are also eaten (Johnson and Baker-Gabb 1994, Robinson and . Johnson 1997).

Distribution in the West CRA region:

Records of the Bush Stone-curlew are sparsely distributed across the West region, with the majority located in the north-west. There are only three post-1970 records from the east of the region, these are from Mannerim on the Bellarine Peninsula, Glenluce, north-west of Woodend, and Berrigan Golf Course. Earlier records from the east are mostly from between Teesdale and West Melton. In the west of the region, most records are from between Stawell, Horsham and Apsley. There are more scattered records south, and a 1978 record from Mt Piccaninny, north west of Portland. The majority of records are from private land (Atlas of Victorian Wildlife)

Disturbances and potentially threatening processes in the West CRA region:

State-wide the Bush-stone Curlew has undergone a significant decline as a result of habitat clearance and fragmentation (Johnson and Baker-Gabb 1994). Within the West current threats relate to further loss and degradation of habitat, particularly from disturbances such as clearing for agriculture and associated pasture improvement activities. Bushstone Curlews are rarely recorded from sites where the grass height is greater than 15cm and are rarely recorded from sites with sown pasture. Recent pasture improvement was considered to be the principal cause of their decline in northeast Victoria between 1985 and 1991 (Webster and Baker-Gabb Scattered woodlots and patches of 1994). regeneration provide habitat within farmland. Most roosting sites are generally within 1km of other patches of suitable habitat. Clearing results in fragmentation and isolation of remnants which reduces their habitat value. Invasion of roadside remnants, important Stone-curlew habitat in the West, by introduced pasture weeds such as Phalaris spp causes habitat loss. Fire prevention activities along roadsides also results in habitat loss. Many Crown Land reserves within the region are currently grazed under license (Robinson and Johnson 1997). Trampling by stock while being moved is known to have resulted in the loss of eggs and young and nesting birds. Grazing prohibits regeneration of future habitat and contributes to tree dieback and the degradation of habitat remnants (Landsberg et al. 1990). Pasture improvement activities, cultivation and irrigation also contributes to tree dieback and the loss and degradation of habitat. Foxes have been reported preying on birds and eggs; Cats and Dogs may also prey upon Bush Stone-curlews, particularly in more closely settled areas. However, it is unclear whether predation by foxes and cats is a significant cause of mortality; nesting success is known to be high at two sites with predator proof fences (Marchant and Higgins 1993, Johnson and Baker-Gabb 1994). Bush Stone-curlews regularly feed at night along roadsides and farm tracks and landholders have reported both adults and young being killed by vehicles. Insecticides and herbicides potentially contribute indirectly to population declines by reducing insect availability (Johnson and Baker-Gabb 1994). Collection of firewood results in the removal of trees and fallen timber, an important component of day shelters, and is a significant threat to the species in the West.

Grey-crowned Babbler

Pomatostomus temporalis

RARITY

a) Geographic Range

Classification of range size within region: Medium

- Distribution of records within region: Patchy, scattered records; the majority of post-1970 records are from the west of the region.
- Number of 5 minute grid cells recorded from: 32 Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low Population Estimate: 450 groups of 2000 individuals are known to exist within Victoria, the
- majority occur north of the divide. Density: Unknown Home Range (ha): Territory size is variable depending on the number of birds in the group and the distribution of available trees, between 1-18 ha with an average of 8 ha has been recorded for groups in one Shire. Territories are typically long and narrow as they are often confined to roadsides and may extend between 500-1000 m along roads
- Source: Robinson et al. (in prep), D. Robinson

- Source: Robinson et al. (In prep), D. Robin pers. comm.
 c) Habitat Specificity
 Classification of habitat specificity: Wide although within the study area confined to relatively few EVCs
- Vegetation types inhabited in the region: Open forest and woodlands. Appears to prefer sites on more fertile soil with a grassy understorey. EVCs recorded from in other parts of the state include: Box ironbark Forest, Plains Grassy Woodland, Herb-rich Foothill Forest and Grassy Dry Forest.

Source: Robinson (1994), NRE BioMap (November 1997), D. Robinson pers. comm. DYNAMICS

Population Trend in Last Decade

- Increasing, stable or declined: Declined
- Source: Davidson and Robinson (1992)
- Doulation trend since discovery by Europeans
 Increasing, stable or declined: Declined
- Source: Emison et al. (1987), Davidson and
- Robinson (1992), Robinson *et al.* (in prep) SPATIAL DYNAMICS a) Population variability

- Classification of population variability: Low Source: D. Robinson pers. comm.
- b) Dispersal
- Classification of powers of dispersal: Low
- Average distances dispersed: < 5 km
- Maximum distance dispersed: 15 km
- Source: Robinson et al. (in prep), D. Robinson pers. comm. LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity (yrs): 2-3 Mean clutch/litter/brood size: 2-3
- Mean no of clutches/litters/broods per year: .
- usually 1
- Time of year young born/hatch: June-February Source: Robinson (1994), D. Robinson pers.

comm. b) Longevity

- Classification of lifespan: Short-lived
- Average lifespan (yrs): 4 +
- Maximum lifespan (yrs): Unknown Source: Brown in Davidson and Robinson (1992), D. Robinson pers. comm.

c) Morphology

- Adult body size Weight (g): 80
- Length (mm): 230-290 Source: Davidson and Robinson (1992), D.

Robinson pers. comm. d) Social organisation

- Colonial or non-colonial: Non-colonial: lives in communal groups.
- Territoriality: Yes Breeding groups consist of a breeding pair and helpers
- Source: Robinson (1994), D. Robinson pers. comm.

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Diet: Primarily insectivore

Source: Robinson (1994)

THREATS

1. Clearing of Native Vegetation: Ranking (3) Davidson and Robinson (1992), Robinson *et al.* (in

prep), D. Robinson pers. comm. 2. Timber harvesting: Ranking (0) D. Robinson pers.

comm

Fuel Reduction Burning: Ranking (2) Adam and Robinson (1996), D. Robinson pers. comm.
 Firewood Collection: Ranking (2) Johnson and Baker-Gabb (1994), Robinson *et al.* (in prep), D.

Baker Gaber, Robinson et al. (in prep), D.
Robinson pers. comm.
Unplanned Fire: Ranking (-)
Introduced Species: Ranking (2) Davidson and Robinson (1992), Robinson et al. (in prep), D. Robinson pers. comm.

 Grazing/Trampling: Ranking (3) Davidson and Robinson (1992), D. Robinson pers. comm.
 Pest Control: Ranking (1) Robinson *et al.* (in prep), Davidson and Robinson (1992), D. Robinson 9. Road Construction and Maintenance: Ranking

(3) Robinson et al. (in prep), D. Robinson pers comm.

10. Mining/Quarrying: Ranking (0), D. Robinson pers.

comm. **11. Tree Dieback: Ranking (2)** Landsberg *et al.* (1990), Davidson and Robinson (1992), Robinson *et*

al. (in prep), D. Robinson pers. comm.

12. Recreation: Ranking (0) D. Robinson pers.

comm.

13. Illegal Collection/Harvesting: Ranking (0) D.

Robinson pers. comm. 14. Vandalism/Disturbance by Humans: Ranking (0) D. Robinson pers. comm. 15. Dams/Impoundments: Ranking (0) D. Robinson

pers. comm.

16. Other: Interspecific competition: Ranking (1) Tzaros 1995, Robinson *et al.* (in prep), **Pasture** Improvement: Ranking (3) Robinson *et al.* (in prep), D. Robinson pers. comm.

Current Management: The Grey-crowned Babbler is classified as "endangered" in Victoria (NRE 1999). The species is listed under the Victorian *Flora and Fauna Guarantee* Isted under the Victorian Flora and Fauna Guarantee Act 1988 and an Action Statement has been published (Davidson and Robinson 1992). Intended management actions include: research into aspects of the species' ecology, a monitoring program to assess current status of all populations with more than five family groups, production of extension material, determination of critical habitat, provision of funds to private land holders to fence off habitat, investigation of existing management of firewood investigation of existing management of firewood resources and current fire protection practices and the development of site-specific management to maintain and enhance habitat where possible. A Management Plan for the species is currently being prepared (Robinson *et al.* in prep). A statewide co-ordinator for Conservation of the Grey-crowned Babbler has been employed by Birds Australia, funded by NRE, to implement recovery actions for the prepared and a recovery term has been entablished to species and a recovery team has been established to oversee a recovery plan.

Species characteristics: The Grey-crowned Babbler is a communally-breeding species that occurs primarily in open forests and woodlands, apparently preferring a mixture of open grassy habitat and stands of trees (Robinson 1994). It is most abundant in strips of mature remnant woodland vegetation where an open ground layer is provided in adjoining paddocks (Davidson and Robinson 1992). Grey-crowned Babblers live in groups of between two and 12 individuals; group size appears related to critical habitat elements such as tree and ground cover. All individuals of the group participate in nesting activities and territorial defence. participate in nesting activities and territorial defence. Grey-crowned Babblers forage for insects on the ground as well as on the trunks and amoungst the branches of trees and shrubs and prefer larger trees and those with either rough or peeling bark. Within

Victoria the species has undergone a decline, principally as a result of widespread clearing of its preferred habitat, with extant populations now largely confined to the north of the state (Davidson and Robinson 1992, Robinson *et al.* in prep). Groups are now mainly restricted to districts which still contain relatively large areas of woodland habitat including roadside vegetation.

Distribution within the West CRA region:

Within the West CRA region there are two main groups of post-1970 Grey-crowned Babbler records. One group is from the Grampians, Lake Fyans and Leadcourt to east of Horsham. The second group is from the far west of the region between Langkoop from the far west of the region between Langkoop and Tallageira. With the exception of two records, one from Exford west of Melbourne and the other from the vicinity of Hayes Hill south-west of Tooborac, all other records are pre-1970. There is a group of these records north of Geelong as far as Parwan. Other isolated pre-1970 records are from Linton, north of Hamilton, Condah, Milltourn and Mt Richmond and Bats Ridge west of Portland. Most records are from private land and road reserves (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes within the West CRA region: Grey-crowned Babblers sites are characterised by threatening several critical habitat elements: woodland or open-forest vegetation communities on fertile or heavy soils, many large trees both on site and in the adjoining areas, an understorey of young trees and shrubs for nest sites and shelter, and a relatively sparse ground layer with abundant ground litter. Disturbances which result in a loss or reduction of any of these critical habitat elements will result in a reduction in Babbler numbers (Robinson et al. in prep, D. Robinson pers. comm.).

Roadside vegetation provides important habitat for Grey-crowned Babbler groups within the West region. . Roadworks such as road-widening, upgrading and installation of utilities, degrade and reduce habitat by removing and damaging mature trees, saplings and shrubs, and result in weed invasion causing a deterioration of ground-layer habitat and are a significant threat to the species. Roadworks also contribute to tree dieback as a result of altered drainage patterns, nutrient run-off or introduced plant pathogens (Heartwole and Lowman 1986, Landsberg *et al.* 1990). Upgraded sealed roads carry faster traffic and may result in higher mortality (Robinson *et al.* in prep.). Intensified land use results in higher rates of tree clearing, higher stocking rates, more Roadside vegetation provides important habitat for traffic and may result in higher mortality (Robinson *et al.* in prep.). Intensified land use results in higher rates of tree clearing, higher stocking rates, more frequent and destructive soil disturbance by machinery, and an increased use of pesticides and fertilisers (Robinson *et al* in prep). Raising water tables, increased salinity, insect attack and soil compaction result in tree dieback and further loss of trees on private land and degredation of remnants (Landsberg *et al.* 1990, Davidson and Robinson 1992). The loss of large trees from paddocks where there is little or no regeneration due to persistent there is little or no regeneration due to persistent grazing by cattle and sheep is a significant threat to habitat quality (Davidson and Robinson 1992). Grazing also contributes to tree dieback as a result of increased nutrient inputs, root damage and soil compaction.

Fuel reduction burning removes litter and can cause the death of young trees and shrubs and results in an increase in introduced vigorous pasture grasses and other weeds such as canary grass (Phalaris spp.). These weeds prevent ready access to the litter layer and therefore reduce the amount of foraging habitat available (Davidson and Robinson 1992). Fuel reduction burning occurs along a few roadsides which support Babbler groups and is a moderate threat to the species (D. Robinson pers. comm.). Firewood collection also results in a loss of foraging babitat. Providing cursoes is attrapply linked to group habitat. Breeding success is strongly linked to group size with larger groups generally raising more young. Group size is related to habitat quality and groups in more fragmented habitats are significantly smaller and have significantly lower breeding success than

larger groups in connected landscapes (Robinson 1994). Continuing fragmentation of habitat as a result of clearing, may cause further decreases in breeding success and extinction of small_isolated groups. Cats have been recorded taking Babblers and although the effect of predation is unknown, given the highly fragmented nature of Babbler populations, it may be a significant threat. Noisy Miners, common inhabitants of roadsides and small remnants, are known to mob Babblers and destroy their nests, especially small groups with young, and may threaten their survival (Tzaros 1995, Robinson et ál. in prep.).

Square-tailed Kite

Lophoictinia isura

RARITY

- a) Geographic Range
- Classification of range size within region: Medium Distribution of records within region: Records are scattered mainly across the north of the region although there are also a small number of
- records in the south-west corner of the region. Number of 5 minute grid cells recorded from: 21 Source: Atlas of Victorian Wildlife
- b) Abundance
- Classification of abundance: Low Population Estimate: Estimated 20-50 pairs in Victoria
- Density: Approximately 1 pair/1200km² Home Range (ha): 7000 ha for one pair in Queensland during a one year period
- Source: Debus and Silveira (1989), Baker-Gabb pers. comm. in Garnett (1992a), G. Czechura pers. comm. in Garnett (1992a), C. Silveira ers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Wide
- Vegetation types used in the region: Tall openforest, open-forest and woodland across a range of EVCs (eg. Box-Ironbark, Grassy Dry Forest), sometimes in riparian situations. In Victoria generally not recorded from extensively cleared areas, extensive naturally treeless areas, alpine areas, nor from small southerly remnant forests isolated by extensive treeless areas. Has been recorded from wooded farmland close to State forest in the study area. Recorded nesting in Manna Gum Eucalyptus viminalis and Blue Gum E. bicostata in Victoria.
- Source: Debus and Silveira (1989), Borella and Borella (1997), NRE BioMap (November 1997) DYNAMICS

Population Trend in Last Decade

- Increasing, stable or declined: Unknown
 Source: C. Silveira pers. comm.
 Population trend since discovery by Europeans
- Increasing, stable or declined: Likely decline in southern Australia commensurate with largescale habitat clearance
- Source: Debus and Silveira (1989), Garnett (1992a) SPATIAL DYNAMICS

- a) Population variability
- Classification of population variability: Unknown Source: R. Loyn pers. comm.
- b) Dispersal
- Classification of powers of dispersal: High
- Average distances dispersed: No banding records, but absence from Victoria during winter suggests movements of many hundreds of kilometers.
- Maximum distance dispersed: 14 km by a juvenile, about eight weeks after fledging.
 Source: Debus and Silveira (1989), Debus and Czechura (1989), Marchant and Higgins (1993)
 LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity (yrs): 2-3 years
- Mean clutch/litter/brood size:2.2 eggs (n=79) Mean no of clutches/litters/broods per year: 1

- Time of year young born/hatch: Spring
- Source: Schodde and Tidemann (1986), Debus and Czechura (1989), Fraser (1993), Marchant and Higgins (1993), Olsen and Marples (1993), Borella and Borella (1997)

b) Longevity

- Classification of lifespan: Probably long-lived
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): >15 years
- Source: Marchant and Higgins (1993)

c) Morphology Adult body size

- Weight (g): Female 590-680 (n=4), male 501 (n=1
- Length (mm): Female 550-560, male 500-510
- Source: Marchant and Higgins (1993), Olsen et

al. (1993a) d) Social organisation

- Colonial or non-colonial: Non-colonial; usually solitary, but well dispersed monogamous pairs when nesting, and sometimes small family groups after fledging. Territoriality: Territorial when breeding
- Source: Schodde and Tidemann (1986), Debus and Czechura (1989), Debus and Silveira (1989), Debus et al. (1992)

e) Other

- Nomadic, migratory, sedentary: Migratory in Victoria
- Diet: Mainly carnivore (mostly nestling passerines)
- Source: Schodde and Tidemann (1986), Debus and Czechura (1989), Debus and Silveira (1989)

THREATS

1. Clearing of Native Vegetation: Ranking (2) Debus and Czechura (1989), Debus *et al.* (1992), Garnett (1992a), C. Silveira pers. comm. 2. Timber harvesting: Ranking (2) Debus and Czechura (1989), Debus and Silveira (1989), C.

Silveira pers. comm. **3. Fuel Reduction Burning: Ranking (2)** Christensen and Kimber (1975), Wooler and Brooker (1980), Debus and Czechura (1989), C. Silveira pers. comm.

4. Firewood Collection: Ranking (1) C. Silveira pers. comm.

5. Unplanned Fire: Ranking (2) Recher et al. (1985), C. Silveira pers. com

6. Introduced Species: Ranking (0) C. Silveira pers.

7. Grazing/Trampling: Ranking (1) C. Silveira pers. comm.

8. Pest Control: Ranking (-) Olsen *et al*. (1993b) 9. Road Construction and Maintenance: Ranking

- C. Silveira pers. comm.
 Mining/Quarrying: Ranking (-)
 Tree Dieback: Ranking (1) C. Silveira pers.

comm. 12. Recreation: Ranking (-) 13. Illegal Collection/Harvesting: Ranking (2) Jolly (1989), Garnett (1992a), Marchant and Higgin (1993), C. Silveira pers. comm.

14. Vandalism/Disturbance by Humans: Ranking (2) Jolly (1989), Garnett (1992a), C. Silveira pers

comm. 15. Dams/Impoundments: Ranking (0) C. Silveira

pers. comm.

Current Management:

The Square-tailed Kite is classified as "endangered" in Victoria (NRE 1999). Management actions outlined in the Midlands Forest Management Plan (NRE 1996b) include establishment of a 250 m radius SMZ around nest trees as they are discovered within which the nest tree and all trees within a radius of 150 m will be protected and logging operations, road construction and other activities likely to disturb breeding pairs will be excluded during the breeding season (July to November). The species has also the Portland been recorded from and

Horsham/Wimmera Forest Management Areas where Forest Management Plans are currently not available. There are no threat-ameliorating management prescriptions in these areas.

Species characteristics:

The Square-tailed Kite is a medium-sized, longwinged bird of prey which occurs in low densities in Victoria; it arrives there in spring, breeds, then departs northward in autumn (Debus and Czechura 1989, Debus and Silveira 1989). The Square-tailed Kite uses traditional nest sites and constructs nests in eucalypts, usually near water (Debus and Czechura 1989, Debus and Silveira 1989, Debus *et al.* 1992, Marchant and Higgins 1993, Borella and Borella 1997). It has a specialised diet consisting mainly of passerine nestlings and eggs taken from nests in the outer foliage of the canopies of eucalypts in tall openforest, open-forest and woodland (Debus and Czechura 1989). Ecotones are important foraging habitat for the Square-tailed Kite because they provide tree cover while allowing access to nests of prey located laterally in trees (Debus and Czechura 1989, Marchant and Higgins 1993).

Distribution in the West region:

Square-tailed Kite records from the West region are mostly from State forest including Wombat State Forest near between Blackwood and Newstead, Creswick State Forest, Clunes State Forest and Mt. Cole State Forest. The species has also been recorded from the Grampians National Park and from wooded farmland near Sedgewick State Forest. The species has also been recorded from the Grampians National Park, near Wartook, Woohlpooer, near Edenhope and from the Heywood vicinity, Bats Ridge and Cobboboonee State Forest in the south-west of the region (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the West region:

For successful breeding, the Square-tailed Kite relies on both an adequate supply of prey, particularly nestling passerines, and tall trees in traditional nesting areas (Fraser 1993, Debus and Czechura 1989, Borella and Borella 1997). Most threats to the Square-tailed Kite relate to the loss or disturbance of those critical resources (Debus and Czechura 1989, Debus and Czechura 1992). Habitat clearance is a significant threat to the Square-tailed Kite as it results in habitat loss and fragmentation and a consequent loss of prey. Similarly, timber harvesting that severely modifies habitat and affects prey densities is also a threat. Wildfire is known to reduce species richness and number of birds (Recher et al. 1985) consequently affecting prey availability as well as hunting and nesting habitat. Similarly, annual fuel reduction burns may have an adverse effect on forest and woodland bird communities and may cause prey shortages (Debus and Czechura 1992). Due to the small size of the Square-tailed Kite population, its low recruitment rate and its use of traditional nest sites (Cupper and Cupper 1981, Debus and Czechura 1989, Fraser 1993, Borella and Borella 1997), eggcollection and illegal shooting are potentially significant threats (Jolly 1989, Garnett 1992a, Marchant and Higgins 1993).

Grey Goshawk

Accipiter novaehollandiae

RARITY

a) Geographic Range

Classification of range size within region: Large Distribution of records within region: Scattered records from the north-east to the south-west of

the study area with concentrations of records in the Otways and the western side of Western Port Bay

- Number of 5 minute grid cells recorded from: 104
- Source: Atlas of Victorian Wildlife b) Abundance

- Classification of abundance: Low
- Population Estimate: Fewer than 200 breeding pairs in Victoria. Density: Estimated at 2-3 pairs/100km² in Tasmania in optimum habitat with little
- disturbance. Home Range (ha): Unknown, possibly core

- Home Kange (na). Onknown, possibly core areas of about 1000 ha.
 Source: Mooney and Holdsworth (1988), C. Silveira pers. comm.
 C) Habitat Specificity
 Classification of habitat specificity: Generally narrow for breeding, but wide for those individuals that areas areast individuals that occasionally disperse great distances. In Victoria, breeding is largely limited to gullies in southern tall-open forest (e.g. Otway Ranges and Gippsland Plains). Vegetation types inhabited in the region: wet
- forests and gullies (including those containing Mountain Grey Gum *E. cypellocarpa*), riparian forest, occasionally woodlands, dry forest, suburban parks and wooded farmlands. Nested in a Blue Gum in Gippsland.
- Source: Hollands (1984), Olsen and Olsen (1985), Emison et al. (1987)

DYNAMICS Population Trend in Last Decade

Increasing, stable or declined: Unknown Source: R. Loyn pers. comm.
Population trend since discovery by Europeans

- Increasing, stable or declined: Likely decline in southern Australia commensurate with largescale habitat clearance.
- Source: Lumsden et al. (1991), C. Silveira pers. comm. SPATIAL DYNAMICS

a) Population variability Classification of population variability: Unknown Source: R. Loyn pers. comm.

b) Dispersal

- Classification of powers of dispersal: High
- Average distances dispersed: Unknown, but vagrants routinely appear hundreds of kilometres from the "normal" range (e.g. Robinvale area, Victoria).
- Maximum distance dispersed: 79 km by a banded individual.
- Source: Emison et al. (1987), Baker et al. (1997) LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity (yrs): 2-3 Mean clutch/litter/brood size: 2.4 eggs (n=104)
- Mean no of clutches/litters/broods per year: 1 (Mooney and Holdsworth (1988) suggest one third of adults may not breed in any one year).
- Time of year young born/hatch: September-December
- Source: Hollands (1984), Schodde and Tidemann (1986), Olsen and Maryles (1993), Marchant and Higgins (1993), Burton *et al.* (1994) b) Longevity
- Classification of lifespan: Probably long-lived
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): At least 12
- Source: Hollands (1984)

c) Morphology

- Adult body size
- Weight (g): Female 530-894 (n=11), male 283-422 (n=5
- Length (mm): Female 500-550, male 380-420 Source: Marchant and Higgins (1993), Olsen *et al.* (1993a)
 d) Social organisation

- Colonial or non-colonial: Non-colonial; monogamous pairs
- Territoriality: Territorial when breeding
 - Source: Marchant and Higgins (1993)

e) Other

- Nomadic, migratory, sedentary: Established pairs sedentary; other individuals disperse widely.
- Diet: Carnivorous, occasional necrophagus and insectivorous.
- Source: Hollands (1984), Mooney (1987), Marchant and Higgins (1993)

THREATS

1. Clearing of Native Vegetation: Ranking (2)

Olsen and Olsen (1985), C. Silveira pers. comm. 2. Timber harvesting: Ranking (2) C. Silveira pers. comm.

3. Fuel Reduction Burning: Ranking (2) C. Silveira pers. comm. 4. Firewood Collection: Ranking (1) C. Silveria

pers. comm.

5. Unplanned Fire: Ranking (2) C. Silveira pers. comm.

6. Introduced Species: Ranking (0) C. Silveira pers. comm.

7. Grazing/Trampling: Ranking (1) C. Silveira pers. comm

8. Pest Control: Ranking (2) Mooney (1988), R. Loyn pers. comm. 9. Road Construction and Maintenance: Ranking

Mooney and Hunt (1983), Mooney (1988),
 Mining/Quarrying: Ranking (-)
 Tree Dieback: Ranking (1) C. Silveira pers.

comm.

12. Recreation: Ranking (-) 13. Illegal Collection/Harvesting: Ranking (-)

14. Vandalism/Disturbance by Humans: Ranking (2) Mooney and Hunt (1983), Mooney (1987), C. Silveira pers. comm.

15. Dams/Impoundments: Ranking (0) C. Silveira pers. comm

Current Management:

The Grey Goshawk is classified as "lower risk - near threatened" in Victoria (NRE 1999). Within the Otways Forest Management Plan, all management activities will be excluded within 100 m of all known nests (DCE 1992a). Management actions outlined in the Midlands Forest Management Plan include establishment of a 250 m radius Special Management Zone (SMZ) around nest trees as they are discovered within which the nest tree and all trees within a radius of 150 m will be protected and logging operations, road construction and other activities likely to disturb breeding pairs will be excluded during the breeding season (July to November). To date, breeding has not been recorded in the Midlands FMA (NRE 1996a). The species has also been recorded from the Portland, Horsham/Wimmera Forest Management Areas where Forest Management Plans are currently not available. There are no threat-ameliorating management prescriptions in these areas.

Species Characteristics:

The Grey Goshawk is generally uncommon throughout its range and its population comprises two colour forms, one white and the other grey (Schodde and Tidemann 1986). It is adapted for life in closed forest where it hunts within or just above the canopy by making short flights from perches; it may also hunt in nearby open country (Olsen et al. 1990, Mooney and Holdsworth 1988, Olsen and Olsen 1985). In Tasmania, adult Grey Goshawks are known to primarily use old-growth wet forests for hunting and nesting. Some individuals may also nest in mixedage or young regrowth forest if old-growth trees are present. In Victoria, successful nests are known from remnant patches of forest in the Otway Ranges (Mooney 1987). Nest sites are often near water (Mooney and Holdsworth 1988, Brereton and Mooney 1994). The Grey Goshawk has a generalised diet which includes mainly mammals,

such as rabbits, possums and bats, as well as birds, reptiles, amphibians and insects; it occasionally takes carrion (Hollands 1984, Marchant and Higgins 1993).

Distribution in the West CRA Region:

The Otways are the Victorian strong hold of the white form of the Grey Goshawk (Emison et al. 1987); the majority of records of the species from the region are from the Otways and from the Geelong vicinity. There are also a group of records from the Wombat State Forest. Other records are widely scattered over the rest of the region. The species has been recorded from a number of State forests and private land (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the West CRA Region:

The Grey Goshawk predominantly utilises older ageclasses of forest for nesting and foraging. Habitat clearance, in addition to leading to a loss of nesting and foraging habitat, may also increase the incidence of hybridisation between the Grey Goshawk and the Brown Goshawk A. fasciatus (Hollands 1984, Olsen and Olsen 1985). Timber harvesting and commercial firewood collection convert older age-classes of forest to young regrowth stands causing the loss of both nesting and foraging habitat (Mooney 1987, Mooney 1988, Mooney and Holdsworth 1988). Wildfire also results in a loss of nesting and foraging habitat. Given that the Grev Goshawk sometimes nests in forest remnants (Mooney 1987, Brereton and Mooney 1994), clearance of those remnants for agriculture may reduce nesting and foraging habitat. Frequent cool prescribed burns reduce habitat quality by simplifying the structure and removing the resources used by prey species (Catling 1991). In Victoria, where the Grey Goshawk is known to take rabbits from farmland near forest edges, culling of rabbits through pest control measures may have an adverse effect on the Grey Goshawk population (R. Loyn pers. comm.). Illegal shooting of birds is considered a significant threat in Tasmania (Brereton and Mooney 1994) although the extent of this threatening process in the West region is unknown, it could constitute a significant threat given the small population size there. Other threats include secondary poisoning through consumption of baited prey and contamination by pesticides (Mooney 1988, Mooney and Holdsworth 1988). While the Grey Goshawk may tolerate some level of disturbance near nest sites (e.g. selective logging, limited road building), nests are deserted following intense/direct disturbance (Mooney and Holdsworth 1988).

White-bellied Sea-Eagle

Haliaeetus leucogaster

RARITY

a) Geographic Range

- Classification of range size within region: Large Distribution of records within region: Records
- are mostly thinly distributed along the coast. Inland records are generally associated with water bodies
- Number of 5 minute grid cells recorded from: 44 Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: Unknown, possibly 100 breeding pairs or less in Victoria Density: Unknown.
- Home Range (ha): Unknown in Victoria, in Tasmania adult home range approximately 100
- Augustation of the second seco

c) Habitat Specificity

- Classification of habitat specificity: Wide
- Classification of habitat specificity: Wide Vegetation types inhabited in the region: Usually nests near water, in tall live or dead trees (including River Red Gum *Eucalyptus camaldulensis*, Forest Red Gum *E. tereticornis* and Southern Mahogany *E. botryoides*). Usually tall open-forest and woodland, may occur in open areas (grassland, heath) and urban areas, rarely within dense vegetation.
- Source: Emison and Bilney (1982), Marchant and Higgins (1993) DYNAMICS

Population Trend in Last Decade

- Increasing, stable or declined: Unknown
 Source: P. Clunie pers. comm.
 Population trend since discovery by Europeans
- Increasing, stable or declined: Declined Source: Mooney (1986), Marchant and Higgins

SPATIAL DYNAMICS

- a) Population variability
- Classification of population variability: Low Source: P. Clunie pers. comm.
- b) Dispersal
- Classification of powers of dispersal: High Immature birds may disperse widely Average distances dispersed: Unknown
- Maximum distance dispersed: One bird has been recorded moving 1824 km over a six-year period.

• Source: Emison *et al.* (1987), Baker *et al.* (1997) LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low Age of sexual maturity (yrs): 4-5 years Mean clutch/litter/brood size: 1-2 eggs Mean no of clutches/litters/broods per year: 1
- Time of year young born/hatch: July-October (in Gippsland Lakes area)
- Source: Bilney and Emison (1983), Mooney (1986)

b) Longevity

- Classification of lifespan: Long-lived
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): Unknown, possibly 17 years Source: Mooney (1986)
- c) Morphology

- Adult body size Weight (g): Female 3100-3900g, male 2000-
- Length (mm): Female 800-850mm, male 750-770mm
- Source: Olsen et al. (1993a)
- d) Social organisation Colonial or non-colonial: Generally alone or in
- pairs Territoriality: Defend small territory around nest
- during breeding season Source: Marchant and Higgins (1993)
- e) Other
- Nomadic, migratory, sedentary: Sedentary, established pairs
- Diet: Carnivore, opportunistic
- Source: Marchant and Higgins (1993)

THREATS

1. Clearing of Native Vegetation: Ranking (2)

Bilney and Emison (1983), Mooney (1986), P. Clunie pers. comm. 2. Timber harvesting: Ranking (2) Marchant and Higgins (1993), Olsen *et al.* (1993a), P. Clunie pers.

comm.

 Fuel Reduction Burning: Ranking (-)
 Firewood Collection: Ranking (1) P. Clunie pers. comm

5. Unplanned Fire: Ranking (-) 6. Introduced Species: Ranking (0) Clunie (1994), P. Clunie pers. comm. 7. Grazing/Trampling: Ranking (-)

7. Grazing/Trampling: Ranking (-)
8. Pest Control: Ranking (1) Mooney and Hunt (1983), Olsen *et al.* (1993b), Clunie (1994), Falkenberg (1994), Williams (1997), P. Clunie pers. comm.

9. Road Construction and Maintenance: Ranking (2) Williams (1997), P. Clunie pers. comm 10. Mining/Quarrying: Ranking (1) P. Clunie pers.

cor

11. Tree Dieback: Ranking (1) P. Clunie pers.

comm.
12. Recreation: Ranking (3) Mooney (1986), Dennis and Lashmar (1996), P. Clunie pers. comm.
13. Illegal Collection/Harvesting: Ranking (-)

14. Vandalism/Disturbance by Humans: Ranking (1) Mooney and Hunt (1983), Bilney and Emison (1983), Mooney (1986), Nermut *et al.* (1995), Dennis and Lashmar (1996), P. Clunie pers. comm.
15. Dams/Impoundments: Ranking (0) P. Clunie pers.

16. Other: Interspecific Competition: Ranking (-) Clunie (1994), Wiersma (1996)

Current Management:

The White-bellied Sea-Eagle is classified as "endangered" in Victoria (NRE 1999) and is listed under the Flora and Fauna Guarantee Act 1988. An Action Statement for the species has been prepared (Clunie 1994). Intended management actions include: annual surveys of known breeding sites to determine breeding success over time, identify population trends, determine critical habitat, encourage research particularly in relation to heavy metal levels in the species and the effect of food chain contamination on survival and reproduction, undertake a population viability analysis once more information is known about dispersal activity, and the protection of known nest sites including buffer zones which will be incorporated into Forest Management Plans and encourage protection of breeding sites on private land through extension programs or conservation covenants.

Species Characteristics:

White-bellied Sea-Eagles occur in low densities over much of Victoria, the majority of records are from the Gippsland area and the Murray River (Atlas of Victorian Wildlife). Preferred inland habitats include large open terrestrial wetlands, deep freshwater swamps, lakes, reservoirs and billabongs (Marchant and Higgins 1993). Breeding pairs are mostly sedentary and defend a breeding territory within a much larger home range. Traditional nest sites are used although territories usually contain several alternative sites (Mooney 1986). Nests are usually found near water, in tall live or dead trees. Whitebellied Sea-Eagles are opportunistic carnivores that hunt over open terrestrial habitats as well as over water; prey includes birds, reptiles, fish, mammals, crustaceans and carrion (Marchant and Higgins 1993).

Distribution in the West CRA Region:

White-bellied Sea-Eagles have been recorded in low densities along the coast from Port Philip Bay in the vicinity of Geelong to Nelson in the south-west corner of the region. There is a group of records from water bodies in and around the Grampians National Park (eg. Rocklands, Moora Moora and Toolando Reservoirs, Lake Lonsdale), Bartons Swamp west of the Grampians and Pine Lake south east of Horsham. The most westerly record is from the vicinity of Bringlebert. Other inland records are from a dam near Dean and from Hepburn Lagoon, Newlyn (Atlas of Victorian Wildlife).

Disturbances and potentially threatening process operating in the West CRA Region:

White-bellied Sea-Eagles are sensitive to disturbance, particularly during the breeding season when disturbance can lead to abandonment of nests and reduced breeding success. (Dennis and Lashmar 1996, Williams 1997). Any disturbances such as

recreation activities (eg. four-wheel driving, hiking, fishing), mining/quarrying, timber harvesting, road construction and maintenance and clearing within 200-300 m of nest sites during the breeding season are highly likely to cause nest abandonment (A. Williams pers. comm.). In South Australia, a high number of abandoned territories on the Eyre Peninsula and West Coast were located in areas developed ad hoc for tourism access to coastal vantage points, or where regularly used four-wheel drive tracks access remote sections of the coastline for fishing or off-road vehicle recreation (Dennis and Lashmar 1996). Breeding pairs are sedentary and are sensitive to disturbances including timber harvesting and clearing which reduce important habitat components such as nest trees (Mooney 1986). Increased agricultural activity subsequent to clearing of native vegetation near nests may also result in abandonment (Dennis and Lashmar 1996). Birds may nest in suboptimal habitat but under these conditions breeding success can be reduced (Bilney and Emison 1983, Williams 1997). Eggshell thinning has been recorded due to past DDT use; while this may not have caused significant population declines (Olsen et al. 1993b), it is an issue to be considered. Deliberate shooting has been recorded (Mooney 1986) although is unlikely to be a significant threat within the West CRA region (P. Clunie pers. comm.). The significance of poisoning (direct or secondary) and food chain contamination by heavy metals are unknown although they may contribute to the decline of the species (Bilney and Emison 1983, Clunie 1994). Competition with Wedge-tailed Eagles for nest sites and food has been recorded although its significance is not known. However, it may be an indication that suitable nest sites are a limiting resource (Clunie 1994, Wiersma 1996, P. Clunie pers. comm.).

Barking Owl

Ninox connivens

RARITY

a) Geographic Range

- Classification of range size within region: Large Distribution of records within region: Widespread scattered records, particularly in the
- north of the region. Also recorded from a few coastal locations.
- Number of 5 minute grid cells recorded from: 43 Source: Atlas of Victorian Wildlife
- b) Abundance
- Classification of abundance: Low
- Population Estimate: Unknown, possibly < 50
- pairs in Victoria Density: Unknown, sparsely distributed and possibly < 1 pair/100 km² Home Range (ha): Defends a small territory (30-
- 200 ha) in which they nest and roost within a much larger home range (foraging range), which may be greater than 1000 ha; known individuals have been observed hunting up to 5 km from their roosts.
- Source: Schodde and Mason (1981), Silveira (1997a) c) Habitat Specificity

- Classification of habitat specificity: Narrow
- Vegetation types inhabited in the region: Dry open forests and River Red Gum forests. Also open forests and River Red Gum forests. Also recorded frrom wooded farmland. Rarely recorded from wet forest and then usually only near clearings. Most records from a recent survey of the North East CRA region were from the Granitic Hills Woodland/Rocky Outcrop Mosaic EVC. The species was also recorded from Grassy Dry Forest, Heathy Dry Forest, Shrubby Dry Forest and Herb-rich Foothill Forest.

Source: Schodde and Mason (1981), Emison et al. (1987), Kavanagh et al. (1995), Loyn et al. (in prep.)

- Population Trend in Last Decade
- Increasing, stable or declined: Unknown Source: R. Loyn pers. comm.
- Population trend since discovery by Europeans
- Increasing, stable or declined: Declined Source: Bridley (1991), Robinson (1994) SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: Low
- Source: R. Loyn and E. McNabb pers. comm. b) Dispersal
- Classification of powers of dispersal: High
- Average distances dispersed: Unknown
- Maximum distance dispersed: Unknown Some may be dispersive, linked to fluctuations in food.

Source: Robinson (1994), R. Loyn pers. comm. LIFE HISTORY PARAMETERS a) Reproductive output

Classification of reproductive output: Low

- Age of sexual maturity (yrs): > 2 years
- Mean clutch/litter/brood size: 1-3 eggs
- Mean no of clutches/litters/broods per year: 1
- Time of year young born/hatch: July-November Source: Schodde and Mason (1981), Robinson (1994)

b) Longevity

- Classification of lifespan: Probably long-lived
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): Captive individual known to live for 20 years
- Source: E. McNabb pers. comm.

c) Morphology Adult body size

- Weight (g): 425-485 females, 425-510 males
- Length (mm): 370-440 females, 350-450 males
- Source: Schodde and Mason (1981)

d) Social organisation

- Colonial or non-colonial: Non-colonial; breeding pairs Territoriality: Yes
- Source: Schodde and Mason (1981)

Other e)

- Nomadic, migratory, sedentary: Sedentary
- Diet: Carnivore, insectivore Source: Schodde and Mason (1981), Debus *et al.* (1998)

THREATS

1. Clearing of Native Vegetation: Ranking (3)

Schodde and Mason (1981), Robinson (1994) 2. Timber harvesting: Ranking (2) E. McNabb pers.

3. Fuel Reduction Burning: Ranking (2) E. McNabb pers. comm

4. Firewood Collection: Ranking (2) Robinson (1994

5. Unplanned Fire: Ranking (2) E. McNabb pers. comm

6. Introduced Species: Ranking (1) R. Loyn and E. McNabb pers. comm. 7. Grazing/Trampling: Ranking (2) E. McNabb pers.

comm. 8. Pest Control: Ranking (2) R. Loyn and E.

McNabb pers. comm. 9. Road Construction and Maintenance: Ranking (-)

10. Mining/Quarrying: Ranking (1) E. McNabb pers.

11. Tree Dieback: Ranking (2) E. McNabb pers.

comm.

Recreation: Ranking (0) E. McNabb pers. comm.
 Illegal Collection/Harvesting: Ranking (0) E. McNabb pers. comm.

14. Vandalism/Other Human Disturbance: Ranking (0) E. McNabb pers. comm.

15. Dams/Impoundments: Ranking (0) E. McNabb pers. comm.

Current Management:

The Barking Owl is classified as "endangered" in Victoria (NRE 1999) and has received a final recommendation for listing under the Victorian *Flora* and Fauna Guarantee Act 1988. There is currently no Action Statement for this species. Until an action statement is published, interim conservation measures outlined in the Midlands Forest Management Plan (NRE 1996a) include establishment of a Special Management Zone (SMZ) of approximately 20 ha around nesting or residency sites as they are discovered. Within this SMZ all trees within a circle of 100 m radius surrounding the nest tree will be protected, logging operations, road construction and other activities likely to disturb pairs during the breeding season will be excluded. This strategy will be reviewed when 20 SPZs have been established in state forest (NRE 1996a). A recent survey of State forests and conservation reserves in the Midlands forest management area (FMA) failed to detect Barking Owl (McNabb et al. 1997). Similarly, Barking Owls were not recorded from 129 sites surveyed throughout the West as part of a broadscale fauna survey conducted for the comprehensive regional assessment of the region (Newell et al. 1999). However, the species was recorded by a targeted survey of the region with records from the Greater Grampians and adjacent Dundas Tablelands and from the Glenelg Plains Bioregions (Taylor and Kirsten in prep.). The Barking Owl is also recorded from the Portland, Horsham and Otway FMAs. Of these areas, there is a published forest management plan for the Otways FMA; there are no specific prescriptions for Barking Owl within this plan (DCE 1992a).

Species characteristics:

The Barking Owl is mainly recorded in dry, open forest and woodlands and wooded farmlands; frequently in habitat with moderate tree cover including wooded farmland near forests or along ecotones of large forest blocks (Emison et al. 1987, P. Peake pers. comm. in Robinson 1994). The species appears to have a preference for hunting in open habitat (Robinson 1994) but roosts among dense vegetation. Birds primarily nest in large, hollow-bearing trees and feed mostly on mediumsized mammals and birds including rabbits, gliders, kookaburras, magpies and parrots. Small mammals such as bats, and lizards, frogs and insects are also eaten (Schodde and Mason 1981, Debus et al. 1998). Recent studies on the abundance and distribution of large owls within Victoria have confirmed the extreme rarity of the Barking Owl.

Distribution within the West CRA region:

Records of Barking Owl are scattered across the region although the majority of records are from the north. However, misidentification of this species is a north. However, misidentification of this species is a significant issue and some records are likely to be spurious (R. Loyn and C. Silveira pers. comm., Taylor and Kirsten in prep.). Records are from the Macedon Ranges, Bullengarook, between Coimadai and Rowsley, the Brisbane Ranges, Anakie, Steiglitz, Bamganie State Forest, Blythedale and Streatham, Mount Beckworth, Middle Creek, the Grampians National Park, State forests near Ledcourt, Lake Lonsdale and Balmoral, Crochan Bushland Reserve, Wartook, Rocklands, near Casterton, and Tallaceira. Wartook, Rocklands, near Casterton, and Tallageira. In the south of the region Barking Owl have been recorded from Cobboboonee State Forest, Bats Ridge Flora and Fauna Reserve, Mt Richmond National Park, Winslow and Lorne Angahook State Park. Records are from conservation reserves, State forest as well as habitat remnants on private land including wooded farmland, cleared land and forest patches. The majority of records are either from forest/farmland edges or from cleared land close to

forest blocks or forest blocks close to cleared land (Atlas of Victorian Wildlife).

Disturbances and potentially threatening process operating in the West CRA Region:

Loss and fragmentation of habitat through clearing is a significant threat to Barking Owls in the West region. The species is known to utilise broad strips of riverine forest along major creeks however, isolated, narrow strips of linear habitat do not appear to be used. Reduced availability of large hollow-bearing trees as a result of logging and firewood collection is also a significant threat to the species (Robinson 1994). Grazing prevents the regeneration of trees and shrubs and will limit future habitat availability. Grazing also contributes to rural tree dieback that results in further loss and degradation of habitat (Landsberg et al. 1990). Rabbits can be an important food source (P. Peake pers. comm. in Robinson 1994) although the implications of pest control including loss of prey and the potential for secondary poisoning following control programs are unknown. The potential threat to this species from pesticide residues found in prey species is also unknown. Introduced species, particularly foxes, may be competing for prey with the Barking Owl and may constitute a threat to the species (R. Loyn pers. comm.). However, Kavangh et al. (1995) suggest the species has a wide dietary flexibility. Barking Owls prefer sites with some dense understorev shrubs for roosting (Schodde and Mason 1981). Fire prevention activities can prevent habitat regeneration and cause the death of young trees and shrubs resulting in loss of roosting habitat as well as loss of habitat of the owl's prey and consequently prey (E. McNabb pers. comm.).

Powerful Owl Ninox strenua

RARITY

a) Geographic Range

- Classification of range size within region: Large
- Distribution of records within region: Most records are from the north and east of the region, there is also a concentration in the south-west, north-west of Portland. The most north-westerly record is from the vicinity of Kanagulk
- Number of 5 minute grid cells recorded from: 97
- Source: Atlas of Victorian Wildlife
- b) Abundance
- Classification of abundance: Low Population Estimate: Unknown less than 500 pairs within Victoria. Density: Unknown, between 1 pair per 103 km²
- and one pair per 58 km² estimated for public land in the East Gippsland FMA. Recorded from 25 of 77 surveyed sites in the Midlands Forest Management Area. Home Range (ha): 300 - >2600, dependent on habitat and availability of prey Source: Seebeck (1976), Garnett (1992b), McNabb (1996), McNabb et al. (1997), McIntyre

- c) Habitat Specificity
 c) Habitat Specificity
 c) Classification of habitat specificity: Wide
 vegetation types inhabited in the region: Been region to the region of the region of the region of the region of the region. recorded from tall open-forests, open-forests and woodlands including drier Box Ironbark habitats and riparian River Red Gum habitat.
- Source: Traill (1993), Gibbons (1995), Silveira (1997b), Loyn et al. (in prep.)

Population Trend in Last Decade

- Increasing, stable or declined: Stable Source: R. Loyn and E.McNabb pers. comm.

Population trend since discovery by Europeans
 Increasing, stable or declined: Declined
 Source: Garnett (1992a)

SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: Low Source: R. Loyn pers. comm.
- b) Dispersal
- Classification of powers of dispersal: High
- Average distances dispersed: Unknown Maximum distance dispersed: Unknown
- Source: Schodde and Mason (1981)
 LIFE HISTORY PARAMETERS
 a) Reproductive output

- Classification of reproductive output: Low Age of sexual maturity (yrs): 2, in captivity, in the wild age at first breeding may be later due to the hunting skills required by the male to provide for the female and offspring.
- Mean clutch/litter/brood size: 1.4
- Mean no of clutches/litters/broods per year: 1 (however, failure to breed appears to be common)
- Time of year young born/hatch: July-September
- Source: Fleay (1968), Schodde and Mason (1981), Debus and Chafer (1994), McNabb (1996), E. McNabb and T. Soderquist pers. comm.

b) Longevity

- Classification of lifespan: Long-lived
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): > 20
- Source: Brouwer and Garnett (1990)

c) Morphology Adult body size

- Weight (g): 1050-1620 females, 1130-1700 males
- Length (mm): 450-540 females, 480-650 males
- Source: Schodde and Mason (1981), T. Soderquist pers. comm.
- d) Social organisation
- Colonial or non-colonial: Non-colonial
- Territoriality: Territorial Source: Schodde and Mason (1981)
- e) Other
- Nomadic, migratory, sedentary: Sedentary
- Diet: Carnivore (predominantly arboreal mammals)
- Source: Tilley (1982), Lavazanian et al. (1994)

THREATS

1. Clearing of Native Vegetation: Ranking (2) Schodde and Mason (1981), Robinson (1994) E.McNabb pers. comm.

2. Timber harvesting: Ranking (3) Garnett (1992a), Davey (1993), Collar *et al.* (1994), Debus and Chafer (1994), Kavanagh and Bamkin (1995), E.McNabb a. Fuel Reduction Burning: Ranking (1) Debus and

Chafer (1994), T. Soderquist pers. comm. 4. Firewood Collection: Ranking (1) Robinson

(1994),T. Soderquist pers. comm. 5. Unplanned Fire: Ranking (2) E. McNabb and T. derquist pers. comm.

6. Introduced Species: Ranking (0) E. McNabb pers.

7. Grazing/Trampling: Ranking (1) T. Soderquist Control: Ranking (1) R. Loyn pers. comm.
 Road Construction and Maintenance: Ranking (1) E. McNabb and T. Soderquist pers. comm.
 Mining/Quarrying: Ranking (1) E. McNabb pers.

11. Tree Dieback: Ranking (1) Landsberg et al.

(1990), T. Soderquist pers. comm. 12. Recreation: Ranking (0) E. McNabb pers. comm.

Illegal Collection/Harvesting: Ranking (0) E. McNabb pers. comm.
 Vandalism/Disturbance by Humans: Ranking

T. Soderquist pers. comm.

15. Dams/Impoundments: Ranking (0) E. McNabb and T. Soderquist pers. comm.

Current Management:

The Powerful Owl is classified as "endangered" in Victoria (NRE 1999) and is listed under the Victorian *Flora and Fauna Guarantee Act* 1988. An Action Statement for the species is currently being prepared (Webster and Humphries in prep). Within the (Webster and Humphries in prep). Within the Midlands FMA core habitat for a minimum of 25 pairs of Powerful Owls will be provided. To achieve this target, specific conservation actions include: a minimum of 500 ha of mature forest will be reserved from timber harvesting from an area of 3864 ha (i.e. circle radius of 3.5 km around the point of detection) forest Special Protection Zone (SPZ). A further 500 ha of mature forest (or regrowth of at least 30 years ha of mature forest (or regrowth of at least 30 years of age) will be maintained through approprite scheduling of timber harvesting and all large densely foliated Blackwoods (*Acacia melanoxylon*) will be retained. A Special Management Zone (SMZ) of approximately 20 ha (i.e. cirle radius of 250 m around each site) will be established around additional nesting or resident owl records, as they are discovered. Within this SMZ, all trees within approximately 3 ha (circle radius of 100 m around the point of detection) will be protected by excluding approximately 3 na (circle radius of 100 m around the point of detection) will be protected by excluding harvesting operations, road construction and other activities likely to disturb breeding activitity during the breeding season (NRE 1996a). Further research into the requirements and distribution of large owls will be encouraged in the Otways FMA (DCE 1992). Recent surveys for large forest owls within the Midlands FMA recorded Powerful Owl from 25 of 77 surveyed sites (McNabb et al. 1997). A broadscale fauna survey of the West conducted as part of the comprehensive regional assessment of the region, recorded Powerful Owl from 33 of 129 surveyed sites (Newell et al. 1999).

Species characteristics:

The Powerful Owl is Australia's largest owl species. Arboreal mammals compose the bulk of the diet. It is an opportunistic predator, and birds, insects and some terrestrial mammals may also be eaten (Lavazanian *et al.* 1994, Traill 1993, Tilley 1982). The Powerful Owl roosts in the tree canopy and utilises large tree hollows for nesting. Powerful Owls are a sedentary species and breeding pairs occupy large permanent territories that contain a number of large permanent territories that contain a number of roost sites and nest trees (McNabb 1996). Home range size appears dependent on habitat and availability of prey and can vary from 300 ha in areas of good quality habitat where arboreal mammalian prey is abundant, to greater than 2600 ha in box ironbark forests where mammalian prey is rare, and a large proportion of the diet consists of birds (T. Soderquist pers. comm.).

Distribution within the West CRA region:

Distribution within the West CRA region: Powerful Owl records are widespread across the region, particular in the east (eg. Cobaw, Macedon and Wombat State Forests, Lerderderg State Park, Brisbane Ranges, Anakie, and Steiglitz) and the north- central area (eg. Beaufort, Ben Major, Mt Cole, Bamganie, and Linton State Forests, Hepburn Regional Park, Langi Ghiran State Park and the pursenee Range). Other concentrations of records are Pyrenee Range). Other concentrations of records are from the Otway Ranges and the south-west corner of the region from near Portland (eg. Cobboboonee State Forest, Hot Spur State Forest, Crawford River Regional Park, Lower Glenelg National Park). Further west the species has been recorded from Barton, the Grampians National Park, the Dundas Range Regional Park, Wartook, and near Kanagulk. Although there are some Powerful Owl records from private land and conservation reserves, the majority are from large blocks of State forest (Atlas of Victorian Wildlife).

Disturbances and potentially threatening process

operating in the West CRA Region: Significant threats to this species include disturbances that reduce the availability of nest sites wildfire reduce available nesting and roosting habitat and prey availability (Debus and Chafer 1994, E. McNabb pers. comm.). Road construction and maintenance associated with timber harvesting also

results in habitat loss (E. McNabb pers. comm.). A dense shrub layer provides essential shelter for pre-fledged owlets that avoid predators after falling to the ground by climbing shrubs (McNabb 1996, Hollands 1991). Fuel reduction burns around nest trees may reduce or eliminate the shrub layer and leave no avenue of escape for fallen owlets. Frequent cool, prescribed burns reduce habitat quality by simplifying the structure and removing the resources used by prey species (Catling 1991, E. McNabb pers. comm.). Disturbance by humans is known to have caused nest abandonment, and is considered a minor threat is the Wort A reduction in the pullability of previous in the West. A reduction in the availability of prey due to predation by introduced species is also considered a minor threat (T. Soderquist pers. comm.).

Masked Owl

Tyto novaehollandiae

RARITY

- a) Geographic Range
- Classification of range size within region: Medium
- Distribution of records within region: (ha): Most records are from the east (although not from the north-east) and from the south-west of the region.
- Number of 5 minute grid cells recorded from: 36
- Source: Atlas of Victorian Wildlife b) Abundance
- Classification of abundance: Low
- Population Estimate: Victorian estimate 300-400 breeding pairs
- Density: Unknown, but territories most likely well spaced, 5-10 km² per pair has been postulated. Home Range (ha): 1017-1178, from radiotracking one female Source: Peake *et al.* (1993), Kavanagh and
- Source: Peake et al. (1993), Kavanagh and Murray (1996), Schodde and Mason (1997), E. McNabb pers. comm.
 c) Habitat Specificity Classification of habitat specificity: Medium
 Vegetation types inhabited in the region: Generally found in lowland forests, most records for active peake and the region in the region.

- from ecotones. Been recorded from sites dominated by River Red Gum *Eucalyptus camaldulensis* or Grey Box *E. microcarpa* and from plains grassy woodland/box woodland. Source: Peake *et al.* (1993), E. McNabb pers.
- comm. DYNAMICS

- Population Trend in Last Decade
- Increasing, stable or declined: Unknown, probably declined Source: Peake *et al.* (1993), E. McNabb pers. comm.

Population trend since discovery by Europeans

- Increasing, stable or declined: Unknown, probably declined
- Source: R. Loyn and E. McNabb pers. comm. SPATIAL DYNAMICS a) Population variability

- Classification of population variability: Unknown Source: R. Loyn and E. McNabb pers. comm.
- b) Dispersal
- Classification of powers of dispersal: High
- Average distances dispersed: Unknown Maximum distance dispersed: Unknown
- Source: Schodde and Mason (1981)
 LIFE HISTORY PARAMETERS
 a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity (yrs): Female 2, Male 3
- Mean clutch/litter/brood size: 1-3 typically survive to fledge (2-4 eggs laid) Mean no of clutches/litters/broods per year: < 1
- Time of year young born/hatch: April November
- Source: Schodde and Mason (1981), Hollands (1991), Debus (1993), Olsen and Marples (1993), Peake *et al.* (1993), Kavanagh (1996)
- b) Longevity Classification of lifespan: Long-lived
- Average lifespan (yrs): Unknown

- Maximum lifespan (yrs): Barn Owl *Tyto alba* been recorded living over 17 years in the wild. Source: Bunn *et al.* (1982), R. Loyn pers. comm.
- c) Morphology Adult body size
- Weight (g): 545-800 females, 420-670 males Length (mm): 380-460 females, 330-410 males Source: Schodde and Mason (1981)

- Obligation
 Colonial or non-colonial: Non-colonial
- Territoriality: Territorial
- Source: Schodde and Mason (1981), Hollands (1991)
- e) Other
- Nomadic, migratory, sedentary: Sedentary
- Diet: Carnivore (terrestrial prey dominant) •
- Source: Schodde and Mason (1981), Kavanagh . and Murray (1996)

THREATS

1. Clearing of Native Vegetation: Ranking (3) Garnett (1992a), Debus (1993), E. McNabb pers.

comm. 2. Timber harvesting: Ranking (2) Debus and Rose

(1994), E. McNabb pers. comm. 3. Fuel Reduction Burning: Ranking (2) Debus and

4. Firewood Collection: Ranking (2) E. McNabb pers. comm.

5. Unplanned Fire: Ranking (2) E. McNabb pers. comm.

Introduced Species: Ranking (1) R. Loyn pers.

7. Grazing/Trampling: Ranking (2) Debus and Rose (1994), E. McNabb pers. comm. 8. Pest Control: Ranking (3) Garnett (1992a), E.

McNabb pers. comm. 9. Road Construction and Maintenance: Ranking

Karken and Barken and Barken and Barken and Commentation (1) E. McNabb pers. comm.
 Mining/Quarrying: Ranking (-)
 Tree Dieback: Ranking (2) Landsberg *et al.* (1990), Debus and Rose (1994), E. McNabb pers.

comm.

 Recreation: Ranking (0) E. McNabb pers. comm.
 Illegal Collection/Harvesting: Ranking (0) E. McNabb pers. comm.

14. Vandalism/Disturbance by Humans: Ranking (0) E. McNabb pers. comm.

15. Dams/Impoundments: Ranking (0) E. McNabb pers. comm.

Current Management:. The Masked Owl is classified as "endangered" in Victoria (NRE 1999) and is listed under the Victorian *Flora and Fauna Guarantee Act* 1988. There is currently no Action Statement for this species. Interim conservation guidelines outlined in the Midlands forest management plan includes the use of survey results in conjunction with records on the Atlas of Victorian Wildlife to determine the location of resident owls . Special management zones (SMZ) of 250 m radius (20 ha) will be established around nesting or residency sites as they are discovered. Within this residency sites as they are discovered. Within this zone, all nest trees and all trees within 100 m (3 ha) Zone, all nest trees and all trees within 100 m (3 ha) of the nest tree will be protected and disturbances such as logging and road construction will be excluded during the breeding season. This strategy will be reviewed once 20 SMZs have been established in State forest (NRE 1996a). A recent survey of state forests and conservation reserves in the Midlands forest management area (FMA) failed to detect Masked Owl (McNabb *et al.* 1997). The Otways forest management plan encourages further Otways forest management plan encourages further research into the requirements and distribution of large owls as a high priority (DCE 1992a). A broadscale fauna survey of the West conducted as part of the comprehensive regional assessment of the region, recorded Masked Owl from only one of 129 surveyed sites. (Newell *et al.* 1999).

Species characteristics:

The Masked Owl is a rarely recorded species that requires trees with large hollows for daytime roosting and nesting. Caves can also provide nest and roost

sites if present and dense foliage may be used for roosting. Breeding pairs occupy large permanent territories (>1000ha) (Kavanagh and Murray 1996). Important habitat components include eucalypt forest for roosting and nesting, and forest edge and open Tor roosting and nesting, and forest edge and open woodland for hunting; the species is most often recorded near the boundary between two vegetation types (Peake *et al.* 1993, Debus and Rose 1994). Terrestrial mammals form the greater part of the Masked Owl's diet, but arboreal mammals are also eaten. Introduced species including rabbits and rodents are included in the diet and may partly compensate for the loss of small native mammals from acricultural and pastoral areas (Schodde and from agricultural and pastoral areas (Schodde and Mason 1981, Peake et al. 1993).

Distribution within the West region: Records of the Masked Owl are scattered in the east and south-east of the region, from the Otway Ranges and from the south-west near Portland. The species has been recorded from Wombat State Forest, You Yangs Forest Park, Lorne Forest Park and Lower Glenelg National Park. Other records are from remnant patches of forested habitat on private land, remnant patches of lorested habitat on private land, roadside reserves, streamside reserves and from cleared farmland (Atlas of Victorian Wildlife). Although Masked Owls are cryptic and do not readily respond to playback (Debus 1995), the failure of a recent survey for large forest owls within the Midlands FMA to detect Masked Owl indicate the species is rare. Similarly, only two records of Masked Owl were recorded during a broadscale fauna survey Owl were recorded during a broadscale fauna survey of the West region. One record was from the Otways State Forest, the other record was of a roadkill owl collected from the verge of the Princes Highway approximately 16 km north east of Heywood (Newell et al. 1999).

Disturbances and potentially threatening process

operating in the West CRA Region: In forest managed for timber production, loss of standing trees with hollows for nest and roost sites is a significant threat to the Masked Owl. The species requires open forest for foraging, and dense logging regeneration may not be suitable foraging habitat (Peake *et al.* 1993). Private land provides habitat for the species in the region; loss of habitat as a result of the species in the region; loss of habitat as a result of clearance of native vegetation is a major threat to the Masked Owl in the West. The species is known to nest in disturbed areas such as isolated stands of trees in paddocks (Hollands 1991). Tree dieback is also a significant threat in rural areas, particularly where the grazing is the primary land use. Lack of network regrating a provide of grazing equipo natural regeneration as a result of grazing causes habitat loss in the long-term (Debus and Rose 1994). Wildfires also result in loss of habitat and prey and vulguines also result in loss of nabitat and prey and are a threat to the species. Frequent fuel reduction burns are known to cause the death of young trees and shrubs (Adam and Robinson 1996) and may result in the loss of roosting habitat and prey (Debus and Rose 1994, E. McNabb pers. comm.). Masked Owls are known to hunt along roads and road widening and maintenance activities may result in a loss of habitat. Road-kill Masked Owls have been recorded in the past and upgraded roads carrying recorded in the past and upgraded roads carrying faster traffic increase the likelihood of road-kill deaths (Atlas of Victorian Wildlife, E. McNabb pers. comm.).

Introduced species, particularly foxes, may be competing for prey with the Masked Owl effecting availability of prey such as rabbits (R. Loyn pers. comm.). In agricultural areas, introduced mammals are important components of the Masked Owl's diet (Debus and Rose 1994). Pest control results in a reduction in the availability of prey, particularly rabbits, and the potential for secondary poisoning following rabbit control programs and rat baiting (Peak *et al.* 1993, R. Loyn pers. comm.). The potential threat to the Masked Owl from pesticide residues found in prey species is unknown and residues found in prey species is unknown and requires investigation.

Chestnut-rumped Heathwren Hylacola pyrrhopygia

RARITY

a) Geographic Range

- Classification of range size within the West region: Large
- Distribution of records within the West region: Patchy distribution, the majority of records are from the west. There is also a group of records in the east and a scattering of records along the coast
- Number of 5 minute grid cells recorded from: 55
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population estimate: Unknown
- Density: Unknown
- Home range: Unknown; probably < 10 ha.
- Source: Emison et al. (1987), R. Loyn pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Narrow Vegetation types inhabited in the West region: Open-forest and woodland, especially those with a heathy understorey; also low shrubs among rocky outcrops. Has been recorded from damp sands herb-rich woodland around Dergholm and from dry foothill forest in the Grampians.
- Source: Blakers et al. 1984. Emison et al. 1987, Newell et al. 1999

DYNAMICS

Population Trend in Last Decade

Increasing, stable or declining: Unknown, infrequently recorded

Source: C. Silveira pers. comm.

Population trend since discovery by Europeans

Increasing, stable or declining: Declined Source: Blakers et al. (1984), Robinson (1993)

SPATIAL DYNAMICS

a) Population variability

Classification of population variability: Unknown. Local increases have been recorded in early post-fire and post-logging seral stages as the shrub layer develops. Source: Loyn (1980), Ford (1989)

b) Dispersal

- Classification of powers of dispersal: Low
- Average distance dispersed: Unknown .
- Maximum distance dispersed: Unknown
- Source: C. Silveira pers. comm.

LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity: Probably 1-2 years.
- Mean clutch/litter/brood size: 2-3 eggs
- Mean no. of clutches/litters/broods per year: 1, sometimes 2.
- Time of year young born/hatch: Winter to spring
- Source: Beruldsen (1980), Schodde and Tidemann (1986), C. Silveira pers. comm.

b) Longevity

- Classification of lifespan: Short-lived
- Average lifespan: Unknown
- Maximum lifespan: Two years for a banded individual.
- Source: Baker et al. (1997)

c) Morphology

Adult body size

- Weight (g): 17.9, n=9
- Length (mm): 130-140
- Source: Simpson and Day (1996), Baker et al (1997)

d) Social organisation

- Colonial or non-colonial: Non-colonial; pairs when breeding and small loose groups after breeding
- Territoriality: Territorial when breeding.
- Source: Schodde and Tidemann (1986).
- e) Other
- Nomadic, migratory, sedentary: Sedentary Mode of feeding: Insectivorous and
- granivorous
- Source: Blakers et al. (1984), Emison et al. (1987)

THREATS

1. Clearing of Native Vegetation: Ranking (2)

- Blakers et al. (1984), C. Silveira pers. comm. 2. Timber harvesting: Ranking (-)
- 3. Fuel Reduction Burning: Ranking (2) C. Silveira pers. comm.
- 4. Firewood Collection: Ranking (2) C. Silveira pers. comm.
- 5. Unplanned Fire: Ranking (2) R. Loyn pers. comm.
- 6. Introduced Species: Ranking (-)
- 7. Grazing/Trampling: Ranking (1) C. Silveira pers. comm.
- 8. Pest Control : Ranking (-) C. Silveira pers. comm.
- 9. Road Construction and Maintenance: Ranking (0) C. Silveira pers. comm.
- 10. Mining/Quarrying: Ranking (-) C. Silveira pers. comm.
- 11. Tree Dieback: Ranking (-) C. Silveira pers. comm.
- 12. Recreation: Ranking (0) C. Silveira pers. comm.
- 13. Illegal Collection/Harvesting: Ranking (0) C. Silveira pers. comm.
- 14. Vandalism/Disturbance by Humans: Ranking (0) C. Silveira pers. comm.
- 15. Dams/Impoundments: Ranking (0) C. Silveira pers. comm.

Current management: The Chestnut-rumped Heathwren is classified as "data deficient" in Victoria (NRE 1999). There are no threat-ameliorating management prescriptions for the Chestnut-rumped Heathwren within the West CRA region.

Species characteristics:

The Chestnut-rumped Heathwren is mainly recorded from heathy woodlands, and open eucalypt forests and woodlands in the lowlands and foothills. It also inhabits box-ironbark, stringybark and peppermint forests with scattered shrub layers and sparse tree cover. Although usually absent from high altitude country, it has been recorded up to 1500 m. In eucalypt forests it occurs mainly in areas where there are natural openings such as among rocky outcrops. Pairs or loose groups spend most of their time foraging for insects and seeds on the ground, especially in areas where fallen branches or rocks are present, or in low shrubs. Nests are buit close to the ground in low shrubs or grass tussocks (Blakers et al. 1984, Emison et al. 1987).

Distribution in the West CRA region:

Within the West, records of the Chestnut-rumped Heathwren are sparsely distributed along the coast from near Anglesea, Otway National Park, Port Campbell National Park and the vicinity of Point Danger near Portland and in the east from

Bullengarook, Mount Sugarloaf and The Brisbane Ranges. Other records are scattered between Portland and Edenhope and the Grampians. Records of the Chestnut-rumped Heathwren are from State forest, private land and conservation reserves (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the West CRA region:

The ground and shrub layers are important habitat components of the Chestnut-rumped Heathwren; disturbances which remove or deplete these habitat resources are likely to cause population declines. Areas with abundant fallen tree debris are favoured foraging habitat (Emison et al. 1987). Removal of fallen dead timber as a result of firewood collection, is a significant threat to the species. Nesting and foraging habitat may be lost as a result of fuel reduction burning and wildfire and these disturbances may be significant threats to the species (C. Silveira pers. comm.). The effect of timber harvesting on the Chestnut-rumped Heathwren is unknown although it has been recorded from early post-harvesting regeneration stages (Emison et al. 1987).

Azure Kingfisher Alcedo azurea

RARITY

a) Geographic Range

- Classification of range size within the West region: Large
- Distribution of records wthin the West region: Widespread scattered records
- Number of 5 minute grid cells recorded from: 51
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population estimate: Unknown
- Density: Unknown •
- Home range: 1.6 km and 1.0 km of creek in the breeding and non-breeding seasons respectively at Murphy's Ck, Qld; 200 m of creek near Sydney, NSW. Dependent on the size of the stream, but usually 200-500 m of stream bank are occupied by one pair.
- Source: Blakers et al. (1984), Shields (1994) c) Habitat Specificity
- Classification of habitat specificity: Narrow ; sheltered creeks and rivers.
- Vegetation types inhabited in the region: **Riparian EVCs**
- Source: Emison et al. (1987), C. Silveira pers. comm.

DYNAMICS

Population Trend in Last Decade

- Increasing, stable or declining: Declined
- Source: Robinson (1993)

Population trend since discovery by Europeans Increasing, stable or declining: Declined at

- southern end of its Australian range.
- Source: Blakers et al. (1984), Robinson (1993)

SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: High; marked fluctuations at some sites.
- Source: R. Loyn pers. comm.

b) Dispersal

- Classification of powers of dispersal: Unknown
- Average distance dispersed: Unknown, but reported migratory movements in the Upper Murray and Eastern Uplands would suggest many tens, perhaps hundreds, of kilometres.
- Maximu m distance dispersed: 10 km by a banded individual.
- Source: McEvey (1965), Emison *et al.* (1987), Baker *et al.* (1997)

LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Medium
- Age of sexual maturity: Probably 1-2 years.
- Mean clutch/litter/brood size: Five eggs
- Mean no. of clutches/litters/broods per year: One
- Time of year young born/hatch: Spring to early summer.
- Source: Beruldsen (1980), C. Silveira pers. comm.

b) Longevity

- Classification of lifespan: Probably long-lived
- Average lifespan: Unknown
 Maximum lifespan: 11 years for a banded
- individual.
- Source: Baker *et al.* (1997)

c) Morphology

- Adult body size
- Weight (g): 34.9 (n=19)
- Length (mm): 180
- Source: Simpson and Day (1996), Baker et al. (1997)

d) Social organisation

- Colonial or non-colonial: Non-colonial; solitary or in dispersed pairs.
- Territoriality: Territorial when breeding.
- Source: Schodde and Mason (1997)
- e) Other
 - Nomadic, migratory, sedentary: Sedentary in most of Victoria, but considered a summer migrant in the Upper Murray and Eastern Uplands.
- Diet: Carnivorous (fish, frogs, insects and crustaceans).
- Source: McÉvey (1965), Blakers *et al.* (1984), Emison *et al.* (1987)

THREATS

- 1. Clearing of Native Vegetation: Ranking (2) C. Silveira and R. Loyn pers. comm.
- 2. Timber harvesting: Ranking (1) Campbell and Doeg (1989), Shields (1994)
- 3. Fuel Reduction Burning: Ranking (-)
- 4. Firewood Collection: Ranking (0) R. Loyn pers. comm.
- 5. Unplanned Fire: Ranking (-)
- 6. Introduced Species: Ranking (2) Shields (1994), S. Saddlier pers. comm., R. Loyn pers. comm.
- 7. Grazing/Trampling: Ranking (1) Shields (1994), C. Silveira pers. comm.
- 8. Pest Control Measures: Ranking (-)
- 9. Road Construction and Maintenance: Ranking (-)
- 10. Mining/Quarrying: Ranking (-)
- 11. Tree Dieback: Ranking (0) R. Loyn pers. comm.
- 12. Recreation: Ranking (-)
- 13. Illegal Collection/Harvesting: Ranking (0) C. Silveira pers. comm.
- 14. Vandalism Disturbance by Humans: Ranking (0) C. Silveira pers. comm.
- 15. Dams/Impoundments: Ranking (2) Shields (1994), Koehn *et al.* (1996), R. Loyn pers. comm.

Current management:

The Azure Kingfisher is not considered "threatened" in Victoria (NRE 1999). There are no threatameliorating management prescriptions for the Azure Kingfisher within the West CRA region.

Species characteristics:

The Azure Kingfisher is rarely recorded far from watercourses. Within Victoria, it occurs along the Murray and Goulburn Rivers as well as along lowland and foothill rivers and streams. It catches its prey by plunging from low perches overhanging the water, such as snags and dead branches. The majority of prey is aquatic and includes small fish, frogs, crustaceans and aquatic insects and their larvae (Emison *et al.* 1987, Shields 1994). The Azure Kingfisher nests in a tunnel that it excavates in the bank of the stream beside the water (Blakers *et al.* 1984, Shields 1994).

Distribution in the West CRA region:

Records of the Azure Kingfisher are thinly distributed but widespread. In the east the species has been recorded from Lerderderg Gorge, Mt Macedon, Brisbane Ranges National Park and Avalon Saltworks and Curlewis near Geelong. There are a few scattered records along the coast from the Otway Ranges and Tower Hill and from the Grampians (Rocklands and Moora Moora Reservoirs). In the south-west records are from Cobboboonee Sate Forest (Cordover and Wright Swamps), Leah Swamp, the Lower Glenelg River, .

Crawford River Regional Park and further north to Aspley (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the West CRA region:

Disturbances that result in the fouling of streams, alterations to stream flow or that remove adjacent riparian vegetation such as clearing and timber harvesting, are likely to threaten the Azure Kingfisher. Streamside frontages are commonly grazed under license within the region; nesting habitat may be lost as a result of grazing and trampling which can cause erosion and collapse of river banks (Shields 1994, C. Silveira pers. comm.). Fluctuating water levels as a result of water releases from impoundments may flood out nest tunnels (Shields 1994). Changes in water temperatures in rivers downstream of impoundments as a result of cold water releases, are known to have a significant effect on the species composition and abundance of fish and macroinvertebrate fauna (Koehn et al. 1996); the significance of these changes to the food resource of the Azure Kingfisher are unknown. Introduced Carp increase water turbidity (S. Saddlier pers. comm.) which is likely to have a significant effect on habitat quality of the Azure Kingfisher, and may result in population declines (R. Loyn pers. comm).

Hooded Robin Melanodryas cucullata

RARITY

a) Geographic Range

- Classification of range size within the West region: Large
- Distribution of records within the West region: Widespread although there is a gap in the

distribution in the center of the region running south to the coast.

- Number of 5 minute grid cells recorded from: 104
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low Population estimate: Unknown
- Density: Unknown
- Home range: 8.3-25.5 ha (mean 18) with a breeding territory from 4.5-9.5 ha (mean 6) were recorded for groups near Armidale,
 - N.S.W.; home range of approximately 15 ha with a breeding territory of approximately 4 ha recorded for a pair in Canberra.
- Source: Emison et al. (1987), Sullivan (1993), Fitri and Ford (1997), R. Loyn pers. comm. c) Habitat Specificity
- Classification of habitat specificity: Wide
- Vegetation types inhabited in the West region: In southern Victoria occur in lightly timbered habitats containing tall shrubs such as Yellow Box Eucalyptus melliodora woodlands, coastal heaths and heathy woodlands. Recorded from open heath associated with heathy woodland, and grassy woodland in the West.
- Source: Emison et al. (1987), Fitri and Ford (1997), Newell et al. 1999

DYNAMICS

- **Population Trend in Last Decade**
- Increasing, stable or declining: Declined
- Source: Pescott (1982), Bennett (1993), Fitri and Ford (1997)

Population trend since discovery by Europeans

- Increasing, stable or declining: Declined
- Source: Wheeler (1969), Thomas and
- Wheeler (1983), Robinson (1991, 1993) SPATIAL DYNAMICS

Population variability 3

- Classification of population variability:
- Unknown, probably low Source: Fitri and Ford (1997)

b) Dispersal

- Classification of powers of dispersal: Low
- Average distance dispersed: Unknown
- Maximum distance dispersed: 2 km for a banded individual
- Source: Baker et al. (1997), Fitri and Ford (1997)

LIFE HISTORY PARAMETERS

Reproductive output 3.

- Classification of reproductive output: Low
- Age of sexual maturity: Unknown
- Mean clutch/litter/brood size: 2-3
- Mean no. of clutches/litters/broods per year: 1-2
- Time of year young born/hatch: July-November
- Source: Schodde and Tidemann (1986), Boles (1988)

b) Longevity

- Classification of lifespan: Long-lived
- Average lifespan: Unknown
- Maximum lifespan: Seven years for a banded individual.
- Source: Baker et al. (1997)

c) Morphology

- Adult body size
- Weight (g): 21-27
- Length (mm): 140-170
- Source: Schodde and Tidemann (1986), Boles (1988)

d) Social organisation

- Colonial or non-colonial: Non-colonial; breeding pairs or may breed communally, often join mixed species feeding flocks.
- Territoriality: Yes
- Source: Bell (1984b), Schodde and Tidemann (1986)

e) Other

- Nomadic, migratory, sedentary: Sedentary although pairs or groups may move within or between breeding seasons.
- Diet: Insects and other arthropods, also recorded taking small lizards
- Source: Emison et al. (1987), Faithfull (1991), Sullivan (1993), Fitri and Ford (1997)

THREATS

1. Clearing of Native Vegetation: Ranking (2) Bell (1984b), Fitri and Ford (1997), S. Kennedy pers. comm.

- 2. Timber harvesting: Ranking (-)
- 3. Fuel Reduction Burning: Ranking (2) S. Kennedy pers. comm.
- 4. Firewood Collection: Ranking (2) Schodde and Tidemann (1986), Sullivan (1993)
- 5. Unplanned Fire: Ranking (2) Robinson (1993)
- Introduced Species: Ranking (2) Tobinion (19 (1993), Fitri and Ford (1997)
- 7. Grazing/Trampling: Ranking (2) Sullivan (1993), Fitri and Ford (1997) 8. Pest Control Measures: Ranking (-)
- 9. Road Construction and Maintenance: Ranking (-)
- 10. Mining/Quarrying: Ranking (-)
- 11. Tree Dieback: Ranking (2) Fitri and Ford (1997)
- 12. Recreation: Ranking (0)
- Illegal Collection/Harvesting: Ranking (0) 13.
- Vandalism/Disturbance by Humans: Ranking (0) 14. Sullivan (1993)
- 15. Dams/Impoundments: Ranking (0)

Current management:

The Hooded Robin is not considered "threatened" in Victoria (NRE 1999). There are no threat ameliorating management prescriptions for the species within the West CRA region.

Species characteristics:

The Hooded Robin is a widespread species that is found throughout the continent with the exception of Tasmania and Cape York Peninsular. In southern Victoria it occurs in lightly timbered habitats containing tall shrubs such as Yellow Box *Eucalyptus* melliodora woodlands, coastal heaths and heathy woodlands (Schodde and Tidemann 1986, Emison et *al.* 1987). In most areas the Hooded Robin is considered a relatively sedentary species that occupies a home range of approximately 10-20 ha year-round. However, there may be some movement of pairs or groups within or between breeding seasons (Fitri and Ford 1997) which may be related to local food availability. In other areas it is likely there is a post-breeding winter dispersion from higher to lower altitudes (Emison et al. 1987, Boles 1988). Hooded Robins nest in pairs or communally; groups including up to three helpers have been recorded (Bell 1984b, Fitri and Ford 1997). Nests are built in trees, shrubs, stumps or in hollows of dead tree trunks. Hooded Robins are ground foragers that use vantage points such as the ends of broken branches or stumps to detect prey; areas with dead fallen timber provide suitable habitat for hunting with plenty of exposed boughs close to the ground (Boles 1988, Sullivan 1993). The diet consists of a wide range of insects and other arthropods; the occasional small lizard may also be taken (Faithfull 1991, Sullivan

1993). Although not currently considered threatened in Victoria, the Hooded Robin is declining in woodland and agricultural areas, particularly in southern Australia (Robinson 1993, Fitri and Ford 1997).

Distribution in the West CRA region:

Hooded Robin records are widespread within the region although there is a gap in the distribution in the center of the region inland that extends to the coast between Macarthur in the south-west and Benwerrin in the south-east. Several authors have noted the decline and disappearance of Hooded Robin populations from several areas within the West CRA region including the Geelong region, Toolern Vale, the Ballarat region, Long Forest and Moyston (Wheeler 1969, Pescott 1982, Thomas and Wheeler 1983, Hewish 1986, Hewish et al. 1986, Robinson 1993, S. Kennedy pers. comm.). Within the West CRA region, Hooded Robins have been recorded from public and private land as well as a number of conservation reserves across the region (Atlas of Victorian Wildlife).

Disturbances and threatening processes operating in the West CRA region:

Although widely distributed with apparently generalised habitat requirements, the Hooded Robin is declining in woodland and agricultural areas. However, reasons for the decline are unclear (Fitri and Ford 1997). Although largely cleared open paddocks provide foraging habitat for Hooded Robins, trees, particularly saplings, provide nest sites and cover; nesting attempts in the open are generally unsuccessful due to predation (Bell 1984b). Loss of nesting habitat as a result of clearing is considered a moderate threat to the species. Fragmentation resulting in the isolation of the Hooded Robin leaves these birds vulnerable to population extirpation from processes such as predation and wildfire (S. Kennedy pers. comm.). Long grass and leaf litter provide ground-level camouflage for fledglings which have been recorded spending long periods sitting on the ground (Sullivan 1993). Grazing results in loss of trees, shrubs and long grass, and is likely to adversely impact on breeding success even though the species may still be able to forage adequately (Fitri and Ford 1997). Tree dieback in agricultural areas will result in loss of nesting habitat in the longterm. Dead, fallen timber provides ample perches for foraging. Firewood collection removes this element of the Robin's habitat. Being a ground foraging species that often nests close to the ground, Hooded Robins are particularly vulnerable to predation by introduced species (Fitri and Ford 1997). The effects of wildfire and fuel reduction burning are unknown although both disturbances will result in some loss of habitat at least in the short-term. Being a largely sedentary species. Hooded Robins are vulnerable to population declines as a consequence of chance catastrophic events such as wildfire (Robinson 1993).

Speckled Warbler Chthonicola sagittata

RARITY

a) Geographic Range

Classification of range size within the West region: Medium

- Distribution of records within the West region: The majority of records are scattered across the north of the region. However, there is a concentration of records in the east between Geelong and Bacchus Marsh and west of Melbourne
- Number of 5 minute grid cells recorded from: • 74
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Medium
- Population estimate: Unknown
- Density: 0.49-0.54 birds/ha in eucalypt woodland at Armidale, NSW.
- Home range: 4.3-8.0 ha near Bendigo, Victoria; breeding territories of about 10 ha at Wollomombi, NSW.
- Source: Bell (1984a), Blakers et al. (1984), Tzaros (1996)

c) Habitat Specificity

- Classification of habitat specificity: Wide
- Vegetation types inhabited in the West region: Woodlands and open-forests with a grassy understorey. Has been recorded from Grassy Dry Forest, Heathy Dry Forest and Box Ironbark EVCs. In the Moyston district these birds nest in large Hedge Wattles Acacia paradoxa in stands of Long-leaved Box Eucalyptus goniocalyx, Yellow Box E. melliodora and Scent Bark E. aromaphloia
- Source: Tzaros (1996), S. Kennedy pers. comm.

DYNAMICS

- Population Trend in Last Decade
- Increasing, stable or declining: Declined
- Source: Thomas and Wheeler (1983), S. Kennedy pers. comm.
- Population trend since discovery by Europeans
- Increasing, stable or declining: Declined
- Source: Thomas and Wheeler (1983), Robinson (1993)

SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: High
- Source: Bell (1984a)
- b) Dispersal
- Classification of powers of dispersal: Low
- Average distance dispersed: Unknown
- Maximum distance dispersed: 6 km by a banded individual.
- Source: Baker et al. (1997)
- LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Medium .
- Age of sexual maturity: Probably 1-2 years.
- Mean clutch/litter/brood size: 2.5 eggs (n=57) Mean no. of clutches/litters/broods per year:
- One Time of year young born/hatch: Spring to early summer (peak in September, October and November)
- Source: Beruldsen (1980), Tzaros (1996)

b) Longevity

- Classification of lifespan: Short-lived
- Average lifespan: Unknown
- Maximum lifespan: Seven years for a banded individual.
- Source: Baker et al. (1997)

c) Morphology

- Adult body size
- Weight (g): Female 13.3 (n=30); Male 13.6 (n=41)
- Length (mm): 115-125
- Source: Simpson and Day (1996), Baker et al. (1997)

d) Social organisation

- Colonial or non-colonial: Non-colonial; solitary, in pairs or in small groups of up to nine birds.
- Territoriality: Territorial when breeding.
- Source: Bell (1984a), Tzaros (1996)

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Mode of feeding: Granivorous and insectivorous.
- Source: Bell (1984a), Blakers et al. (1984), Tzaros (1996)

THREATS

- 1. Clearing of Native Vegetation: Ranking (2) S. Kennedy pers. comm.
- 2. Timber harvesting: Ranking (2) McEvey (1965), Robinson and Traill (1996)
- 3. Fuel Reduction Burning: Ranking (1) Tzaros (1996)
- 4. Firewood Collection: Ranking (2) S. Kennedy pers. comm.
- 5. Unplanned Fire: Ranking (1) Tzaros (1996)
- 6. Introduced Species: Ranking (2) Tzaros (1996), Robinson and Traill (1996)
- 7. Grazing/Trampling: Ranking (2) Robinson and Traill (1996)
- 8. Pest Control Measures: Ranking (0) S. Kennedy pers. comm.
- 9. Road Construction and Maintenance: Ranking (0)
- Mining/Quarrying: Ranking (-)
 Tree Dieback: Ranking (1) S. Kennedy pers. comm.
- 12. Recreation: Ranking (0) S. Kennedy pers. comm.
- 13. Illegal Collection/Harvesting: Ranking (0) S. Kennedy pers. comm.
- 14. Vandalism/Disturbance by Humans: Ranking (-) Hewish (1986)
- 15. Dams/Impoundments: Ranking (0) S. Kennedy pers. comm.

Current management:

The Speckled Warbler is currently not considered "threatened" in Victoria (NRE 1999). There are no threat-ameliorating management prescriptions for the Speckled Warbler within the West CRA region.

Species characteristics:

The Speckled Warbler is a ground nesting and ground foraging species which inhabits the drier forests and woodlands of the northern foothills of the Great Dividing Range (Emison et al. 1987). Areas of granite substrate are favoured in places such as Melville Caves and Mt Alexander (S. Kennedy pers. comm.). It forages in small open patches of bare ground or amongst thin layers of leaf litter and grass tussocks, often as part of a mixed-species feeding flock. Insects and their larvae form a major component of the diet; other invertebrates, and occasionally fruits and seeds, may also be eaten (Bell 1984a, Schodde and Tidemann 1986, Emison *et al.* 1987, Tzaros 1996). Domed nests of dried grasses and bark strips are built in slight hollows in the ground, under a thin cover of fallen branches or sparse shrubs (Schodde and Tidemann 1986, Tzaros 1996). Although not currently classified as threatened in Victoria, Speckled Warblers are amoungst a group of ground feeding and ground nesting woodland species known to be declining in Victoria (Robinson 1993, Robinson and Traill 1996, Kennedy in prep.).

Distribution in the West CRA region: The majority of Speckled Warbler records are scattered across the north of the region as far west as Edenhope. However, there is a concentration of records in the south-east in the vicinities of Toolern

Vale, Long Forest between Melton and Bacchus Marsh, the You Yangs and the Brisbane Ranges. There are two records in the south-west of the region, one 1952 record from near Lake Condah and a 1940 record from near Gorae West. Records are State forest, private land and conservation reserves (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the West CRA region:

The Speckled Warbler has been recorded from remnant patches of woodland habitat on private land as well as wooded farmland within the region and further clearing associated with intensified land use would result in loss of habitat on private land (Robinson et al. in prep). Timber harvesting also results in loss and modification of habitat. In addition, dense young regrowth forests are unlikely to provide suitable foraging habitat for the Speckled Warbler. Being a ground nesting and ground foraging species, Speckled Warblers are particularly vulnerable to predation by introduced species. Over-grazing can result in habitat modification and cause population declines (Robinson and Traill 1996). Nests, eggs and young may also be vulnerable to trampling by grazing cattle. Weed invasion results in loss of foraging habitat. Firewood collection disturbs ground layer vegetation, and removes debris and fallen timber and is considered a moderate threat to the species (S. Kennedy pers. comm.). Numbers of Warblers are known to have decreased following fire although this disturbance may only cause short-term declines as the sparse new regrowth provides suitable foraging habitat (Tzaros 1996).

Gilbert's Whistler

Pachycephala inornata

RARITY a) Geographic Range

- Classification of range size within the West region: Medium
- Distribution of records within the West region: Scattered widespread records, there is a small isolated groups of records from the north-west of the region near Natimuk.
- Number of 5 minute grid cells recorded from: 16
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population estimate: •
- Density: Patchily distributed; near Cowra, NSW, 3 pairs nested within approximately 25 ha (0.24 birds/ha) however, there was a substantial distance between this group of nests and the next.
- Home range: Unknown
- Source: Bourke (1954), Boles (1988)

c) Habitat Specificity

Classification of habitat specificity: Wide Vegetation types inhabited in the West region: Recorded from box-ironbark-gum forests including Ironbark Eucalyptus sideroxylon, Grey Box E. microcarpa, Yellow Box E. melliodora, Yellow Gum E. leucoxylon, often in association with mallee eucalypts including Bull Mallee E. behriana, Blue Mallee E. polybractea and Green Mallee E. viridis. Also

recorded from dense mallee scrub and cypress pine Callitris spp. and box-buloke Casuarina luehmannii woodlands. Been recorded from the Box Ironbark Forest, Heathy Dry Forest and Gravelly-sediment Mallee EVCs.

Source: Emison et al. (1987), Alas of Victorian Wildlife, NRE (unpublished data)

DYNAMICS

Population Trend in Last Decade

- Increasing, stable or declining: Declined
- Source: Robinson (1993), R. Loyn pers. comm.

Population trend since discovery by Europeans

- Increasing, stable or declining: Declined commensurate with broad-scale clearing of habitat
- Source: Robinson (1991, 1993), Smith et al. (1994)

SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: Low Source: Boles (1988)
- b) Dispersal
- Classification of powers of dispersal: High; reported to disperse widely during late summer and autumn in dry years or after major wildfire
- Average distance dispersed: Unknown
- Maximum distance dispersed: Probably low
- Source: Emison et al. (1987)

LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity: Unknown, males may breed in immature plumage
- Mean clutch/litter/brood size: 2-4 eggs
- Mean no. of clutches/litters/broods per year: 1
- Time of year young born/hatch: September-December
- Source: Bourke (1954), Schodde and Tidemann (1986), Boles (1988)

b) Longevity

- Classification of lifespan: Probably long-lived
- Average lifespan: Unknown
- Maximum lifespan: Banded individual recovered after 7 years. Other Whistlers recovered after 17 years (Golden) and 15 years (Rufous)
 - Source: Baker et al. (1997)

c) Morphology

Adult body size

- Weight (g): 29-33
- Length (mm): 190-205
- Source: Boles (1988), Baker et al. (1997)
- d) Social organisation
- Colonial or non-colonial: Non-colonial;
- breeding pairs Territoriality: Territorial
- Source: Schodde and Tidemann (1986), Boles (1988)
- e) Other
- Nomadic, migratory, sedentary: Sedentary with dispersal limited mainly to young of the year although may disperse in response to environmental conditions.
- Mode of feeding: Insectivore; beetles, weevils and particularly caterpillars
- Source: Schodde and Tidemann (1986), Emison et al. (1987), Joseph and Kernot (1982)

THREATS

- 1. Clearing of Native Vegetation: Ranking (3) Robinson (1993), Robinson and Traill (1996), D. Robinson pers. comm.
- 2. Timber harvesting: Ranking (2) Robinson (1993), Robinson and Traill (1996)
- 3. Fuel Reduction Burning: Ranking (2) Robinson (1993), Robinson and Traill (1996) 4. Firewood Collection: Ranking (2) Robinson
- (1993), Robinson and Traill (1996)
- 5. Unplanned Fire: Ranking (1) Smith et al. (1994)
- 6. Introduced Species: Ranking (2) Robinson (1993)
- 7. Grazing/Trampling: Ranking (2) Robinson (1993), Robinson and Traill (1996)
- 8. Pest Control Measures: Ranking (-)
- 9. Road Construction and Maintenance: Ranking (-)
- 10. Mining/Quarrying: Ranking (2) Robinson (1993), Robinson and Traill (1996)
- 11. Tree Dieback: Ranking (1) D. Robinson pers. comm.
- 12. Recreation: Ranking (-)
- 13. Illegal Collection/Harvesting: Ranking (0)
- 14. Vandalism/Disturbance by Humans: Ranking (0)
- 15. Dams/Impoundments: Ranking (0)

Current management:

Gilbert's Whistler is currently not considered "threatened" in Victoria (NRE 1999). There are no threat-ameliorating management prescriptions for the species within the West CRA region.

Species characteristics:

Within Victoria, the stronghold of the Gilbert's Whistler is in the north-west of the state where it inhabits mature mallee scrubs and Slender Cypresspine Callitris preissii woodlands with dense shrub layers, and reaches its highest densities in stands of Broom Honeymyrtle Melaleuca uncinata (Emison et *al.* 1987). However, it is not restricted to this vegetation type, and has been recorded from boxironbark-gum forests within the region, often in association with mallee eucalypts, as well as from dense mallee scrub, cypress pine and box-buloke woodlands (Emison et al. 1987, Boles 1988, Atlas of Victorian Wildlife). Gilbert's Whistlers forage on the ground amoungst the litter under the cover of shrub thickets, as well as close to the ground within the shrub layer. It is an insectivore; the diet is known to include beetles, weevils and particularly caterpillars. Established pairs occupy permanent territories year round although birds have been reported to disperse widely in response to adverse environmental conditions. Nests are built in forks of shrubs or low trees, generally within 2 m of the ground (Bourke 1954, Schodde and Tidemann 1986, Emison et al. 1987). Although not currently considered threatened, Gilbert's Whistler populations are declining in parts of southern Australia, including Victoria (Robinson 1993).

Distribution in theWest CRA region:

The few records of Gilbert's Whistler from the West region are mostly from the north. In the north-west there is a small group of records west of Natimuk. There are very few records from the south of the region; the most southerly records are from the vicinities of Lethbridge and Shelford and the You Yangs. Other records are from the vicinity of Clunes including Clunes State Forest. Gilbert's Whistlers have been recorded from forested and lightly wooded private land as well as from public land (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the West CRA region: Although not currently considered threatened in Victoria, Gilbert's Whistlers are amongst a suite of woodland birds known to be declining (Robinson 1993, Smith et al. 1994, R. Loyn pers. comm.). Disturbances most likely to cause population declines in the West CRA region are those that result in loss and simplification of shrub layers and litter which provide foraging and nesting substrates and cover. disturbances include clearing, timber These harvesting, firewood collection, fuel reduction burning and grazing/trampling (Robinson 1993, Smith et al. 1994, Robinson and Traill 1996). Gilbert's Whistlers have moderately large home ranges and are dependent on large blocks of native vegetation and decline rapidly in response to habitat loss and fragmentation (D. Robinson pers. comm.). Within the West, some populations of Gilbert's Whistlers have been reduced to only a few pairs. These populations are isolated from other populations and are extremely vulnerable to local extinction as a result of disturbances such as predation by introduced species or catastrophic events including drought and wildfire (Robinson 1993). Within the mallee, large fires are known to have a severe and long-term impact on a number of bird species (Smith et al. Although usually sedentary, Gilbert's 1994). Whistlers are known to disperse in reponse to large unplanned fires (Emison et al. 1987). However, the long-term effects on populations are unknown.

Black-eared Cuckoo Chrysococcyx osculans

RARITY

a) Geographic Range

- Classification of range size within the West region: Large
- Distribution of records within the West region: Widespread scattered records, there is concentration in the east. There are very few records from the south of the region.
- Number of 5 minute grid cells recorded from: 40
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population estimate: Unknown
- Density: Unknown, low
- Home range: Migratory
- Source: Emison et al. (1987)

c) Habitat Specificity

- Classification of habitat specificity: Narrow
- Vegetation types inhabited in the West region: mallee scrubs. drv woodlands and boxironbark forests. Also recorded from lightly wooded farmland and rural gardens.
- Source: Emison et al. (1997), Atlas of Victorian Wildlife, D. Robinson pers. comm. DYNAMICS

- **Population Trend in Last Decade** Increasing, stable or declining: Declining
- Source: Robinson (1993)
- Population trend since discovery by Europeans
- Increasing, stable or declining: Declined
- Source: Robinson (1993)

SPATIAL DYNAMICS

- a) Population variability
- Classification of population variability: High
- Source: Emison et al. (1987)

b) Dispersal

- Classification of powers of dispersal: High
- Average distance dispersed: Unknown
- Maximum distance dispersed: Unknown
- Source: Emison et al. (1987)

LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity: Unknown •
- Mean clutch/litter/brood size: 1; parasitic, laying mainly in domed nests
- Mean no. of clutches/litters/broods per year: 1
- Time of year young born/hatch: August-January
- Source: Schodde and Tidemann (1986)

b) Longevity

- Classification of lifespan: Unknown
- Average lifespan: Unknown
- Maximum lifespan: Unknown; banded Fantailed Cuckoo recovered after 5 years
- Source: Baker et al. (1997)

c) Morphology

Adult body size

- Weight (g): 26.3 (mean, N=5)
- Length (mm): 190-210
- Source: Schodde and Tidemann (1986), Baker et al. (1997)

d) Social organisation

- Colonial or non-colonial: Non-colonial
- Territoriality: Non-territorial
- Source: Schodde and Tidemann (1986)

e) Other

- Nomadic, migratory, sedentary: Migratory
- Mode of feeding: Insectivore mainly moths and caterpillars: seeds are sometimes eaten
- Source: Blakers et al. (1984), Schodde and Tidemann (1986)

THREATS

- 1. Clearing of Native Vegetation: Ranking (2) D.Robinson pers. comm.
- 2. Timber harvesting: Ranking (2) D.Robinson pers. comm.
- 3. Fuel Reduction Burning: Ranking (2) D.Robinson pers. comm.
- 4. Firewood Collection: Ranking (2) D.Robinson pers. comm.
- 5. Unplanned Fire: Ranking (1) D.Robinson pers. comm.
- 6. Introduced Species: Ranking (1) D.Robinson pers. comm.
- 7. Grazing/Trampling: Ranking (2) D.Robinson pers. comm. 8. Pest Control Measures: Ranking (-)
- 9. Road Construction and Maintenance: Ranking (-)
- 10. Mining/Quarrying: Ranking (1) D.Robinson pers. comm.
- 11. Tree Dieback: Ranking (1) D.Robinson pers. comm.
- 12. Recreation: Ranking (0)
- 13. Illegal Collection/Harvesting: Ranking (0)
- 14. Vandalism/Disturbance by Humans: Ranking (0)
- 15. Dams/Impoundments: Ranking (0)

Current management:

The Black-eared Cuckoo is currently not considered "threatened" in Victoria (NRE 1999). There are no threat-ameliorating management prescriptions for the species within the West CRA region.

Species characteristics:

The Black-eared Cuckoo is a summer breeding migrant to Victoria where it inhabits mallee scrubs, dry woodlands and box-ironbark forests with annual rainfall less than 700 mm. It is mainly recorded north of the Great Divide (Emison et al. 1987, Atlas of

Victorian Wildlife). Black-eared Cuckoos are nest parasites; domed nests are preferred, particularly those of the Redthroat and Speckled Warbler (Schodde and Tidemann 1986). The species forages in low shrubs and from open ground amoung trees, and feeds by perch-pouncing on insects and larvae, particularly moths and caterpillars; seeds are sometimes eaten (Blakers et al. 1984). The Blackeared Cuckoo is an uncommon species and although not currently considered threatened in Victoria, it is known to be declining (Robinson 1993).

Distribution in theWest CRA region:

The majority of Black-eared Cuckoo records are from the east of the region between Geelong and Mount Sugarloaf, north-east of Bacchus Marsh (eg Darley Hill, Lara, Brisbane Ranges National Park, the You Yangs, Serendip Sanctuary). Also recorded between Bacchus Marsh and Melbourne from near Exford and West Melton. Other records are widely scattered, mainly in the north of the region. In addition to blocks of public land, Black-eared Cuckoos have also been recorded from rural gardens and lightly wooded farmland (Atlas of Victorian Wildlife).

potentially Disturbances and threatening processes operating in the West CRA region:

The shrub and ground layers are important habitat components of the Black-eared Cuckoo. This species prefers large blocks of native vegetation, and large numbers of small trees and shrubs in combination with an open ground layer or gaps between trees for ground-feeding (D. Robinson pers. comm.). Disturbances which impact on these layers are likely to adversely affect populations. Clearing, timber harvesting, firewood collection, fuel reduction burning and grazing/trampling result in loss and modification of shrub and ground-layer vegetation. Weed invasion may result in loss of foraging habitat. In addition, as a nest parasite, Black-eared Cuckoos will also be impacted by disturbances that impact on their hosts. The Speckled Warbler is a preferred host of the Black-eared Cuckoo. This ground nesting and foraging species is most vulnerable to disturbances including clearing, timber harvesting, firewood collection and grazing/trampling; it is declining in Victoria (Robinson 1993, Robinson and Traill 1996).

Mountain Dragon "Anglesea form"

Tympanocryptis diemensis

RARITY

a) Geographic Range

- Classification of range size within the West region: Small
- Distribution of records within the West region: All records are within several kilometres of Anglesea and Aireys Inlet on the south-eastern coast of the region Number of 5 minute grid cells recorded from: 5 Source: Atlas of Victorian Wildlife

- b) Abundance Classification of abundance: Low
- Population Estimate: Unknown
- Density: Unknown
- Home Range (ha): Unknown
- Source: P. Robertson pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Narrow
- Vegetation types inhabited in the region:
- Coastal heath and heathy woodland

• Source: P. Robertson pers. comm. DYNAMICS

Population Trend in Last Decade

- Increasing, stable or declined: Unknown, possibly declined due to impacts of fire more

- Source: P. Robertson pers. comm.
 Population trend since discovery by Europeans
 Increasing, stable or declined: Unknown

• Source: P. Robertson pers. comm. **SPATIAL DYNAMICS** (Knowledge of the biology and ecology of the Anglesea form of the Mountain Dragon is lacking, therefore information in the following categories, with the exception of "Threats", is extrapolated from accounts of the general species Tympanocryptis diemensis

a) Population variability

- Classification of population variability: Unknown Source: P. Robertson pers. comm.
- b) Dispersal
- Classification of powers of dispersal: Low
- Average distances dispersed: Unknown
- Maximum distance dispersed: Unknown
- Source: P. Robertson pers. comm. LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low

- Age of sexual maturity (yrs): Unknown Mean clutch/litter/brood size: 2-7 eggs Mean no of clutches/litters/broods per year:
- Time of year young born/hatch: Eggs laid late spring/summer, hatch late summer/autumn (may be earlier in lowland populations)
- Source: Kent (1987), Wilson and Knowles (1988), Ehmann (1992), Green and Osborne (1994), P. Robertson pers. comm.

b) Longevity

- Classification of lifespan: Unknown
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): Unknown
- Source: P. Robertson pers. comm.
- c) Morphology

Adult body size

- Weight (g): Unknown
- Length (mm): 55-82 (snout-vent length), 155 (total length) females attain greater size than
- Source: Jenkins and Bartell (1980), Kent (1987), Ehmann (1992), P. Robertson pers. comm.

d) Social organisation

- Colonial or non-colonial: Non-colonial
- Territoriality: Yes, especially males
- Source: Witten (1993), Green and Osborne (1994), P. Robertson pers. comm.

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Diet: Arthropods, particularly ants
- Source: Wilson and Knowles (1988), Ehmann (1992), Green and Osborne (1994)

THREATS

1. Clearing of Native Vegetation: Ranking (3) P. Robertson pers. comm.

- 2. Timber Harvesting: Ranking (3) P. Robertson pers, comm
- 3. Fuel Reduction Burning: Ranking (2) P.
- Robertson pers. comm.

4. Firewood Collection: Ranking (1) P. Robertson pers. comm.

5. Unplanned Fire: Ranking (3) P. Robertson pers. comm.

6. Introduced Species: Ranking (3) P. Robertson pers. comm.

7. Grazing/Trampling: Ranking (1) P. Robertson pers. comm.

8. Pest Control: Ranking (-)

9. Road Construction and Maintenance: Ranking

(2) P. Robertson pers. comm.

10. Mining/Quarrying: Ranking (2) P. Robertson pers. comm.

- Eucalypt Dieback: Ranking (-)
 Recreation: Ranking (1) P. Robertson pers. comm.

13. Illegal Collecting/Harvesting: Ranking (1) P. Robertson pers. comm.

14. Vandalism: Ranking (0) P. Robertson pers. comm.

15. Dams/Impoundments: Ranking (0) P. Robertson pers. comm.

Current Management:

The Anglesea Mountain Dragon is currently classified as "Critically Endangered" in Victoria (NRE 1999). There are no management prescriptions for this lizard in the West CRA region. No published data exist for this species.

Species characteristics:

As no information is available on the Anglesea form of the Mountain Dragon (J. Coventry pers. comm.), the following account is based on knowledge of the or the information bragon (J. Coventry pers. comm.), the following account is based on knowledge of the general species *Tympanocryptis diemensis*. The Mountain Dragon is a small agamid occurring in open woodland, open shrubland and open heath, predominantly in eastern Victoria (Ehmann 1992, Green and Osborne 1994, Cogger 1996). This lizard favours areas of stunted, sparse or open vegetation, often on skeletal stony or sandy soils with rock outcrops (Ehmann 1992, Green and Osborne 1994). Winter hibernacula consist of deeply buried logs and tree stumps (Jenkins and Bartell 1980). Mountain Dragons, particularly males, are territorial (Wilson and Knowles 1988, Witten 1993). This species is sexually dimorphic, females achieving greater size than males (Kent 1987). Mating takes place in spring and early summer and two to seven eggs are deposited in a shallow burrow in open sandy or gravelly areas (Green and Osborne 1994) in late spring or early summer (Kent 1987, Ehmann 1992). The eggs hatch in late summer (Green and Osborne 1994). Mountain Dragons prey on a variety of atthropods (Wilson and Knowles 1988, Green and 1994). Mountain Dragons prey on a variety of arthropods (Wilson and Knowles 1988, Green and Osborne 1994), particularly ants (Ehmann 1992).

Distribution in the West CRA region:

All eight records of the Anglesea Mountain Dragon are within approximately six kilometres of the townships of Anglesea and Aireys Inlet on the south-east coast of the West CRA region. Six of the eight records are from the Otway State Forest. The remaining records are from land adjacent to the Great Ocean Road.

Disturbances and potentially threatening processes operating in the West CRA region:

Habitat loss and alteration due to clearing, particuarly for housing and associated development, timber harvesting, firewood collection, fuel reduction burning and wildfire are likely to be the greatest threats to the Anglesea Mountain Dragon. These activities result in the loss of shelter, foraging habitat and habitat enabling effective thermoregulation, and make this lizard more susceptible to predation from both native and evolution and the provintity of these reports to and exotic animals. The proximity of these records to major townships suggests domestic animals such as cats and dogs may pose a considerable threat to the species. Loss of habitat through clearing for housing development is a particular threat in unprotected habitat in the vicinities of coastal townships. As the Anglesea Mountain Dragon is likely to show a preference for rocky slopes, increased run-off and erosion resulting from habitat loss and alteration are also likely to have deleterious consequences.

Striped Worm-lizard

Aprasia striolata

RARITY

- a) Geographic Range
 Classification of range size within the West region: Medium
- Distribution of records within the West region: Records from four disjunct localities in the south-west of the region
- Number of 5 minute grid cells recorded from: 9 Source: Atlas of Victorian Wildlife
- b) Abundance
- Classification of abundance: Low

- Population Estimate: Unknown
- Density: Unknown
- Home Range (ha): Unknown
- Source: Atlas of Victorian Wildlife

c) Habitat Specificity

- Classification of habitat specificity: Narrow in Victoria.
- Vegetation types inhabited in the region: prefers habitat on sandy or loamy soils including coastal heaths and semi-arid heaths.
- (1996), P. Robertson pers. comm. Population Trend in Last Decade

Increasing, stable or declined: Unknown Source: P. Robertson pers. comm.

- Doulation trend since discovery by Europeans
 Increasing, stable or declined: Unknown, possibly declined as habitat is lost to softwood plantations and agriculture
 Source: P. Robertson pers. comm.
 SPATIAL DYNAMICS
 a) Population variability

- Classification of population variability: Unknown Source: P. Robertson pers. comm.
- b) Dispersal
- Classification of powers of dispersal: Low Average distances dispersed: Unknown
- Maximum distance dispersed: Unknown
- Source: P. Robertson pers. comm. LIFE HISTORY PARAMETERS a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity (yrs): Probably 2-3, if like congeners
- Mean clutch/litter/brood size: 2 eggs per clutch (based on the usual clutch size for pygopodids) Mean no of clutches per year: 1
- Time of year young hatch: January-February Source: Ehmann (1992), P. Robertson pers.
- comm.

b) Longevity

- Classification of lifespan: Unknown
- Average lifespan (yrs): Unknown
- Source: P. Robertson pers. comm
 C) Morphology
 Adult body size Maximum lifespan (yrs): Unknown

- Weight (g): Unknown Length (mm): 140 (snout-vent), 230 (total) Source: Ehmann (1992), Cogger (1996)

d) Social organisation

- Colonial or non-colonial: Non-colonial
- Territoriality: Unknown Source: P. Robertson pers. comm.
- e) Other
- Nomadic, migratory, sedentary: Sedentary
- Diet: Possibly an ant specialist, like congeners
- Source: P. Robertson pers. comm.

THREATS

1. Clearing of Native Vegetation: Ranking (3) P. Robertson and G. Brown pers. comm.

- 2. Timber Harvesting: Ranking (-)
- 3. Fuel Reduction Burning: Ranking (3) P.

Robertson and G. Brown pers. comm

4. Firewood Collection: Ranking (3) P. Robertson and G. Brown pers. comm. 5. Unplanned Fire: Ranking (2) P. Robertson and

G. Brown pers. comm.

6. Introduced Species: Ranking (3) P. Robertson and G. Brown pers. comm.

7. Grazing/Trampling: Ranking (3) P. Robertson and G. Brown pers. comm.

8. Pest Control: Ranking (1) P. Robertson pers. comm.

9. Road Construction and Maintenance: Ranking (1) P. Robertson and G. Brown pers. comm.

10. Mining/Quarrying: Ranking (1) P. Robertson and G. Brown pers. comm.

11. Tree Dieback: Ranking (-)

12. Recreation: Ranking (1) P. Robertson pers. comm.

13. Illegal Collecting/Harvesting: Ranking (0) P.

Robertson pers. comm. 14. Vandalism: Ranking (0) P. Robertson and G. Brown pers. comm.

15. Dams/Impoundments: Ranking (-)

Current Management:

The Striped Worm-lizard is classified as "lower risk near threatened" in Victoria (NRE 1999). It has been recommended for listing under the *Flora* and *Fauna Guarentee Act* 1988. There are currently no threat-ameliorating management prescriptions for this species in the West CRA region.

Species characteristics:

The Striped Worm-lizard is a fossorial pygopid that favours habitat in sandy or loamy soils (Cogger 1996). Captive specimens have displayed diurnal and crepuscular activity (Greer 1989). This lizard lives under fallen timber, leaf litter and rocks and boulders embedded in soil (Ehmann 1992). In Victoria the Striped Worm-lizard favours "sub-humid" to semi-arid heaths on sandy soils (P. Robertson pers. comm.). A seasonal shift in refugia has been noted with superficial cover favoured in winter and noted, with superficial cover favoured in winter and rioted, with supericial cover favoured in winter and spring, whilst deeper refuges are sought during summer. Little is known about the biology and ecology of this lizard. However, like other congeners, it probably preys upon ants (P. Robertson pers. comm.). Females lay two elongate eggs per clutch (Ehmann 1992).

Distribution in the West CRA region:

Knowledge of the distribution and abundance of the Striped Worm-lizard in the West CRA region is poor. The eight records of this lizard in the region are from four disjunct localities, all of which are in the west and south-west of the region. Two records are from near Casterton, one from near Penshurst, one from the Jilpanger Flora and Fauna Reserve near Edenhope, one from the Portland Aluminium Smelter and one from coastal dunes on Discovery Bay (approximately 30 kilometres north-west of Portland). These records were collected between 1974 and 1994. In addition two pre-1900 records exist - one from the city of Portland, and one near Edenhope (Atlas of Victorian Wildlife). The species was recently recorded incidentally during a broadscale fauna survey of the West as part of the comprehensive regional assessment of the region. One record was of numerous individuals from a private property south-west of Casterton, the other was of a single animal, cruth of Casterton, the other was of a single animal, south of Edenhope (Newell et al. 1999, N. Clemann pers. comm.).

Disturbances and potentially threatening processes operating in the West CRA region:

Most threats to the Striped Worm-lizard are related to habitat alteration and loss resulting from clearing, grazing, firewood collection, fuel reduction burning and wildfire. These disturbances result in the loss of shelter and disturbance to the ground debris layer which provides shelter and foraging habitat for this lizard. The encroachment of softwood plantations into this species' habitat is considered a threat (P. Robertson pers. comm.). Both managed and unplanned fires consume ground debris leaving the Striped Worm-lizard susceptible to predation. Clearing of vegetation reduces the source material for the ground debris layer. Similarly firewood collection may remove shelter sites from the lizard's habitat. Grazing by domestic stock may also remove or change ground-level vegetation and debris, as well as compacting the soil, making it unsuitable for small fossorial animals such as the Striped Worm-lizard. The disjunct distribution of Striped Worm-lizard populations renders them particularly vulnerable to localised extirpation from disturbance, with little chance for recolonisation. The impact of exotic predators such as foxes and cats on the Striped Striped Worm-lizard susceptible to predation. predators such as foxes and cats on the Striped

Worm-lizard is unclear, but is likely to be deleterious (P. Robertson and G. Brown pers. comm.).

Swamp Skink Egernia coventryi

RARITY a) Geographic Range

- Classification of range size within the West region: Large
- Distribution of records within the West region: Highly disjunct records, predominantly from coastal areas in the south of the region. Isolated inland records from Ballarat and the Grampians National Park
- Number of 5 minute grid cells recorded from: 18 Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate:
- Density: 50 animals per ha (estimate from
- Home Range (ha): possibly greater than 10m², estimate for mark-recapture 5m² Source: Clemann (1997), P. Robertson pers.
- comm.

- c) Habitat Specificity
 Classification of habitat specificity: Narrow
- Vegetation types used in the region: Coastal heaths, wet heaths and swampland. Also recorded from woodland. In other regions this lizard favours swamp, saltmarsh and riparian
- vegetation, particularly sedge and tussock life-form species, often on the margins of heathland Source: Robertson (1980), Smales (1981), Schulz (1985), Clemann (1997), Clemann and Beardsell (1999), N. Clemann pers. comm. DYNAMICS

Population Trend in Last Decade

Increasing, stable or declined: Unknown Source: P. Robertson pers. comm. Population trend since discovery by Europeans Increasing, stable or declined: Declined due to habitat clearance

Source: P. Robertson pers. comm. SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: Unknown
- Source: P. Robertson pers. comm.
- b) Dispersal
 - Classification of powers of dispersal: Low Average distances dispersed: Unknown Maximum distance dispersed: Unknown
- Source: P. Robertson pers. comm.
 LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity (yrs): 2-3 years Mean clutch/litter/brood size: 2-6 young, usually
- Mean no of clutches/litters/broods per year: 1
- Time of year young born/hatch: January-
- February
- Source: Robertson (1980), P. Robertson pers. comm.

b) Longevity

- Classification of lifespan: Probably long-lived Average lifespan (yrs): Estimated at
- approximately 10 years
- Maximum lifespan (yrs): Unknown
- Source: P. Robertson pers. comm.

c) Morphology

- Adult body size
- Weight (g): 25-28g
- Length (mm): 100mm (snout-vent) Source: Cogger (1995), Clemann (1997), P. Robertson pers. comm.

d) Social organisation

- Colonial or non-colonial: Non-colonial
- Territoriality: Yes, aggressive to conspecifics, especially males

- Source: Clemann (1997), P. Robertson pers. comm.
- e) Other
- Nomadic, migratory, sedentary: Sedentary Mode of feeding: Primarily insectivore, up to 20-50% plant material
- Source: Douch (1994), Clemann (1997)

1. Clearing of Native Vegetation: Ranking (3) P.

Robertson and G. Brown pers. comm. 2.Timber Harvesting: Ranking (2) P. Robertson and

G. Brown pers. comm. 3.Fuel Reduction Burning: Ranking (1) P.

Robertson pers. comm. 4.Firewood Collection: Ranking (0) P. Robertson 5. Unplanned Fire: Ranking (1) P. Robertson pers.

comm.

6. Introduced Species: Ranking (2) P. Robertson and G. Brown pers. comm.

7. Grazing/Trampling: Ranking (2) P. Robertson

and G. Brown pers. comm.
8. Pest Control: Ranking (-)
9. Road Construction and Maintenance: Ranking (1) P. Robertson and G. Brown pers. comm.
10. Mining/Quarrying: Ranking (1) P. Robertson

11.Eucalypt Dieback: Ranking (1) P. Robertson

pers. comm. 12. Recreation: Ranking (1) P. Robertson pers.

comm.

Illegal Collecting/Harvesting: Ranking (0) P.
 Robertson and G. Brown pers. comm.
 Vandalism: Ranking (0) P. Robertson and G.

Brown pers. comm.

15. Dams/Impoundments: Ranking (2) P. Robertson and G. Brown pers. comm.

Current Management:

The Swamp Skink is classified as "vulnerable" in Victoria (NRE 1999), and has been nominated for listing under the *Flora and Fauna Guarantee Act* 1988 (Robertson pers. comm.). There are no threatameliorating management prescriptions for this species within the West CRA region.

Species characteristics:

The Swamp Skink occurs in swampland and heathland vegetation in the West CRA region, but has been recorded in saltmarsh in other Victorian regions (Schulz 1985, Clemann 1997). This species shelters in burrows and under rocks and logs (Robertson 1980, Smales 1981, Clemann 1997), and exposed logs may be used as basking sites as well as shelter (Smales 1981). Sedge and tussock life-form vegetation is an important component of Swamp form vegetation is an important component of Swamp Skink habitat, providing shelter, and basking and foraging sites (Clemann 1997). The Swamp Skink is aggressively territorial and will actively exclude conspecifics from homesites, particularly in male-male confrontations (Robertson pers. comm., Clemann 1997). This lizard is primarily insectivorous, but considerable matter is place approximated but considerable vegetable matter is also consumed (Douch 1994, Clemann 1997). A viviparous species, the Swamp Skink gives birth to two to six young in mid to late summer (Robertson 1980).

Distribution in the West CRA region:

Records of Swamp Skinks in the West region are highly disjunct and predominantly from coastal areas. These extend from Swan Island (Port Phillip Bay) in the east to the South Australian border in the west. Inland records exist from the Grampians National Park, the Glenelg River district north-west of Park, the Glenelg River district north-west of Portland, Cobboboonee State Forest, north-east of Portland, the Gellibrand area north of Port Campbell National Park and Ballarat (Atlas of Victorian Wildlife). The Ballarat site is assumed to have been destroyed (Robertson 1980, P. Robertson pers. comm.). However, the species was recently recorded approximately 20 km south of Ballarat (N. Clemann pers. comm.).

Disturbances and potentially threatening processes operating in the West CRA region:

Major threats to the Swamp Skink are habitat loss caused by clearing and drainage of swamps (Robertson 1980, Smales 1981, Lumsden et al. 1991, Clemann 1997). Gillespie et al. (1992) note that in East Gippsland the species appears to be dependent East Gippsland the species appears to be dependent on late successional stages of riparian scrub and coastal heathland. They suggest inappropriate fire regimes and wildfires represent a threat, as does road construction which could affect hydrological regimes. Although Swamp Skink habitat is generally unsuitable for timber harvesting, altered hydrological regimes resulting from harvesting nearby may adversely impact on populations. Habitat loss from grazing and trampling by domestic stock has had a deleterious impact on Swamp Skink populations in other regions (Robertson pers. comm.). Additional, albeit less significant, threats may include predation by exotic predators such as doos, cats and foxes. by exotic predators such as dogs, cats and foxes, and pollution of wetland habitat (Clemann 1997).

Woodland Blind Snake

Ramphotyphlops proximus

RARITY a) Geographic Range

- Classification of range size within the West region: Small
- Distribution of records within the West region: Scattered in the vicinity of Stawell and the Grampians, to west of Goroke
- Number of 5 minute grid cells recorded from: 7
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: Unknown
- Density: Unknown
- Home Range (ha): Unknown .
- Source: Atlas of Victorian Wildlife, P. Robertson

- pers.comm.
 c) Habitat Specificity
 Classification of habitat specificity: Medium Vegetation types inhabited in the region: Box-
- Vegetation types inhabited in the region. Dove Ironbark, woodlands and mallee associations.
 Source: P. Robertson pers. comm.
 Population Trend in Last Decade

- Population Trend in Last Decade
 Increasing, stable or declined: Unknown
 Source: P. Robertson pers. comm.
 Population trend since discovery by Europeans
 Increasing, stable or declined: Declined, commensurate with broad-scale clearing and fragmenting of native vegetation.
 Source: P. Robertson
 SPATIAL DYNAMICS
 a) Population variability

a) Population variability

- Classification of population variability: Unknown Source: P. Robertson pers. comm.
- b) Dispersal
- Classification of powers of dispersal: Low Average distances dispersed: Unknown
 Maximum distance dispersed: Unknown
 Source: P. Robertson pers. comm.
 LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity (yrs): Unknown Mean clutch/litter/brood size: 3-34 (13)
- Mean no of clutches/litters/broods per year: 1 Time of year young born/hatch: February -April
- Source: Ehmann and Bamford (1993), P.
- Robertson pers. comm.

b) Longevity

- Classification of lifespan: Unknown
- Average lifespan (yrs): Unknown Maximum lifespan (yrs): Unknown
- Source: Ehmann and Bamford (1993)

c) Morphology

- Weight (g): Unknown
- Length (mm): Male 194-395 (272), Female 264-433 (366)
- Source: Shine and Webb (1990) d) Social organisation
- Colonial or non-colonial: Non-colonial
- Territoriality: Non-territorial Source: G. Brown and P. Robertson pers. comm.
- Other e)
- Nomadic, migratory, sedentary: Sedentary Diet: Insectivore; feeds mainly on the larvae and pupae of stinging ants (*Myrmecia*)
- Source: Webb and Shine (1993), P. Robertson pers. comm.

1. Clearing of Native Vegetation: Ranking (3) P. Robertson and G. Brown pers. comm.

2. Timber Harvesting: Ranking (1) P. Robertson and G. Brown pers. comm.

3. Fuel Reduction Burning: Ranking (2) G. Brown pers. comm.

4. Firewood Collection: Ranking (2) P. Robertson and G. Brown pers. comm.

5. Unplanned Fire: Ranking (2) P. Robertson and G. Brown pers. comm.

6. Introduced Species: Ranking (1) P. Robertson pers. comm

7. Grazing/Trampling: Ranking (3) P. Robertson and G. Brown pers. comm.

8. Pest Control: Ranking (1) P. Robertson pers. comm.

9. Road Construction and Maintenance: Ranking (1) P. Robertson pers. comm

10. Mining/Quarrying: Ranking (1) P. Robertson and G. Brown pers. comm.

11. Tree Dieback: Ranking (-) P. Robertson and G. Brown pers. comm.

12. Recreation: Ranking (0) P. Robertson and G. Brown pers. comm.

13. Illegal Collecting/Harvesting: Ranking (0) P.

Robertson and G. Brown pers. comm.

14. Vandalism: Ranking (0) P. Robertson and G. Brown pers. comm.

15. Dams/Impoundments: Ranking (0) P. Robertson and G. Brown pers. comm.

Current Management: The Woodland Blind Snake is classified "vulnerable" in Victoria (NRE 1999). There are no management prescriptions for the Woodland Blind Snake in the West CRA region.

Species characteristics:

The Woodland Blind Snake is a small fossorial snake. It inhabits dry forests and mallee mainly in the Riverina and Midland areas of northern Victoria (Brown and Bennett 1995). During rain and flooding it emerges emerges from underground and seeks shelter under rocks, fallen timber and loose soil under shelter under rocks, fallen timber and loose soil under leaf litter (Ehmann 1992). It is likely that the presence of the Woodland Blind Snake is influenced by prey availability and soil characteristics such as penetrability, moisture content and particle size (Ehmann and Bamford 1993). High substrate complexity on or near ground level probably favours the occurrence of this species (Brown and Bennett 1995). Prey consists of invertebrates, mainly the larvae and pupae of large stinging ants (*Myrmecia*) (Webb and Shine 1993).

Distribution in the West CRA region:

Records of the Woodland Blind Snake in the West are scattered between Lubeck, north of Stawell, to 13 km south of Halls Gap. There is a single isolated record west of Goroke. Only three records originate post-1970, with the most recent record from 1980. The species has been recorded from state forest, privately owned land and roadside reserves (Atlas of Victorian Wildlife).

Disturbances and potentially threater processes operating in the West CRA region: Disturbances and potentially threatening

Clearing of habitat is the major threat to the Woodland Blind Snake, with past clearing for agriculture probably responsible for a severe decline in this species in the last 100 years. Due to its fossorial nature, this species is particularly sensitive to soil and ground layer disturbances such as grazing and trampling by domestic stock. Activites that cause soil compaction and erosion are likely to have an impact through unfavourable changes to soil structure and humidity (Sadlier and Pressey 1994), and may also have an effect on burrowing prey. Blind Snakes are rarely recorded from land subject to agricultural practices (Ehmann and Bamford 1993). Leaf litter and ground debris are important shelter Leaf litter and ground debris are important shelter sites for the species and removal or degradation of this layer as a result of disturbances such as fuel reduction burning, wildfire and firewood collection are likely to adversely impact on Woodland Blind Snake populations. Pesticide use may reduce prey numbers (Ehmann 1992) and is considered a moderate threat to this species (G. Brown pers. comm.). Predation by cats and foxes is considered a minor threat (B. Bebarten porg. acmm.) minor threat (P. Robertson pers. comm.).

Lace Monitor

Varanus varius

RARITY

a) Geographic Range

- Classification of range size within West region: Medium
- Distribution of records within the West region: All records from the north of the region, the majority are from the eastern edge of the Grampians. Recorded as far west as Casterton and as far east as Landsborough.
- Number of 5 minute grid cells recorded from: 27 Source: Atlas of Victorian Wildlife
- b) Abundance
- Classification of abundance: Medium
- Population Estimate: Unknown
- Density: Unknown
- Home Range (ha): Males approximately 65 Source: Weavers (1993), G. Brown and P.

Robertson pers. comm.

- c) Habitat Specificity
 Classification of habitat specificity: Wide
 - Vegetation types used in the region:
- Woodlands, dry forests • Source: Brown and Bennett (1995) DYNAMICS
- Population Trend in Last Decade

- Increasing, stable or declined: Unknown
 Source: P. Robertson pers. comm.
 Population trend since discovery by Europeans
 Increasing, stable or declined: Unknown, Increasing, scale of declined, of the own, possibly declined commensurate with broad-scale clearing and fragmenting of native vegetation for agricultural purposes
 Source: P. Robertson pers. comm.
 SPATIAL DYNAMICS

- Classification of powers of dispersal: Unknown Average distances dispersed: Unknown Maximum distance dispersed: Unknown
- Source: P. Robertson pers. comm.
 LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity (yrs): Unknown
- Mean clutch/litter/brood size: 4-14
- Mean no of clutches/litters/broods per year: 1
- Source: Ehmann (1992), Green and King (1993), P. Robertson pers. comm.

b) L ongevity

Classification of lifespan: Probably long-lived

a) Population variability

Classification of population variability: Unknown
 Source: P. Robertson pers. comm.
 b) Dispersal

- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): Unknown
- Source: Green and King (1993), P. Robertson pers. comm. c) Morphology

- Adult body size Weight (g): 1800-7000 (5100)
- Length (mm): Mean length 600 (snout-vent), maximum recorded 765 (snout-vent) Source: Weavers (1989), Ehmann (1992),
- Weavers (1993) d) Social organisation
- Colonial or non-colonial: Solitary
- Territoriality: Probably non-territorial Source: Jenkins and Bartell (1980), P. Robertson pers. comm.
- e) Other
- Nomadic, migratory, sedentary: Sedentary Diet: Carnivore; small mammals, reptiles, carrion,
- nestling birds, insects Source: Cogger (1996), P. Robertson pers. comm.

1. Clearing of Native Vegetation: Ranking (3) P.

Robertson and G. Brown pers. comm. 2. Timber Harvesting: Ranking (3) Brown and

Bennett (1995),

3. Fuel Reduction Burning: Ranking (2) P.

Robertson and G. Brown pers. comm 4. Firewood Collection: Ranking (2) Brown and Bennett (1995)

5. Unplanned Fire: Ranking (2) P. Robertson and G. Brown pers. comm.

6. Introduced Species: Ranking (1) P. Robertson and G. Brown pers. comm.

7. Grazing/Trampling: Ranking (1) P. Robertson and G. Brown pers. comm.

8. Pest Control: Ranking (2) P. Robertson and G. Brown pers. comm.

9. Road Construction and Maintenance: Ranking (1) P. Robertson and G. Brown pers. comm.

10. Mining/Quarrying: Ranking (1) P. Robertson and G. Brown pers. comm.

11. Tree Dieback: Ranking (1) P. Robertson and G. Brown pers. comm

12. Recreation: Ranking (1) P. Robertson and G. Brown pers. comm.

13. Illegal Collecting/Harvesting: Ranking (1) P. Robertson and G. Brown pers. comm.

14. Vandalism: Ranking (1) P. Robertson and G. Brown pers. comm

15. Dams/Impoundments: Ranking (0) P. Robertson and G. Brown pers. comm.

Current Management:

The Lace Monitor is classified as "data deficient" in Victoria (NRE 1999). There are no management prescriptions for this species in the West CRA region

Species characteristics:

The Lace Monitor is an opportunistic carnivore, The Lace Monitor is an opportunistic carnivore, foraging widely for carrion, mammals, birds, reptiles and arthropods. In some areas rabbits constitute at least a quarter of prey numbers in this lizard's diet (Weavers 1989). Small skinks are an important component of the diet of juvenile Lace Monitors (Alexander 1997). The Lace Monitor depends on large trees (living and dead) for foraging, basking and shelter (Silveira *et al.* 1997). It is semi-arboreal, often fleeing up trees when approached. It also forages in trees for bird's enge and pactings (Green and King fleeing up trees when approached. It also forages in trees for bird's eggs and nestlings (Green and King 1993). The Lace Monitor shelters in burrows, disused rabbit warrens or tree crevices and hollows (Green and King 1993). A complex ground layer with a high density of logs is believed to be beneficial for the survival of dispersing young (Alexander 1997). Eggs are laid in rotting stumps or termitaria (Ehmann 1992), and this lizard may be dependent on termitaria (P. Robertson pers. comm.). This species is often seen foraging in roadside remnants and networks of stream vegetation, its distribution seemingly correlated with connected systems of habitat (Brown and Bennett 1995). With a home range of approximately 65 hectares (Weavers 1993), the Lace Monitor requires large tracts of suitable habitat.

Distribution in the West CRA region:

Records of the Lace Monitor in the West CRA region occur predominantly east of the Grampians National Park from Marnoo and Dadswells Bridge in the north to Jallukar. Also recorded from the east of the region from Dunneworthy State Forest and near Landsborough, and from Mount Arapiles and Casterton in the west. The species has been recorded from privately-owned land, roadside reserves, state forest and conservation reserves (Atlas of Victorian Wildlife).

rbances and potentially processes operating in the region: Disturbances threatening West CRA

The Lace Monitor is threatened primarily by disturbances such as timber harvesting and clearing that involve the loss of large trees (living and dead), upon which this species depends for foraging, basking and shelter (Brown and Bennett 1995). These disturbances also result in habitat rnese disturbances also result in habitat fragmentation which is considered a threat to this species because of its large home range requirements and tendency to use connected remnants. Fuel reduction burning and wildfire are regarded as a moderate threat to the Lace Monitor as they can result in loss of foraging sheltering and nesting sites (Friend 1993, G. Brown pers. comm.). nesting sites (Friend 1993, G. Brown pers. comm.). Other potentially threatening processes that may degrade habitat include tree dieback and grazing. Road construction removes and fragments habitat and may increase the possibility of roadkills, a not uncommon occurrence for this species (P. Robertson pers. comm.). Any activities that lead to the loss or destruction of termitaria in Lace Monitor habitat may severely impact this species (P. Robertson pers. comm.). Certain rabbit control methods such as 'ripping' burrows and destroying accumulations of ripping' burrows and destroying accumulations of logs and debris (that may harbor rabbits) could reduce available shelter and foraging opportunities (P. Robertson pers. comm.). Similarly, large reductions in rabbit numbers through control methods such as Rabbit Calicivirus Disease and baiting may deprive Lace Monitors of a vital food resource. Monitors are also susceptible to baits laid to control introduced carnivores (G. Brown pers. comm.). The Lace Monitor exhibits dietary overlap with foxes and cats, and competition for food may have some impact on monitor populations (G. Brown and P. Robertson pers. comm.). Small Lace Monitors may be at risk from predation from introduced carnivores (Alexander 1997). In the past the Lace Monitor has been a target for illegal collection though presently this is considered a minor threat to this species (P. Robertson pers. comm.). Lace Monitors and their nests may be disturbed by recreational activities such as camping, and there is a small risk that people may kill the lizards during acts of vandalism (P. Robertson pers. comm.).

Common Scaly-foot

Pygopus lepidopodus

RARITY

- a) Geographic Range
 Classification of range size within the West region: Small
- Distribution of records within the West region: Single record west of Dadswells Bridge, on the north-east edge of Grampians National Park. Number of 5 minute grid cells recorded from: 1 Source: Atlas of Victorian Wildlife
- b) Abundance
- Classification of abundance: Low
- Population Estimate: Unknown
- Density: Unknown Home Range (ha): Unknown
- Source: P. Robertson pers. comm.
 c) Habitat Specificity
- Classification of habitat specificity: Medium
- Vegetation types inhabited in the region: Woodland.

In other areas recorded from Box-Ironbark with green mallee and dense understorey to and is also known to inhabit a variety of forest types including heathlands, mallee and semi-arid vegetation.

Source: Wilson and Knowles (1988), Ehmann (1992), Cogger (1996), P. Robertson pers. comm

DYNAMICS

Population Trend in Last Decade

- Increasing, stable or declined: Unknown
 Source: P. Robertson pers. comm.
 Population trend since discovery by Europeans
 Increasing, stable or declined: Likely decline commensurate with broad-scale clearing of
- native vegetation for agriculture, forest produce and mining. • Source: P. Robertson pers. comm. SPATIAL DYNAMICS a) Population variability

- Classification of population variability: Unknown Source: P. Robertson pers. comm.
- b) Dispersal Classification of powers of dispersal: Low
- Average distances dispersed: Unknown
- Maximum distance dispersed: Unknown

Source: P. Robertson pers. comm. LIFE HISTORY PARAMETERS a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity (yrs): Unknown
- Mean clutch/litter/brood size: 2 eggs
- Mean no of clutches/litters/broods per year: 1
- Time of year young hatch: March to late April (or possibly earlier).
- Source: Patchell and Shine (1986), Ehmann (1992), P. Robertson pers. comm.
- b) Longevity
- Classification of lifespan: Unknown
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): Unknown
- Source: P. Robertson pers. comm.

c) Morphology

- Adult body size
- Weight (g): Unknown Length (mm): 275 (maximum snout-vent), 855
- (maximum total) Source: Patchell and Shine (1986), Wilson and
- Knowles (1988), Ehmann (1992), Cogger (1996) d) Social organisation
- Colonial or non-colonial: Non-colonial
- Territoriality: Unknown
- Source: P. Robertson pers. comm.
- e) Other
- Nomadic, migratory, sedentary: Sedentary
- Diet: Spiders (especially burrowing forms), and insects.
- Source: Patchell and Shine (1986), Hutchins and Sleeper (1989), Ehmann (1992)

THREATS

1. Clearing of Native Vegetation: Ranking (3) P. Robertson and G. Brown pers. comm.

2. Timber Harvesting: Ranking (1) P. Robertson and G. Brown pers. comm

3. Fuel Reduction Burning: Ranking (3) P.

Robertson pers. comm.

4. Firewood Collection: Ranking (2) P. Robertson and G. Brown pers. comm.

5. Unplanned Fire: Ranking (2) P. Robertson and G. Brown pers. comm.

6. Introduced Species: Ranking (2) P. Robertson and G. Brown pers. comm.

7. Grazing/Trampling: Ranking (2) P. Robertson and G. Brown pers. comm.

8. Pest Control: Ranking (1) G. Brown pers. comm.

9. Road Construction and Maintenance: Ranking

(1) P. Robertson pers. comm.

10. Mining/Quarrying: Ranking (2) P. Robertson pers. comm.

- 11. Tree Dieback: Ranking (-)
- 12. Recreation: Ranking (0) P. Robertson pers.

comm. 13. Illegal Collecting/Harvesting: Ranking (0) P.

Robertson pers. comm.

14. Vandalism: Ranking (0) P. Robertson pers. comm.

15. Dams/Impoundments: Ranking (0) P. Robertson

and G. Brown pers. comm. **16. Other: Rock Harvesting: Ranking (1)** P. Robertson and G. Brown pers. comm.

Current Management:

The Common Scaly-foot is not classified as a threatened species in Victoria (NRE 1999). This lizard is common in the mallee, but very uncommon elsewhere. There are currently no management prescriptions for this species in the West CRA region.

Species characteristics:

The Common Scaly-foot is a large terrestrial pygopodid ('legless lizard'), which is found in a variety of habitats, from wet sclerophyll coastal forests and coastal heaths and dunes, to semi-arid mallee associations, temperate open forests, woodlands and tea-tree and heath swamps (Wilson and Knowles 1988, Ehmann 1992, Cogger 1996). Within this habitat this lizard shelters beneath rocks, low vegetation, fallen timber and other ground debris (Wilson and Knowles 1988, Ehmann 1992, Cogger 1996). The Common Scaly-foot's diet is composed predominantly of spiders, particularly burrowing forms, but insects and skinks are also consumed (Patchell and Shine 1986, Hutchins and Sleeper 1989, Ehmann 1992). This lizard will pursue spiders Primarily 1992). This lizard will pursue spiders in their own burrows and climb low dense shrubs and hummock grasses to forage (Ehmann 1992). Primarily diurnal, this species becomes crepuscular to nocturnal in hot weather (Patchell and Shine 1986, Wilson and Knowles 1988, Hutchins and Sleeper 1989, Ehmann 1992, Cogger 1996). The Common Scaly-foot mates in spring, and two eggs are laid beneath a rock or log in late spring or summer, hatching between March and late April (Patchell and Shine 1986, Ehmann 1992), or possibly earlier (P Shine 1986, Ehmann 1992), or possibly earlier (P. Robertson pers. comm.). Communal nesting has been recorded for this species (Patchell and Shine 1986, Ehmann 1992).

Distribution in the West CRA region:

There is a single 1995 record of this species from west of Dadswells Bridge, on the north-east edge of the Grampians National Park (Atlas of Victorian Wildlife).

Disturbances and potentially threate processes operating in the West CRA region: threatening

Land clearing has reduced much of the Common Scaly-foot's habitat to undisturbed areas of remnant bushland, and any activities which disturb this habitat may threaten this species and its prey. Grazing by may threaten this species and its prey. Grazing by domestic stock may remove or alter ground-level vegetation and debris. Clearing of vegetation reduces the source material for ground debris, threatening an important resource for this lizard and prey. Similarly, the loss of ground debris through wildfire and fuel reduction burns may expose individuals to predators. The impact of exotic predators such as cats and foxes is unclear, but likely to be deleterious. The collection of firewood and rocks removes shelter sites from this lizard's habitat. The use of pesticides is likely to deplete numbers of The use of pesticides is likely to deplete numbers of prey for the Common Scaly-foot (G. Brown pers. comm.). The localised distribution of this species in the region renders the population highly susceptible to extirpation from catastrophic events such as wildfire, with little chance of recolonisation.

Warty Bell Frog Litoria raniformis

RARITY

a) Geographic Range

- Classification of range size within the West region: Large
- Distribution of records within the West region: Records are widespread across the region, with a concentration of records west of Melbourne.
- Number of 5 minute grid cells recorded from: 124
- Source: Atlas of Victorian Wildlife
- b) Abundance Classification of abundance: Unknown, but can be locally common
- Population Estimate: Unknown
- Density: Unknown Home Range (ha): Unknown
- Source: Atlas of Victorian Wildlife, N. Clemann pers. comm.
- c) Habitat Specificity
- Classification of habitat specificity: Wide
- Vegetation types inhabited in the region: Recorded from roadside culvets amidst cleared land, swamps, lakes, ponds, and Brown Stringybark *Eucalyptus baxteri* forest with a heathy understorey. Source: N. Clemann and G. Brown pers. comm.
- Population Trend in Last Decade
- Increasing, stable or declined: Declined
- Source: Johnson (1994), Osborne *et al.* (1996)
 Population trend since discovery by Europeans
 Increasing, stable or declined: Declined
- Source: Johnson (1994), Osborne *et al.* (1996)
 SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: Unknown Source: G. Gillespie pers. comm.
- b) Dispersal
- Classification of powers of dispersal: Unknown
- Average distances dispersed: Unknown
- Maximum distance dispersed: Unknown

Source: G. Gillespie pers. comm. LIFE HISTORY PARAMETERS a) Reproductive output

- Classification of reproductive output: Unknown
- Age of sexual maturity (yrs): Unknown
- Mean clutch/litter/brood size: Unknown
- Mean no of clutches/litters/broods per year: Unknown
- Time of year young born/hatch: Tadpoles develop over summer and autumn, and metamorphose between late summer and autumn. Tadpoles may overwinter, metamorphosing the following season. Source: Gillespie *et al.* (1995)

b) Longevity

- Classification of lifespan: Unknown
- Average lifespan (yrs): Approximately 6 Maximum lifespan (yrs): Unknown Source: Ashworth (1998)

c) Morphology

- Adult body size Weight (g): Up to 100
- Length (mm): Male 55-65, Female 60-104 Source: Barker *et al.* (1995), Gillespie pers.
- comm.

d) Social organisation

- Colonial or non-colonial: Unknown, aggregations recorded.
- Territoriality: Yes (calling males)
- Source: Humphries (1979)
- e) Other
- Nomadic, migratory, sedentary: Unknown
- Diet: Frogs and invertebrates Source: Humphries (1979), Hero et al. (1991)

THREATS

1. Clearing of Native Vegetation: Ranking (3) Ashworth (1998)

2. Timber Harvesting: Ranking (1) G. Gillespie pers, comm

3. Fuel Reduction Burning: Ranking (1) Gillespie et al. (1995)

- 4. Firewood Collection: Ranking (1) Gillespie et al. (1995)
- 5. Unplanned Fire: Ranking (1) G. Gillespie pers. comm.

6. Introduced Species: Ranking (3) Gillespie et al. (1995), White and Pyke (1996), Tyler (1997)

- 7. Grazing/Trampling: Ranking (2) Tyler (1997),
- Ashworth (1998
- 8. Pest Control: Ranking (3) Gillespie et al. (1995), Tyler (1997)
- 9. Road Construction and Maintenance: Ranking (-)
- 10. Mining/Quarrying: Ranking (-) 11. Tree Dieback: Ranking (-)
- 12. Recreation: Ranking (0) G. Gillespie pers. comm.
- 13. Illegal Collecting/Harvesting: Ranking (1) G.
- Gillespie pers. comm.
- 14. Vandalism: Ranking (-)
- 15. Dams/Impoundments: Ranking (-)
 16. Other: Ozone depletion: Ranking (2) Gillespie et al. (1995), Tyler (1997), Pollution: Ranking: (2) G. Gillespie pers. comm.

Current Management:

The Warty Bell Frog is classified as "vulnerable" in Victoria (NRE 1999). There are no current wittionia (NRE 1999). There are no current management prescriptions for the Warty Bell Frog in the West CRA region.

Species characteristics:

Species characteristics: The Warty Bell Frog is a large and widespread species which may be locally common (Hero *et al.* 1991). Largely aquatic, this species is active by day and preys upon other frogs, including conspecifics (Humphries 1979, Hero *et al.* 1991, Cogger 1996), and invertebrates (Humphries 1979). It inhabits woodlands, shrublands and open and disturbed areas with permanent still water (Gillespie *et al.* 1995, Hero *et al.* 1991, Cogger 1996). Within this habitat this frog shelters amongst sedges or other aquatic vegetation, or beneath logs and rocks (Gillespie *et al.* 1995). The Warty Bell Frog is known to bask (Humphries 1979, Tyler 1997). Breeding is predicted to occur between August and April in permanent lakes, swamps, dams and lagoons (Hero *et al.* 1991, Cogger 1996). The biology and ecology of this species are poorly known.

Distribution in the West CRA region:

Records of the Warty Bell Frog in the region are widespread. A considerable concentration of records exist immediately west, north-west and south-west of exist immediately west, north-west and south-west of Melbourne, probably reflecting the concentrated human population (and thus recording opportunities) in these areas (Atlas of Victorian Wildlife). While a large proportion of these records originate from privately-owned land, this species has been recorded across most land tenures, including state forest, state parks, national parks and fauna and flora reserves (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the West CRA region:

The Warty Bell Frog has undergone a dramatic decline in south-eastern Australia (Osborne *et al.* 1996, Tyler 1997). Whilst there is little information available on disturbances and threatening processes on this species in the West CRA region, major threats most likely include loss of habitat from drainage of swamps and wetlands for agricultural and urban development, and cattle grazing which is likely to damage Warty Bell Frog breeding habitat and negatively impact on populations (Tyler 1997). Agricultural practices which affect water quality, such as the application of fertilizers, also threaten this frog (Ashworth 1998). The removal of rocks, fallen timber and remnant vegetation during processes such as land clearing, timber harvesting, firewood collection and fuel reduction burning may adversely affect this species (Gillespie *et al.* 1995). The use of both pesticides (Gillespie *et al.* 1995) and herbicides (Tyler 1997) has been implicated in the decline of this The Warty Bell Frog has undergone a dramatic

frog. Introduced Mosquito Fish *Gambusia affinis* and *G. holbrooki*) may prey on the larval stage of this frog, reducing recruitment into the adult population (Gillespie *et al.* 1995, White and Pyke 1996, Tyler 1997). Considerable declines in this species have been observed during periods of drought. During these periods breeding activity may be suppressed, and there may be increased motality of larvae and dessication of adults (Gillespie *et al.* 1995, Osborne *et al.* 1996). As a basking species, the Warty Bell Frog is exposed to UV rays, and it has been suggested that increased UV radiation, resulting from a depletion of the ozone layer, may be harmful to this species (Gillespie *et al.* 1995, Tyler 1997).