

APPENDIX A: North East stratification and survey intensity analysis - flora

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

Key to lithology*

a = finely textured unconsolidated deposits: highest fertility

b = finely textured unconsolidated deposits/coarsely textured unconsolidated deposits: moderate fertility

c = granites and gneisses: moderate to low fertility

d = granites and gneisses/sedimentary: moderate fertility

e = sedimentary rock: low fertility (except where rainfall is high)

f = sedimentary/granites and gneisses: low fertility

g = sedimentary/volcanic rock: low/moderate fertility

h = volcanic rock (acid volcanics): low fertility

i = volcanic rock/granites and gneisses: low fertility

j = volcanic/sedimentary rock: high fertility

? = undescribed

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

Stratum No.	mean ann. precip.	min. temp. coldest month	max. temp. warmest month	lithology*	# spp	# sites	probability next species new (%)	forest area (ha)	% of forest in North East	# polygons	site density (sites per 10,000 ha)	distribution (geographic units)
77	v. high	low	low	c	299	231	1	23,024	1.70	100	100.33	Bogong Mountains
76	v. high	low	low	e	310	220	2	18,082	1.34	222	121.67	Pinnabar Mountains, Bogong Mountains
20	low	high	v. high	e	245	46	5	7,423	0.55	236	61.97	Mt Pilot Foothills, Strathbogie Foothills
Total								48,529	3.59			

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

Stratum No.	mean ann. precip	min. temp. coldest month	max. temp. warmest month	lithology	# spp	# sites	probability next species new (%)	forest area (ha)	% of forest in North East	# polygons	site density (sites per 10,000 ha)	distribution (geographic units)
61	v. high	moderate	moderate	e	309	78	2	65,778	4.86	366	11.86	Mitta Foothills, Big Ben Foothills, Bogong Mountains
30	moderate	high	high	c	376	46	6	35,392	2.61	942	13.00	Mt Pilot Foothills, Strathbogie Foothills, Highlands Foothills
70	v. high	low	moderate	e	274	92	3	32,992	2.44	236	27.89	Pinnabar Mountains, Dartmouth Mountains, Bogong Mountains
10	low	high	v. high	c	343	29	11	18,014	1.33	676	16.10	Bogong Mountains
73	high	low	moderate	e	207	24	13	13,275	0.98	349	18.08	Pinnabar Mountains, Buffalo Mountains, Bogong Mountains, Barry Mountains, Big River Mountain
68	v. high	low	moderate	c	199	24	14	11,243	0.83	427	21.35	Pinnabar Mountains, Buffalo Mountains, Bogong Mountains

<i>Stratum No.</i>	<i>mean ann. precip</i>	<i>min. temp. coldest month</i>	<i>max. temp. warmest month</i>	<i>lithology</i>	<i># spp</i>	<i># sites</i>	<i>probability next species new (%)</i>	<i>forest area (ha)</i>	<i>% of forest in North East</i>	<i># polygons</i>	<i>site density (sites per 10,000 ha)</i>	<i>distribution (geographic units)</i>
101	moderate	high	moderate	c	209	27	6	8,559	0.63	183	31.54	Strathbogrie Foothills, Highland Foothills
15	low	high	v. high	a	225	23	13	5,926	0.44	861	38.82	Mt Pilot Foothills, King River Floodplain
79	v. high	high	high	e	140	5	*	4,877	0.36	205	10.25	Big Ben Foothills, Bogong Mountains
78	v. high	moderate	high	e	167	11	11	4,783	0.35	280	23.00	Mitta Foothills, Big Ben Foothills, Bogong Mountains
49	low	high	high	c	97	4	*	3,673	0.27	317	10.89	Highlands Foothills
114	moderate	high	moderate	e	104	5	*	2,908	0.21	148	17.19	Strathbogrie Foothills, Barry Mountains
13	moderate	moderate	v. high	i	69	3	*	2,570	0.19	65	11.67	Corryong Foothills
35	moderate	high	high	a	90	2	*	1,981	0.15	38	10.10	Big Ben Foothills, Toombullup Foothills
16	low	v. high	v. high	a	61	5	*	1,962	0.14	415	25.48	Mt Pilot Foothills, Toombullup Foothills, Strathbogrie Foothills, Highlands Foothills
64	high	moderate	moderate	f	102	5	*	1,600	0.12	14	31.24	Big Ben Foothills
83	low	high	v. high	h	115	5	*	1,470	0.11	135	34.01	Strathbogrie Foothills
9	low	v. high	v. high	b	9	2	*	1,414	0.10	134	14.14	Mt Pilot Foothills
27	low	v. high	v. high	e	30	1	*	827	0.06	91	12.09	Strathbogrie Foothills, Highlands Foothills
117	low	v. high	high	b	30	1	*	628	0.05	152	15.92	Highlands Foothills
Total								219,872	16.23			

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

<i>Stratum No.</i>	<i>mean ann. precip</i>	<i>min. temp. coldest month</i>	<i>max. temp. warmest month</i>	<i>lithology</i>	<i># spp</i>	<i># sites</i>	<i>probability next species new (%)</i>	<i>forest area (ha)</i>	<i>% of forest in North East</i>	<i># polygons</i>	<i>site density (sites per 10,000 ha)</i>	<i>distribution (geographic units)</i>
50	high	moderate	moderate	e	512	184	2	219,771	16.23	847	8.37	Pinnibar Mountains, Dartmouth Mountains, Buffalo Mountains, Barry Mountains, Big River Mountain
42	high	high	high	e	336	32	9	141,158	10.43	739	2.27	Mitta Foothills, Big Ben Foothills, Buffalo Mountains, Upper King Mountains
52	high	high	moderate	e	312	33	8	89,804	6.63	696	3.67	Upper King Mountains, Delatite Valley, Big River Mountain, Matlock Mountains
5	moderate	moderate	high	d	99	2	*	43,816	3.24	302	0.46	Corryong Foothills, Tallangatta Foothills, Pinnibar Mountains
51	high	moderate	high	e	120	5	*	39,563	2.92	539	1.26	Tallangatta Foothills, Mitta Foothills, Dartmouth Mountains
38	moderate	high	v. high	e	109	4	*	36,980	2.73	934	1.08	Mitta Foothills, Big Ben Foothills, King River Floodplain, Buffalo Mountains
22	high	moderate	high	d	124	4	*	36,881	2.72	182	1.08	Tallangatta Foothills, Pinnibar Mountains
39	moderate	high	high	e	243	13	18	34,091	2.52	720	3.81	Big Ben Foothills, Toombullup Foothills, Strathbogie Foothills, Barry Mountains, Delatite Valley
23	high	moderate	moderate	c	292	29	13	31,881	2.35	217	9.10	Tallangatta Foothills, Pinnibar Mountains, Dartmouth Mountains, Buffalo Mountains, Upper King Mountains, Delatite Valley
28	high	moderate	moderate	d	182	12	20	29,717	2.20	106	4.04	Pinnibar Mountains, Tallangatta Foothills
100	high	high	moderate	h	179	10	21	26,874	1.99	68	3.72	Upper King Mountains, Toombullup Foothills
19	high	moderate	high	c	191	9	19	26,528	1.96	242	3.39	Tallangatta Foothills, Granya Foothills, Dartmouth Mountains
90	moderate	high	high	h	217	11	13	25,302	1.87	224	4.35	Toombullup Foothills, Strathbogie Foothills
31	high	high	high	c	221	10	20	23,669	1.75	299	4.23	Mitta Foothills, Big Ben Foothills, Buffalo Mountains

Stratum No.	mean ann. precip	min. temp. coldest month	max. temp. warmest month	lithology	# spp	# sites	probability next species new (%)	forest area (ha)	% of forest in North East	# polygons	site density (sites per 10,000 ha)	distribution (geographic units)
94	high	high	high	h	220	8	30	21,394	1.58	36	3.74	Toombullup Foothills, Upper King Mountains
12	moderate	moderate	high	c	178	6	33	18,519	1.37	337	3.24	Granya Foothills, Tallangatta Foothills, Pinnibar Mountains
63	high	high	high	a	177	9	27	17,793	1.31	216	5.06	Buffalo Mountains, Upper King Mountains, Barry Mountains
115	moderate	v. high	high	e	136	5	*	17,328	1.28	208	2.89	Highlands Foothills, Big River Mountain, Delatite Valley
11	moderate	high	v. high	c	128	4	*	16,496	1.22	1108	2.42	Mt Pilot Foothills, Big Ben Foothills, Mitta Foothills, Strathbogie Foothills
71	high	high	moderate	c	190	8	34	15,236	1.13	78	5.25	Toombullup Foothills, Upper King Mountains, Delatite Valley, Strathbogie Foothills, Buffalo Mountains
132	high	v. high	high	e	238	13	16	15,100	1.12	57	8.61	Big River Mountain
72	moderate	moderate	moderate	e	152	9	28	13,177	0.97	104	6.83	Barry Mountains
66	high	high	v. high	e	102	2	*	12,065	0.89	489	1.66	Big Ben Foothills, Mitta Foothills, Buffalo Mountains
4	moderate	moderate	v. high	d	72	1	*	11,243	0.83	161	0.89	Corryong Foothills, Granya Foothills, Tallangatta Foothills, Pinnibar Mountains
54	moderate	moderate	high	e	102	4	*	11,110	0.82	139	3.60	Pinnibar Mountains, Dartmouth Mountains
33	v. high	moderate	moderate	c	170	9	36	10,373	0.77	82	8.68	Tallangatta Foothills, Pinnibar Mountains
8	moderate	moderate	v. high	c	217	8	31	9,827	0.73	379	8.14	Granya Foothills, Tallangatta Foothills, Mitta Foothills
7	moderate	high	v. high	b	56	2	*	6,141	0.45	992	3.26	Mitta Foothills, Buffalo Mountains, Big Ben Foothills, Corryong Foothills, King River Floodplain
81	high	high	v. high	a	83	2	*	5,301	0.39	184	3.77	Buffalo Mountains, Upper King Mountains, Big Ben Foothills
17	moderate	moderate	high	i	110	4	*	4,923	0.36	39	8.12	Corryong Foothills
26	high	moderate	moderate	i	85	3	*	4,815	0.36	10	6.23	Corryong Foothills
34	moderate	high	v. high	a	78	2	*	3,996	0.30	395	5.00	Big Ben Foothills, Buffalo Mountains, Toombullup Foothills
36	v. high	moderate	moderate	d	59	2	*	3,802	0.28	77	5.26	Tallangatta Foothills, Pinnibar Mountains
85	moderate	high	v. high	h	44	1	*	3,720	0.27	156	2.69	Toombullup Foothills
75	high	low	moderate	c	74	3	*	3,108	0.23	68	9.65	Bogong Mountains, Pinnibar

Stratum No.	mean ann. precip	min. temp. coldest month	max. temp. warmest month	lithology	# spp	# sites	probability next species new (%)	forest area (ha)	% of forest in North East	# polygons	site density (sites per 10,000 ha)	distribution (geographic units)
												Mountains, Barry Mountains
29	v. high	moderate	moderate	i	64	2	*	2,679	0.20	15	7.47	Corryong Foothills
24	high	moderate	high	i	95	2	*	2,170	0.16	56	9.21	Corryong Foothills
109	low	high	high	e	32	1	*	2,086	0.15	130	4.79	Highlands Foothills, Delatite Valley, Barry Mountains
86	high	moderate	moderate	a	39	1	*	1,216	0.09	38	8.23	Buffalo Mountains, Barry Mountains
98	moderate	high	high	j	49	1	*	1,015	0.08	36	9.85	Toombullup Foothills
Total								1,040,668	76.88			

STRATA (>500 HA) WITHOUT SAMPLE SITES

Stratum No.	mean ann. precip	min. temp. coldest month	max. temp. warmest month	lithology	# spp	# sites	probability next species new (%)	forest area (ha)	% of forest in North East	# polygons	site density (sites per 10,000 ha)	distribution (geographic units)
1	low	high	v. high	b	0	0	100	5,147	0.38	659	0.00	King River Floodplain, Mt Pilot Foothills, Mitta Foothills
110	high	moderate	moderate	h	0	0	100	3,370	0.25	38	0.00	Upper King Mountains, Barry Mountains
116	low	v. high	high	e	0	0	100	3,334	0.25	262	0.00	Highlands Foothills
112	low	v. high	high	c	0	0	100	3,285	0.24	267	0.00	Highlands Foothills
59	high	high	v. high	c	0	0	100	3,175	0.23	236	0.00	Big Ben Foothills, Mitta Foothills
3	moderate	moderate	v. high	b	0	0	100	3,172	0.23	315	0.00	Corryong Foothills, Tallangatta Foothills, Pinnibar Mountains
60	high	moderate	v. high	e	0	0	100	2,882	0.21	226	0.00	Mitta Foothills
21	moderate	moderate	high	b	0	0	100	2,826	0.21	166	0.00	Pinnibar Mountains, Tallangatta Foothills
113	moderate	v. high	high	c	0	0	100	2,468	0.18	192	0.00	Highlands Foothills
53	high	high	high	b	0	0	100	2,235	0.17	141	0.00	Mitta Foothills, Buffalo Mountains, Bogong Mountains, Tallangatta Foothills
69	high	high	v. high	b	0	0	100	2,032	0.15	176	0.00	Buffalo Mountains, Mitta Foothills
46	high	high	high	f	0	0	100	1,292	0.10	59	0.00	Tallangatta Foothills, Big Ben Foothills
57	moderate	moderate	v. high	e	0	0	100	1,221	0.09	73	0.00	Tallangatta Foothills, Mitta Foothills
74	moderate	moderate	moderate	c	0	0	100	1,204	0.09	35	0.00	Pinnibar Mountains, Bogong Mountains
103	high	high	moderate	a	0	0	100	1,159	0.09	41	0.00	Upper King Mountains, Barry

<i>Stratum No.</i>	<i>mean ann. precip</i>	<i>min. temp. coldest month</i>	<i>max. temp. warmest month</i>	<i>lithology</i>	<i># spp</i>	<i># sites</i>	<i>probability next species new (%)</i>	<i>forest area (ha)</i>	<i>% of forest in North East</i>	<i># polygons</i>	<i>site density (sites per 10,000 ha)</i>	<i>distribution (geographic units)</i>
												Mountains
82	moderate	high	high	g	0	0	100	905	0.07	32	0.00	King River Floodplain
80	moderate	high	v. high	g	0	0	100	668	0.05	21	0.00	King River Floodplain
6	moderate	high	v. high	d	0	0	100	633	0.05	119	0.00	Corryong Foothills, Granya Foothills, Tallangatta Foothills
92	high	high	high	g	0	0	100	563	0.04	25	0.00	King River Floodplain
88	v. high	high	high	c	0	0	100	517	0.04	30	0.00	Big Ben Foothills, Bogong Mountains
Total								42,088	3.12			

STRATA OCCUPYING LESS THAN 500 HECTARES

<i>Stratum No.</i>	<i>mean ann. precip</i>	<i>min. temp. coldest month</i>	<i>max. temp. warmest month</i>	<i>lithology</i>	<i># spp</i>	<i># sites</i>	<i>probability next species new (%)</i>	<i>forest area (ha)</i>	<i>% of forest in North East</i>	<i># polygons</i>	<i>site density (sites per 10,000 ha)</i>	<i>distribution (geographic units)</i>
44	moderate	moderate	v. high	f	0	0	100	389	0.03	32	0.00	Tallangatta Foothills
111	v. high	low	low	h	?	5	?	377	0.03	48	132.63	Bogong Mountains
93	low	v. high	v. high	c	0	0	100	332	0.02	69	0.00	Highlands Foothills
107	high	high	high	j	0	0	100	325	0.02	10	0.00	Toombullup Foothills
119	low	high	high	?	0	0	100	289	0.02	62	0.00	Delatite Valley
125	moderate	high	high	?	0	0	100	275	0.02	132	0.00	Delatite Valley
126	high	moderate	moderate	g	0	0	100	213	0.02	14	0.00	Barry Mountains
127	high	low	moderate	h	18	1	*	165	0.01	4	60.74	Barry Mountains
43	moderate	high	v. high	f	0	0	100	158	0.01	31	0.00	Tallangatta Foothills, Big Ben Foothills
25	low	high	v. high	?	0	0	100	87	0.01	50	0.00	Granya Foothills, Pinnibar Mountains
121	v. high	moderate	moderate	h	0	0	100	36	0.00	4	0.00	Upper King Mountains
124	moderate	v. high	high	h	0	0	100	18	0.00	3	0.00	Delatite Valley
40	moderate	high	v. high	?	0	0	100	14	0.00	6	0.00	Mitta Foothills
118	high	low	low	c	0	0	100	9	0.00	1	0.00	Barry Mountains
Total								2,687	0.19			

APPENDIX B: - Fauna Survey Intensity - North East

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 North East 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 Mammals	Large Mammals	Small Ground Mammals	Bats	Diurnal Birds	Nocturnal Birds	Large Forest Owls	Reptiles	Amphibians
1	5,147	0.38	*	*	25	100	27	*	*	*	*
3	3,172	0.23	100	100	0	100	*	100	100	100	100
4	11,243	0.83	*	24	7	0	25	*	100	49	100
5	43,816	3.24	11	15	7	0	12	15	91	0	100
6	633	0.05	100	100	100	100	100	100	100	100	100
7	6,141	0.45	100	100	100	100	*	100	100	100	100
8	9,827	0.73	4	0	0	8	7	16	76	21	100
9	1,414	0.10	*	*	100	*	19	*	*	100	100
10	18,014	1.33	0	14	0	0	3	100	20	13	20
11	16,496	1.22	23	9	5	13	6	0	100	*	*
12	18,519	1.37	0	21	0	7	18	25	72	*	*
13	2,570	0.19	100	*	*	0	*	100	100	*	*
15	5,926	0.44	0	63	2	13	4	36	100	100	5
16	1,962	0.14	*	*	100	*	*	100	*	100	100
17	4,923	0.36	*	*	*	100	*	*	*	0	*
19	26,528	1.96	0	8	3	0	5	14	100	21	76
20	7,423	0.55	11	2	4	0	1	45	100	12	5
21	2,826	0.21	100	100	100	100	100	100	100	100	100
22	36,881	2.72	7	53	1	0	18	0	100	33	*
23	31,881	2.35	0	4	2	0	2	0	100	12	0
24	2,170	0.16	*	64	*	0	*	*	*	50	*
25	87	0.01	100	100	100	100	100	100	100	100	100

Strata No.	Area (ha)	% Forest Area	Arboreal Mammals	Large Mammals	Small Ground Mammals	Bats	Diurnal Birds	Nocturnal Birds	Large Forest Owls	Reptiles	Amphibians
26	4,815	0.36	*	7	12	100	*	*	100	23	100
27	827	0.06	*	100	0	0	20	*	100	18	0
28	29,717	2.20	15	9	0	0	5	0	44	15	100
29	2,679	0.20	*	*	100	100	100	*	*	100	100
30	35,392	2.61	0	5	0	1	2	0	0	27	0
31	23,669	1.75	9	0	23	*	6	25	84	19	100
33	10,373	0.77	28	40	100	0	18	*	100	22	100
34	3,996	0.30	*	*	100	100	*	*	*	100	100
35	1,981	0.15	*	*	14	100	*	*	93	*	*
36	3,802	0.28	*	93	*	100	*	*	100	100	100
38	36,980	2.73	24	36	100	100	7	*	100	56	100
39	34,091	2.52	4	8	0	0	4	41	100	*	*
40	14	0.00	100	100	100	100	100	100	100	100	100
42	141,158	10.43	1	6	3	0	1	5	10	3	17
43	158	0.01	100	100	100	100	100	100	100	100	100
44	389	0.03	100	100	100	100	100	100	100	100	100
46	1,292	0.10	100	100	100	100	*	100	100	100	100
49	3,673	0.27	100	100	100	100	100	100	100	100	100
50	219,771	16.23	2	3	0	0	0	0	16	4	51
51	39,563	2.92	23	0	5	3	5	0	100	51	100
52	89,804	6.63	2	4	2	3	4	8	0	22	100
53	2,235	0.17	*	*	*	100	*	*	*	100	100
54	11,110	0.82	*	*	*	*	*	*	*	*	*
57	1,221	0.09	100	100	100	100	100	100	100	100	100
59	3,175	0.23	100	100	100	100	100	100	100	100	*
60	2,882	0.21	*	*	100	100	*	100	*	100	100
61	65,778	4.86	1	1	1	0	1	4	0	5	100
63	17,793	1.31	19	22	55	0	11	100	100	16	100
64	1,600	0.12	*	*	100	100	100	*	*	100	100

Strata No.	Area (ha)	% Forest Area	Arboreal Mammals	Large Mammals	Small Ground Mammals	Bats	Diurnal Birds	Nocturnal Birds	Large Forest Owls	Reptiles	Amphibians
66	12,065	0.89	*	39	*	100	9	100	*	*	*
68	11,243	0.83	40	88	25	0	18	0	100	50	100
69	2,032	0.15	*	*	100	100	12	*	*	100	100
70	32,992	2.44	26	4	6	4	1	10	0	0	0
71	15,236	1.13	5	8	4	0	2	52	92	*	*
72	13,177	0.97	97	14	0	6	*	*	*	95	99
73	13,275	0.98	55	33	5	5	16	*	100	14	100
74	1,204	0.09	100	100	100	100	100	100	100	100	100
75	3,108	0.23	100	*	*	100	100	100	100	100	100
76	18,082	1.34	*	6	3	0	7	*	*	18	0
77	23,024	1.70	*	0	4	8	*	*	*	25	100
78	4,783	0.35	*	*	*	*	100	*	*	100	100
79	4,877	0.36	*	0	0	0	17	*	*	0	100
80	668	0.05	100	100	100	100	100	100	100	100	100
81	5,301	0.39	0	100	100	*	*	*	100	100	100
82	905	0.07	100	100	100	100	100	100	100	100	100
83	1,470	0.11	100	100	100	100	*	100	100	100	100
85	3,720	0.27	*	*	100	*	*	*	100	100	100
86	1,216	0.09	*	*	*	100	100	*	*	100	100
88	517	0.04	100	100	100	100	100	100	100	100	100
90	25,302	1.87	11	2	2	0	3	0	87	9	100
92	563	0.04	100	100	100	100	100	100	100	100	100
93	332	0.02	100	100	100	100	100	100	100	100	100
94	21,394	1.58	21	4	0	0	6	0	100	31	100
98	1,015	0.08	*	*	100	100	100	100	*	100	100
100	26,874	1.99	8	10	4	8	5	0	80	*	*
101	8,559	0.63	0	27	2	2	3	45	*	*	*
103	1,159	0.09	*	10	*	100	100	*	*	100	100
107	325	0.02	100	100	100	100	100	100	100	100	100

Strata No.	Area (ha)	% Forest Area	Arboreal Mammals	Large Mammals	Small Ground Mammals	Bats	Diurnal Birds	Nocturnal Birds	Large Forest Owls	Reptiles	Amphibians
109	2,086	0.15	*	*	100	100	100	*	*	100	100
110	3,370	0.25	100	100	100	*	*	100	100	100	100
111	377	0.03	100	100	100	100	100	100	100	100	100
112	3,285	0.24	100	100	100	100	100	100	100	100	100
113	2,468	0.18	100	100	100	100	100	100	100	100	100
114	2,908	0.21	*	65	0	57	*	*	36	*	*
115	17,328	1.28	34	95	*	100	16	*	100	*	*
116	3,334	0.25	*	*	100	100	*	*	*	100	100
117	628	0.05	*	*	100	*	100	*	100	100	100
118	9	0.00	100	100	100	100	100	100	100	100	100
119	289	0.02	100	100	100	100	100	100	100	100	100
121	36	0.00	100	100	100	100	100	100	100	100	100
124	18	0.00	100	100	100	100	100	100	100	100	100
125	275	0.02	100	100	100	100	100	100	100	*	*
126	213	0.02	*	*	100	100	100	*	*	100	100
127	165	0.01	100	100	100	100	100	100	100	100	100
132	15,100	1.12	23	20	9	1	6	93	100	18	29

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

Notes:

A vegetation **mosaic** consists of discrete floristic entities (EVCs) which were unable to be distinguished in the mapping due to the scale used (ie. 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. In the North East RFA area complexes were mapped as part of the pre-1750 mapping exercise on private land where sufficient information was available to determine that a group of EVCs occurred in a particular area but there was insufficient information available to accurately map the boundaries between them.

Mosaics and complexes where all components are individually described in this appendix have not been described separately.

Plains Grassy Woodland

Only one site is mapped (at Locksley) and appears to be a floristic community referred to by Foreman (in prep.) as Eastern Wet Grassland. Within the study area this vegetation occurs at the extreme eastern edge of the Northern Riverine Plains where annual rainfall is 500mm to 600mm, on Quaternary alluvial soils or (occasionally) on outwash colluvial deposits derived from adjacent Palaeozoic sediments. These soils are heavily textured throughout and are usually seasonally inundated. Scattered Grey Box *Eucalyptus microcarpa*, White Box *E. albens* and Yellow Box *E. melliodora* comprise the overstorey in the west of the study area whilst River Red Gum *E. camaldulensis* occurs further east where rainfall is higher and/or soils are more poorly drained. A sparse shrub layer of Golden Wattle *A. pycnantha*, Hedge Wattle *A. paradoxa*, Varnish Wattle *A. verniciflua* and other shrubs is often present.

Common species include Kangaroo Grass *Themeda triandra*, Wallaby Grasses *Austrodanthonia* spp., Spear Grasses *Austrostipa* spp., Common Wheat-grass *Elymus scaber*, Windmill Grass *Chloris truncata*, Common Bog-sedge *Schoenus apogon*, Little Club-sedge *Isolepis marginata*, Tall Sedge *Carex appressa*, Rushes *Juncus* spp., Black-anther Flax-lily *Dianella revoluta* s.s., Common Early Nancy *Wurmbea dioica* ssp. *dioica*, Vanilla Lily *Arthropodium* sp. aff. *strictum*, Milkmaids *Burchardia umbellata*, Yellow Bulbine-lily *Bulbine bulbosa*, Yellow Rush-lily *Tricoryne elatior*, Common Onion-orchid *Microtis unifolia*, Small Loosestrife *Lythrum hyssopifolia*, Scaly Buttons *Leptorhynchus squamatus*, Tall Sundew *Drosera peltata* ssp. *peltata*, Common Raspwort *Gonocarpus tetragynus*, Blue Devil *Eryngium ovinum*, Common everlasting *Chrysocephalum apiculatum* s.l., Common Sunray *Triptilodiscus pygmaeus*, Grassy Bindweed *Convolvulus remotus*, Grassland Wood-sorrel *Oxalis perennans*, Yellowish Bluebell *Wahlenbergia luteola* and Narrow Rock Fern *Cheilanthes sieberi* ssp. *sieberi*.

Despite the abundance of native species in this vegetation, the remnants are considered to be in moderate to poor condition due to a high frequency, cover and diversity of exotic species.

Plains Grassy Woodland is severely depleted within the study area and within Victoria. In the North East it occurs on very small, linear areas of public land such as road and rail reserves including Bonegilla, Glenrowan and Springhurst rail reserves and Boorhaman rail and road reserves. Plains Grassy Woodland in the study area is vulnerable to a variety of threats including grazing and trampling by stock, inappropriate burning regimes, weed invasion and soil disturbance associated with the maintenance of public utilities.

Equivalent unit in other studies:

Eastern Wet Grassland (in part) (Foreman in prep.).

Heathy Woodland

Heathy Woodland was observed at only one site in the study area at Jamieson Gap, north east of Jamieson on rocky maroon-coloured conglomerates. Structurally the vegetation occurs as a low, open woodland dominated in the over storey by Long-leaf Box *Eucalyptus goniocalyx* s.l. which attain a height of approximately ten metres. The understorey carries a diversity of shrubs (predominantly peas and epacrids) including Parrot Peas *Dillwynia* spp., Twisted Beard-heath *Leucopogon glacialis*, Prickly Broom-heath *Monotoca scoparia*, Daphne Heath *Brachyloma daphnoides*, and Guinea-flowers *Hibbertia* spp.. The field layer carries a dense array of grasses and herbs including Silvertop Wallaby-grass *Joycea* l., several species of daisy Asteraceae and several species of orchids.

Grassy Woodland

Floristic Community: Rainshadow Grassy Woodland

The characterisation of Rainshadow Grassy Woodland in the north-east is problematic as only one highly modified site was sampled. As a consequence, a character species table has not been produced. The information relating to the mapped locations does not have a strong correlation in terms of single site sampled and the species recorded there, however the environment (exposed sites, geology and rainfall) are correlated. Rainfall for all sites is less than 700mm per year. The parent geologies include Ordovician metamorphic rocks (primarily gneisses) and Devonian granitoids. Soils are sandy clay loams of moderate to high fertility which are deep brick red in colour.

The overstorey species vary in their dominance between Hill Red Gum *Eucalyptus blakelyi* and White Box *E. albens*. Lightwood *Acacia implexa*, Daphne Heath *Brachyloma daphnoides* and Nodding Blue-lily *Stypanandra glauca* being commonly present in the understorey. Most sites are grassy with a medium to high cover of weedy herbs. Species commonly present (based on mapping) include: Five-awned Spear-grass *Pentapogon quadrifidus*, Kangaroo Grass *Themeda triandra*, Wallaby Grasses *Danthonia* spp., Elegant Hair-grass *Aira elegans*, Quaking Grass species *Briza* spp., Squirrel-tail Fescue *Vulpia bromoides* and *Bromus* spp. Forbs include Hairy Pink *Petrorhagia velutina*, Erect Chickweed *Moenchia erecta*, Pimpernel *Anagallis arvensis* and Wall Speedwell *Veronica arvensis*.

Additional mapping of pre-1750s extent shows Rainshadow Grassy Woodland to have once been extensive on the hills north of Tallangatta in the Bethanga - Talgarno area, on the hills immediately south of Wodonga and on the low, fertile hills east of the Hume Freeway between Euroa and Benalla. The geology south of Wodonga consists of granitoids and schists. Additional species from this mapping include Red Stringybark *E. macrorhyncha*, Red Box *E. polyanthemus*, Yellow Box, *E. melliodora*, Grey Box *E. microcarpa*, Apple Box *E. bridgesiana*, Drooping Sheoke *Allocasuarina verticillata*, Black Cypress-pine *Callitris endlicheri*, Red Wattle *A. rubida*, Deane's Wattle *A. deanei*, Hedge Wattle *A. paradoxa*, Currawang *A. doratoxylon* (in rocky areas), Currajong *Brachychiton populneus*, Sweet Bursaria *Bursaria spinosa*, Dense Spear-grass *Austrostipa densiflora*, Rough Spear-grass *Austrostipa scabra* ssp. *scabra*, Red-leg Grass *Bothriochloa macra*, Tall Wheat-grass *Elymus scaber*, Cane Wire-grass *Aristida ramosa* and Purple Coral-pea *Hardenbergia violacea*.

Equivalent unit in other studies:

Rainshadow Woodland (Woodgate *et al.* 1994).

Floristic Community: Foothill Grassy Woodland

Foothill Grassy Woodland has only recently been confirmed as an EVC thus it is poorly sampled and has been mapped as part of Herb-rich Foothill Forest. This vegetation occurs as a woodland to open forest on moderate to steep, fairly dissected valley slopes above rivers at foothill elevations. Aspects are generally north through to west. The overstorey is represented by a number of eucalypt species including Narrow-leaved Peppermint *Eucalyptus radiata*, Broad-leaved Peppermint *E. dives*, Brittle Gum *E. mannifera*, Eurabbie *E. globulus* ssp. *bicostata*. The shrub stratum is sparse but diverse and represented by a range of species which are usually present in adjacent EVCs, including Handsome Flat-pea *Platylobium formosum*, Prickly Bush-pea *Pultenaea juniperina* s.l., Beard-heaths *Leucopogon* spp., Honey-pots *Acrotriche serrulata*, Common Correa *Correa reflexa*, Pink-bells *Tetradlea ciliata* and Dwarf Geebung *Persoonia chamaepeuce*. Tree-form Silver Banksia *Banksia marginata* may also be present. The ground layer is high in both cover and diversity of grasses and forbs. Kangaroo Grass *Themeda triandra* and Tussock Grasses *Poa* spp., usually dominate, other species include Weeping Grass *Microlaena stipoides*, Wallaby Grasses *Austrodanthonia* spp., Bent Grasses *Deyeuxia* spp., Plume-grasses *Dichelachne* spp., Short-stem sedge *Carex breviculmis*, small Mat-rushes *Lomandra* spp., Flax-lilies *Dianella* spp., Small St. John's wort *Hypericum gramineum*, Ivy-leaf Violet *Viola hederacea*, Purple Coral-pea *Hardenbergia violacea*, Bluebells *Wahlenbergia* spp., Clustered Everlasting *Chrysocephalum semipapposum* and Hairy Pennywort *Hydrocotyle hirta*. Perennial geophytes such as orchids and lilies are common.

Floristic Community: Shrubby Granitic-outwash Grassy Woodland

This EVC occurs on north to north-western aspects on the edges of granite hills, although at the lower limit of the rainfall range it may occur on all aspects. It is restricted to freely-draining, deep sandy clay colluviums on gentle, lower slopes at altitudes of less than 300m. Rainfall ranges from 550 to 750mm and, although there is adequate run-off from the hills after rainfall, there is limited available moisture during drier periods. Within the study area it was mapped on the granite hills south of the Murray River in the far north east, Mount Pilot, Mount Barambogie, the lower gentle slopes below the Warby Range and the Strathbogie Ranges.

Floristically there is high species diversity in all strata. The overstorey includes Blakley's Red Gum *Eucalyptus blakelyi*, Red Stringybark *E. macrorhyncha*, and Red Box *E. polyanthemos*. Long-leaf Box *E. goniocalyx* and White Box *E. albens* may also be present. The dense low shrub layer is represented by a diversity of Guinea Flowers *Hibbertia* spp.. At the medium level the shrubs are scattered and dominated by Wattles *Acacia* spp.. Daphne Heath *Brachyloma daphnoides* and Common Fringe-myrtle *Calytrix tetragona* are also present and Lemon Bottlebrush *Callistemon pallidus* was found in the far north-east of the study area. The grassy ground layer is often dominated by Cane Wire-grass *Aristida ramosa* and may also include Dense Spear Grass *Austrostipa densiflora*, Rough Spear Grass *A. scabra*, Wallaby Grasses *Austrodanthonia* spp., Kangaroo Grass *Themeda triandra*, Soft Tussock-grass *Poa morrisii*. Herbs and geophytes present include Cranesbill *Geranium* sp., Stinking Pennywort *Hydrocotyle laxiflora*, Common Raspwort *Gonocarpus tetragynus*, Chocolate-lily *Arthropodium strictum*, Narrow Rock-fern *Cheilanthes sieberi*, Black-anther Flax-lily *Dianella revoluta*, Wattle Mat-rush *Lomandra filiformis*, Sun-orchid *Thelymitra* sp., Milkmaids *Burchardia umbellata*, Twining Fringe-lily *Thysanotus patersonii*, Leopard Orchid *Diuris pardina*, and Greenhood Orchids *Pterostylis* spp.

Equivalent units in other studies:

Granitic Grassy Forest (Cropper 1996)

Eastern Low-rises Grassy Woodland (ECC 1997)

Floristic Community: Slopes Box Grassy Woodland

Slopes Box Grassy Woodland was mapped on the low hills near Yarck and Gobur, west of Mansfield and east of Seymour. It may occupy low hills above Plains Grassy Woodland and Floodplain Riparian Woodland and be in association with Valley Grassy Forest which occupies adjacent protected slopes or gullies at higher rainfall. Grassy Dry Forest replaces it on steeper slopes above 500m.

This EVC is ecologically close to Rainshadow Grassy Woodland but carries fewer 'C4' grass species. It also lacks the typical rainshadow species such as Kurrajong *Brachychiton populneus*, Black Cypress Pine *Callitris endlicheri* and the suite of dry country wattles including Red-stem Wattle *Acacia rubida*, Currawang *A. doratoxylon* and Deane's Wattle *A. deanei*.

The overstorey is usually represented by Grey box *Eucalyptus microcarpa*, but White Box *E. albens* may be present (eg. in the Yarck area). The shrub stratum is low to medium height and includes Golden Wattle *Acacia pycnantha*, Hedge Wattle *A. paradoxa*, Black Wattle *A. mearnsii*, Lightwood *A. implexa*, Gold-dust Wattle *A. acinacea*, Drooping Cassinia *Cassinia arcuata*, Grey Parrot-pea *Dillwynia cinerascens*, Smooth Parrot-pea *D. sericea*, and Blue Finger-flower *Cheiranthra cyanara*. The ground layer is represented by a diversity of grasses and forbs and includes Wallaby Grasses *Austrodanthonia* spp., Spear Grass *Austrostipa* spp., Kangaroo Grass *Themeda triandra*, Tall Wheat Grass *Elymus scaber*, Black-anther Flax-lily *Dianella revoluta*, Pale Flax-lily *D. longifolia*, Wattle Mat-rush *Lomandra filiformis* and Yellow Bulbine-lily *Bulbine bulbosa*. Many of the forbs have affinities to Plains Grassy Woodland. Introduced species vary in cover, frequently observed species include St John's Wort *Hypericum perforatum*, Cat's Ear *Hypochoeris radicata* and a range of exotic pasture grasses including Tawoomba Canary Grass *Phalaris aquatica*.

Equivalent unit in other studies:

Box Woodland (Land Conservation Council 1991)

Box Woodland (Commonwealth of Australia 1997)

Creekline Grassy Woodland

Creekline Grassy Woodland is a depleted EVC and was mapped at only one site on public land in the North-East study area, on the flood-plain of the King River near Wangaratta. It was adjacent to both farmland and disturbed land, with a high proportion of weed species present. Other occurrences within the study area have been identified by the pre-1750 mapping exercise. These are largely represented as highly modified, disturbed vegetation along many of the smaller, intermittent creeks on the floodplain of larger rivers and along the ephemeral streams of the lower slopes of foothills, although some reasonably intact sites were located in Mount Pilot Multi-purpose Park near Beechworth.

Seasonal inundation and alluvial soils provide high fertility and moisture-availability which is reflected in the dominant species. The open canopy overstorey is usually dominated by River Red Gum *Eucalyptus camaldulensis*. Mountain Swamp Gum, *E. camphora* and Warby Swamp Gum, *E. cadens*, Blue Gum *E. globulus* ssp. *bicostata* and Silver Wattle *Acacia dealbata* may also be present. The sparse to dense grassy ground layer is dominated by Common Tussock-grass *Poa labillardierei* and Weeping Grass *Microlaena stipoides* with Rushes *Juncus* spp. and Flat-sedges *Cyperus* spp. were scattered throughout. Wood-sorrel species **Oxalis* spp., Blackberry **Rubus fruticosus* spp. agg. Rough

Dog's Tail **Cynosurus echinatus*, Quaking-Grasses **Briza* spp. and Sheep-Sorrel **Acetosella vulgaris* are some of the most common weed species.

Equivalent unit in other studies:

Creepline Grassy Woodland (Muir *et. al.* 1995).

Alluvial Terraces Herb-rich Woodland

The following description is based on that of Alluvial Terraces Herb-rich Woodland described by Muir *et al.* (1995). In the study area Alluvial Terraces Herb-rich Woodland occurs in Chiltern Box-Ironbark National Park. Generally it is found on the lower slopes, drainage lines and old alluvial plains of gently undulation landscapes. Poorly-drained sodic soils are derived from Ordovician sediments or Tertiary alluvium. The greater water availability and slightly higher fertility of these sites enables herbs to flourish.

The ground layer is dominated by forbs and grasses including Stinking Pennywort *Hydrocotyle laxiflora*, Coarse Lagenifera *Lagenifera huegelii*, Grassland Wood-sorrel *Oxalis perennans*, Sheep's Burr *Acaena echinata*, Yam Daisy *Microseris scapigera*, Solenogyne *Solenogyne dominii*, Common Wheat-grass *Elymus scabrus*, Rough Spear-grass *Austrostipa scabra* ssp. *falcata*, Common Bog-sedge *Schoenus apogon* and Rushes *Juncus* spp.. Geophytic lilies such as Chocolate-lily *Arthropodium strictum* and Yellow Rush-lily *Tricoryne elatior* are common as is a diverse range of annual herbs. The overstorey is very open and dominated by Yellow Box *Eucalyptus melliodora* with Grey Box *E. microcarpa* frequently co-dominant.

Gilgai Plains Woodland/Wetland Mosaic

The following description is based on that of Alluvial Terraces Herb-rich Woodland described by Muir *et al.* (1995). Additional data has enabled clarification of this EVC which has been split into Gilgai Plains Woodland/Wetland Mosaic and Alluvial Terraces Herb-rich Woodland. The latter only occurs within the study area in the Chiltern Box-Ironbark National Park.

At Reef Hills Regional Park, Gilgai Plains Woodland/Wetland Mosaic occupies old alluvial terraces of silt and clay which are no longer flooded (e.g. by the Broken River). However, these heavy soils do become inundated after winter rains as indicated by the gleyed appearance of the soil profile. Gilgai land forms occur as a result of self-mulching clays which crack and infill with crumbling peds over summer and swell with winter rain thus forming a complex series of humps and hollows. The vegetation of the humps and hollows is correspondingly complex in pattern. Vegetation in the hollows is Wetland whilst that of the raised humps are Gilgai Plains Woodland.

The overstorey is dominated by River Red Gum *Eucalyptus camaldulensis*. The understorey has scattered shrubs of Hedge Wattle *Acacia paradoxa*. The greatest diversity is in the ground layer which consists of a large number of herbs. Forbs are the dominant life form with perennial geophytes well represented. Forbs include Native Daisies *Brachyscome* spp., Goodenias *Goodenia* spp., Podolepis *Podolepis* spp. and Milkmaids *Burchardia umbellata* to name a few. Sedges, particularly *Isolepis* spp. and *Juncus* spp. are also well represented. Grasses are not common but Wallaby Grasses *Danthonia* spp. and occasionally Kangaroo Grass *Themeda australis* with the weedy Hair Grasses **Aira* spp. and Shell Grasses **Briza* also present but are not abundant.

Equivalent unit in other studies:

Alluvial Terraces Herb-rich Woodland (in part) (Muir *et. al.* 1995).

Floodplain Riparian Woodland

This community comprises the woodland vegetation which typically occurs along the banks of the larger, slower-moving rivers of the study area, including the Goulburn, Ovens and Murray Rivers. It frequently occurs in conjunction with one or more floodplain wetland communities.

River Red Gum (*Eucalyptus camaldulensis*) forms a tall, woodland canopy over a medium to tall shrub layer including Silver Wattle (*Acacia dealbata*) and Tree Violet (*Hymenantha dentata*). The ground layer features Common Tussock-grass (*Poa labillardierei*) on the drier, elevated banks, Rushes (*Juncus* spp.), Common Reed (*Phragmites australis*) and various sedge species (Cyperaceae spp.) occupying the saturated or inundated soils at the water's edge.

Environmental weeds form a major component of this community in virtually all stands. A wide variety of pasture grasses and herbs are ubiquitous.

Wetland Formation

The Wetland Formation in the study area comprises very few, small localised examples, largely due to the drainage of wetlands for agriculture. The formation described here, occurs in billabongs with

standing water and in soaks and depressions often near a larger water body. The structure is an open woodland to a treeless sedge/forb and grass-rich vegetation in which the shrub layer is sporadic and mostly non-existent. Nearly all of the environment where it could potentially occur has been dramatically altered and is invariably dominated by weed species.

The species common to undisturbed or little disturbed areas are River Red Gum *Eucalyptus camaldulensis* and Mountain Swamp Gum *E. camphora*. Shrub species may be present on the margins and include Prickly Tea-tree *Leptospermum continentale*, and Tree Violet *Hymenanthera dentata*. Common Reed *Phragmites australis* is often abundant and various sedge species including Flecked Flat-sedge *Cyperus gunnii*, Common Spike-sedge *Eleocharis acuta* and Bog-sedges *Schoenus* spp. are also abundant. Other ground flora include rushes, mainly *Juncus* spp., Water-pepper *Persicaria hydropiper* with Common Tussock-grass *Poa labillardierei* also common. The open water may support a carpet of duckweed *Lemna* spp. and/or Pacific Azolla *Azolla filiculoides*. Weeds are often a prominent component, the most common species being Bitter-cress **Rorippa* spp., Willow **Salix* spp., Bird's-foot Trefoil **Lotus* spp., Dock **Rumex* spp., Cat's Ear **Hypochoeris radicata*, Yorkshire Fog **Holcus lanatus* and Blackberry **Rubus fruticosus* spp. agg..

Equivalent units in other studies:

- Floodplain Riparian Woodland (LCC 1991)
- Floodplain Wetland Complex (LCC 1991).

Valley Grassy Forest

Relatively little Valley Grassy Forest remains in the study area, primarily due to clearing for agriculture. The combination of fertile, with good water retention capability, gently undulating lower slopes, and reasonable water availability have made such sites attractive for agriculture. Remaining examples therefore tend to be limited in extent and either adjacent to, or near private land. This proximity to cleared agricultural land facilitates weed invasion and as a consequence, Valley Grassy Forest has a relatively high weed composition. The largest example (which however is disturbed) occurs in Burrowa-Pine Mountain National Park in the Corryong area, with other smaller better quality sites being widely scattered across the study area.

The geology is generally colluvial or alluvial, of Quaternary age, and are derived from a range of geologies: on river flats, terraces and valleys floors and alluvial fans on valley sides. Other sites have soils which are colluviums derived from Devonian or Silurian igneous materials at the foot of slopes. Where organic matter and nutrients have been leached from upslope, soils are generally well developed, gradational and brown organic silty clay loams. The upper horizons may become water-logged over winter as indicated by the gleyed appearance of upper horizons of the soil profile. Altitudes range from 220m to 650m and rainfall is less than 1000mm per year.

Visually, this EVC is quite distinctive, set as it is on gentle undulating slopes with scattered eucalypts, a sparse shrub cover and, in season, a rich array of herbs, lilies and the usual grasses and sedges. At the drier end of the spectrum the ground layer may be sparse and slightly less diverse, but with the moisture-loving species still remaining. Upslope of Valley Grassy Forest on the steeper gradients the adjacent vegetation is usually Grassy Dry Forest or occasionally Shrubby or Heathy Dry Forest, with Herb-Rich Foothill Forest in the nearby moister protected environments.

Yellow Box *Eucalyptus melliodora* is often present, in association with dry forest or woodland eucalypts such as Red Stringybark *E. macrorhyncha*, White Box *E. albens* and Hill Red Gum *E. blakelyi*. Taller shrubs such as Lightwood *Acacia implexa*, Silver Wattle *A. dealbata* or Cherry Ballart *Exocarpos cupressiformis* may be present, with the ubiquitous low shrubs Grey Guinea-flower *Hibbertia obtusifolia* or Daphne Heath *Brachyloma daphnoides* scattered in low numbers and cover throughout.

The ground layer has a high proportion (and usually good cover) of both native and introduced grasses and forbs. Weeping grass *Microlaena stipoides*, Common Plume Grass *Dichelachne rara*, Common Wheat Grass *Elymus scabrus*, and the tussock grasses Grey Tussock Grass *Poa sieberiana* var. *sieberiana* and Common Tussock Grass *Poa labillardierei* are common. The usual native herbs are Kidney-Weed *Dichondra repens*, Creeping Cudweed *Euchiton gymnocephalus*, Austral Cranesbill *Geranium solanderi*, Common Raspwort *Gonocarpus tetragynus*, Small St. John's Wort *Hypericum gramineum*, Cotton Fireweed *Senecio quadridentatus*, Stinking Pennywort *Hydrocotyle laxiflora* and Sheep's Burr *Acaena* spp.. Introduced species can be common and include Cat's Ear **Hypochoeris radicata*, Pimpernel **Anagallis arvensis*, Common Centaury **Centaureum erythraea*, Sweet Vernal-grass **Anthoxanthum odoratum*, Large Quaking-Grass **Briza maxima*, Lesser Quaking-grass **Briza minor*, Clovers **Trifolium* spp. and Squirrel-tail Fescue **Vulpia bromoides*. The ground layer has an average composition of 23% weeds which constitutes 16% of the cover. A variety of lilies, sedges and mat-rushes may occur, including Common Bog-sedge *Schoenus apogon*, Short-stem sedge *Carex*

breviculmis, Chocolate-lily *Arthropodium strictum*, Wattle Mat-rush *Lomandra filiformis*, Yellow Bulbine Lily *Bulbine bulbosa*, Common Wood-rush *Luzula meridionalis* varieties and Finger Rush *Juncus subsecundus*.

At Mount Pilot Multi-Purpose Park near Beechworth a different floristic entity within this ecological vegetation class occurs. This Valley Grassy Forest grows in the soaks or depressions within gently undulating areas of Grassy Dry Forest. Soils may become water-logged over winter but remain moist year round and are brown sandy to clay loams derived from Devonian igneous intrusive materials such as granite. Hill Red Gum is usually present in the overstorey, with But But *E. bridgesiana* and Long-leaved Box / Silver Bundy *E. goniocalyx/nortonii*. Shrubs such as Silver Wattle and Prickly Tea-tree *Leptospermum continentale* may form a sparse cover, with Five-awned Spear-grass *Pentapogon quadrifidus*, Weeping Grass *Microlaena stipoides*, and Reed Bent-grass *Deyeuxia quadriseta* common in the grassy understorey. The introduced flora is unchanged, but some of the wetter ground species present also suggest a different floristic community. These may include Purple Bladderwort *Utricularia dichotoma*, Broad-leaf Rush *Juncus planifolius*, Varied Raspwort *Haloragis heterophylla* and Tall Sedge *Carex appressa*.

Equivalent units in other studies:

Herb-Rich Forest (Woodgate *et al.* 1994).

Valley Forest (LCC 1991).

Valley Grassy Forest (Muir *et al.* 1995)

Riparian Forest

Riparian Forest although widespread is relatively uncommon in the study area. This EVC is prone to weed invasion largely due to its fertile soils, abundant supply of water and the history of human and recurrent natural disturbance. Due to clearing for agriculture and the concentration of various forms of disturbance along rivers and creeks (such as mining and grazing), very few undisturbed examples remain. Riparian Forest grows along river flats and the larger creeks on Quaternary alluviums derived from a variety of parent geologies including Ordovician sedimentary and metamorphic rocks, Devonian granitoids, Lower Carboniferous and Cambrian sediments. The particle size of the soils is highly variable and can range from cobbles to silts that are randomly arranged in lenses as the result of floods. The majority of the soils' composition however, consists of moderately deep silty loams that are rich organic material in the A horizon. Rainfall is of the order of 900-1800 mm per annum with elevation in the range 600-1000 m.

The only tree species which is strongly characteristic of Riparian Forest is Manna Gum *Eucalyptus viminalis*. Tree height is mostly between 30 and 40 m which is a strong indicator of the high environmental site quality of the habitat of Riparian Forest. Numerous other eucalypts can be present, the most common of which are Narrow-leaf Peppermint *Eucalyptus radiata* s.l. and Eurabbie *E. globulus* ssp. *bicostata*. This EVC generally has a well developed secondary tree-layer which is indicative of high site quality with Blackwood *Acacia melanoxylon* and Silver Wattle *Acacia dealbata* being common.

The shrub layer is dominated by Hazel Pomaderris *Pomaderris aspera*, Tree Lomatia *Lomatia fraseri* and Prickly Currant-bush *Coprosma quadrifida*. The ground layer is generally rich in herbs, grasses and ferns. The most common forbs are Self-heal **Prunella vulgaris*, Ivy-leaf Violet *Viola hederacea*, Bidgee Widgee *Acaena nova-zelandiae*, Creeping Cudweed *Euchiton gymnocephalus* and Small-leaf Bramble *Rubus parviflorus*. Common grasses include Weeping Grass *Microlaena stipoides*, Common Hedgehog-grass *Echinopogon ovatus* and Yorkshire Fog **Holcus lanatus* in disturbed sites. Ferns characteristic of Riparian Forest include Fishbone Water-fern *Blechnum nudum*, Soft Water-fern *Blechnum minus*, Mother Shield-fern *Polystichum proliferum* and Soft Tree-fern *Dicksonia antarctica*. The Tall Sedge *Carex appressa* often dominates the high light environments such as stream bank and open areas free of shrubs.

The common and seriously invasive weeds of this EVC are Willow **Salix spp.*, Blackberry **Rubus fruticosus spp. agg.*, Cat's Ear **Hypochoeris radicata*, Self-heal, Yorkshire Fog **Holcus lanatus*, Musk Monkey Flower **Mimulus moschatus*, and White Clover **Trifolium repens*.

Equivalent units in other studies:

Riparian Forest (Woodgate *et al.* 1994).

Riparian Forest (LCC 1991).

Swampy Riparian Woodland

Once a common vegetation type along broad drainage lines with slight gradients and on lower slopes near streams or larger rivers, Swampy Riparian Woodland has been largely altered particularly by drainage for agriculture. Thus, whilst it is scattered widely in the study area, it is now depleted

within the study area. It may be found growing in broad drainage lines with slight gradients, on lower slopes near streams and less commonly in gentle basins on valley slopes in association with permanent soaks or springs, not necessarily associated with permanent streams. Rainfall is in the range of 900-1500 mm per year and the elevation range is between 300 and 800 m. Soils are mostly silt-rich river sands and gravels, although sites with heavier clay soils may also support Swampy Riparian Woodland. The soils are generally Quaternary alluviums in stream environments derived from a broad range of parent geologies which are mostly Cambrian and Ordovician marine sediments and metamorphosed sediments. Examples of this vegetation which occur in soaks away from in-stream habitats develop as gleyed soils derived from Silurian and Devonian granitoids and leucocratic granites. These soils are water-logged during much of winter and spring.

As the name suggests, the overstorey of this vegetation type has a woodland structure which often forms mosaics with wetter tree-less areas dominated by sedges, rushes and many other plants associated with riparian environments. Mountain Swamp Gum *Eucalyptus camphora* is the dominant overstorey species. A wide range of other eucalypts can be present, mainly as adventive species from the surrounding drier forests, and in the Mount Pilot (and adjacent Warby Ranges) area Warby Swamp Gum *E. cadens* grows in common association. The understorey shrubs consist of Blackwood *Acacia melanoxylon* (as it rarely reaches tree-form in this community) and Prickly Current-bush *Coprosma quadrifida*. Common Cassinia *Cassinia aculeata* and Silver Wattle *A. dealbata* are also sporadically present as adventive species from the surrounding drier vegetation. Ovens Wattle *A. pravissima*, Prickly Tea-tree *Leptospermum continentale* may also be present. The ground stratum is the most characteristic feature of this EVC and is normally dense with sedges such as Leafy Flat-sedge *Cyperus lucidus* and Tall Sedge *Carex appressa* competing for space with ferns like Fishbone Water-fern *Blechnum nudum*, Soft Water-fern *Blechnum minus* and Mother Shield-fern *Polystichum proliferum*.

There are many other plants which also occur in the Riparian Forest which compete for space between the inter-tussock gaps of sedges and ferns. Species commonly present are Bidgee Widgee *Acaena novae-zelandiae*, Water Starwort **Callitriche stagnalis*, Cat's Ear **Hypochoeris radicata*, Kidney-weed *Dichondra repens*, Cinquefoil Cranesbill *Geranium potentilloides*, Austral Brooklime *Gratiola peruviana*, Hairy Pennywort *Hydrocotyle hirta*, Musk Monkey-flower **Mimulus moschatus* and Self-heal **Prunella vulgaris*. The most common grasses (generally an uncommon life-form in this EVC) are Yorkshire Fog **Holcus lanatus* and Common Hedgehog-grass *Echinopogon ovatus*. The Showy Willow-herb *Epilobium pallidiflorum* is a depleted species and was recorded at one site in this study.

The presence of introduced species is a significant threat, particularly blackberries which can completely destroy this EVC. This is caused by disturbance in or near the stream environment which facilitates the establishment of these weeds. These infestations quickly move down-stream (even in the absence of future anthropomorphic disturbance) as a result of the natural recurrent disturbance associated with regular flooding. The construction of roads through or adjacent to this EVC allow introduced species to readily invade and often radically change the floristics and structure of the vegetation. Mean weed composition is 21% of species and 19% of cover.

Equivalent unit in other studies:

Swampy Riparian Forest (LCC 1991).

Riverine Escarpment Scrub

This EVC is described for the first time in this study although it is known from other areas south of the Great Dividing Range. It is characterised by a medium to tall shrub layer which often limits the regeneration of overstorey trees to the natural gaps in the canopy and results in a sparse overstorey. The ground layer is often open due to heavy shading. Most sites occur on Ordovician sediments or various Devonian igneous rocks including granite, granodiorite, rhyolite, rhyodacite and basalt. The soils are loamy sands often rocky and shallow in the A horizon merging to clayey sands at depth. As such the clays at depth may be palaeosols with the sandy soils of the 'A' horizon representing more recent alluvial deposits associated with flood events of the adjacent stream.

Riverine Escarpment Scrub can be equally present on gentle slopes, alluvial terraces/levee banks and near-stream steep (lower) slopes associated with rivers and the larger creeks of the study area. This EVC is restricted to the lowland and foothill country elevations of 300-650 m. Rainfall varies from 1000 to over 1500 mm per year. The overstorey is mainly Candlebark *Eucalyptus rubida* which is the most common species followed by Narrow-leaved Peppermint *E. radiata* s.l. and Manna Gum *E. viminalis*. The shrub layer is dominated by Slender Tea-tree *Leptospermum brevipes* and Burgan *Kunzea ericoides*. Other species with a generally minor presence are Hazel *Pomaderris aspera*, Sweet Bursaria *Bursaria spinosa* and Silver Wattle *Acacia dealbata*. Curiously there is generally a suite of Pomaderris species with restricted distribution present in Riverine Escarpment Scrub. These include: Blunt-leaf

Pomaderris *P. helianthemifolia* (the most common), Velvet Pomaderris *P. velutina* and Prunus Pomaderris *P. prunifolia*.

The ground layer can range from low to high diversity (which may be dependant on the time since the last disturbance) and consists of forbs, grasses and sedges. The cover of these life forms is however, generally low. The ubiquitous forbs include Bidgee Widgee *Acaena novae-zelandiae*, Kidney Weed *Dichondra repens*, Bedstraw *Galium* spp., Cranesbill *Geranium* spp., Creeping Cudweed *Euchiton gymnocephalus* and Ivy -leafed Violet *Viola hederacea*. The common grasses are Common Hedgehog-grass *Echinopogon ovatus*, Common Wheat-grass *Elymus scabrus* and Weeping Grass *Microlaena stipoides*. In sites that continue to the stream edge, sedges such as Common Bog-sedge *Schoenus apogon* and *Carex* spp. often occur. The other sedge frequently present is Variable Sword-sedge *Lepidosperma laterale*. Riverine Escarpment Scrub can have a high component of weeds in places where it extends to the stream bank and this stems from disturbances in the upstream catchment and direct disturbance by flood action or road construction or past mining.

Equivalent unit in other studies:

Not previously described, however it is known from similar habitat throughout Gippsland and the Central Highlands. It was obliquely referred to as a riverine form of Rocky Outcrop Scrub in Woodgate *et al.* (1994).

Riparian Shrubland

The stream beds of minor creeks in a restricted part of the study area were observed to have Riparian Shrubland present, however it may be more common than is delineated on the maps due to inaccessibility of substantial sections of rivers and creeks in the study area. The soils are generally infertile coarse sands and rock bars. The environment is one of periodic and severe disturbance as a result of floods. Adult eucalypts only inhabit the margins of this vegetation although saplings may be transitory in the river beds. The overstorey is dominated by a diverse array of shrubs able to withstand frequent flooding or those able to regenerate rapidly after such disturbance. Species present include Blackwood *Acacia melanoxylon*, Silver Wattle *A. dealbata*, Ovens Wattle, *A. pravissima*, Black Wattle, *A. mearnsii*, Musk Daisy-Bush *Olearia argophylla*, Burgan *Kunzea ericoides*, Prickly Currant-bush *Coprosma quadrifida*, Victorian Christmas-bush *Prostanthera lasianthos*, River Lomatia *Lomatia myricoides*, Woolly Tea-tree *Leptospermum lanigerum*, Sweet Bursaria *Bursaria spinosa*, River Bottle-brush *Callistemon sieberi*, Tree Violet, *Hymenanthera dentata* and in the moist sites Austral Mulberry *Hedycarya angustifolia*, Alpine Pepper *Tasmannia xerophylla*. Forbs and grasses either survive between severe floods on bare sand or in cracks of rocks or regenerate rapidly from seed. These include Glandular Willow-herb **Epilobium ciliatum*, Clustered Cudweed *Euchiton gymnocephalus*, Weeping Grass *Microlaena stipoides*, Spiny-headed Mat-rush, *Lomandra longifolia* and Common Tussock Grass, *Poa labillardierei* and Common Blown Grass *Agrostis avenacea*.

Equivalent unit in other studies:

Riparian Shrubland (Woodgate *et al.* 1994).

Riparian Forest/Swampy Riparian Woodland/Riverine Escarpment Scrub Mosaic

Riparian Mosaic is a mapping unit used when predicability of mapping in riparian situations was low, and more than one type of riparian vegetation was assumed to be present using aerial photograph interpretation, or where the size of different ecological vegetation classes could not be adequately represented at the 1:100,000 mapping scale. As a consequence, no character species table is supplied. It is employed where riparian sites are narrow, or where their characteristics rapidly change causing the quality and nature of the riparian vegetation to be likewise variable. Additionally such sites are usually inaccessible. Combinations of Riparian Forest, Swampy Riparian Woodland, Riverine Escarpment Scrub, Riparian Shrubland, and disturbed vegetation may be present where Riparian Mosaic has been mapped.

Granitic Hills Woodland

Granitic Hills Woodland is mostly restricted to intrusive igneous geologies in the north and west of the study area with occasional examples on acid volcanics (which have the same composition but a different origin). Parent geologies include Devonian leucocratic granites, micaceous granite and Devonian rhyodacite. The ecological vegetation class occurs on the granite country of Mount Pilot, Mount Lawson, Mount Wombat, Mount Granya and Burrowa-Pine Mountain National Park. The largest occurrence on acid volcanics is also in the Burrowa-Pine Mountain National Park. The soils which result are brown and sandy, ranging in texture from a gritty sand to a sandy clay loam. The water-holding capacity and hence moisture availability is therefore low.

Spurs and rocky outcrop slopes with a north east to westerly aspect are favoured by this EVC. Slopes vary widely from 0 to 45 degrees. The altitude range is somewhat broad, from 220 to 760m. Rainfall can reach up to 1000mm per annum but characteristically shows a high variation from year to year. Outcropping rock is common in any given locality, in either slab or as tors, covering on average 45% of sites. It is not uncommon for Granite Hills Woodland to be interspersed with Rocky Outcrop Mosaic, the delineation of the two vegetation types dependant upon the degree of soil development, with the latter having the more skeletal soils.

Two broad floristic entities emerged within this vegetation class, one from the relatively intact and not recently fire affected sites at Mount Lawson, Mount Granya and Burrowa-Pine Mountain National Park, and the other from the more disturbed and weedy sites across the study area, with varying fire histories. The level of weed invasion seems to be partly a measure of the distance of the site from sources of disturbance and weed propagules.

The overstorey of both entities is commonly a low woodland to 15m of Hill Red Gum *Eucalyptus blakelyi*, but other dry forest eucalypts such as Red Stringybark *Eucalyptus macrorhyncha* ssp. *macrorhyncha*, and Long-leaf Box/Silver Bundy *Eucalyptus goniocalyx/nortonii* can also be present. Black Cypress Pine *Callitris endlicheri* is normally found in uncleared and fire sheltered rocky areas where it can be structurally dominant, but virtually absent in sites that have suffered a history of fire and grazing. It can however occur in both floristic entities.

Understorey species of Granitic Hills Woodland include the small tree Drooping Sheoak *Allocasuarina verticillata*, and the forbs Cotton fire-weed *Senecio quadridentatus*, Nodding Blue Lily *Stypantra glauca*, Austral Carrot *Daucus glochidiatus*, Tall Raspwort *Gonocarpus elatus* and Common Raspwort *G. tetragynus*. Acacia species are common in all Granitic Hills Woodland sites, including Varnish Wattle *Acacia verniciflua*, Currawang *Acacia doratoxylon* and Red-Stem Wattle *Acacia rubida*. Dense growth of Common Fringe Myrtle *Calytrix tetragona* can result from fires or drought and sometimes gives the appearance of a monoculture. Small rock-loving species are often present including Australian Stonecrop *Crassula sieberiana* ssp. *tetramera* and Green Rock Fern *Cheilanthes austrotenuifolia*. Common introduced species include Elegant Hair-grass **Aira elegans*, Lesser Quaking-grass **Briza minor* and Squirrel-tail Fescue **Vulpia bromoides*.

An important feature of rocky granite country on which Granitic Hills Woodland occurs, is the high cover of bryophyte and lichen species usually present on both rocks and soils. *Triquitrella papillata*, *Leptodontium paradoxum* and *Bryum* spp. are the common mosses forming the soil crust. The Coral Lichens *Cladia aggregata* and *Cladia retiphora* are frequently present, sometimes forming an almost continuous ground layer amongst the vascular plants. On the rock surfaces moss species such as *Grimmia laevigata*, *Campylopus bicolor*, *Hedwigia integrifolia* and *Breutelia affinis* can be present, with the liverwort *Frullania probosciphora* sometimes epiphytic on tree trunks. After rain liverworts including *Asterella drummondii* and *Fossombronina* spp. may be evident as a part of the soil crust. Great expanses of rock may be covered with the many species of the lichen genus *Parmelia*.

Black Cypress Pine was normally present in the first floristic community, which includes all except one of the Burrowa-Pine sites. Hairy Geebung *Persoonia rigida*, along with some of the rarer Grevillea species such as Green Grevillea *Grevillea jephcottii*, Crimson Grevillea *Grevillea polybractea* and Fan Grevillea *Grevillea ramosissima*. Species of the family Fabaceae are represented by Smooth Parrot-pea *Dillwynia glaberrima*, Small-leaf Parrot-Pea *Dillwynia phyllicoides*, Showy Parrot-pea *Dillwynia sericea* and the Heathy Bush-Pea *Pultenaea procumbens*. The minimal level of weed invasion in this floristic entity may be partly due to decreased possibilities for weed growth with an increase in shrub cover, the generally poor soils and the steep topography which have preserved this EVC from clearing and fragmentation. Spider Orchids *Caladenia* spp. and Greenhood Orchids *Pterostylis* spp. are much more frequently recorded and in greater diversity than in the 'more disturbed' floristic community. Introduced species comprised less than 7% of cover and 18% of species.

In the second floristic entity Black Cypress Pine was only present in either uncleared or unburnt sites where regeneration was able to take place. The most notable difference apart from the lack of many of the shrub and orchid species is inclusion of many more introduced species eg. Large Quaking Grass **Briza maxima*, Hare's foot Clover **Trifolium arvense*, Common Mouse-ear Chickweed **Cerastium glomeratum*, Hop Clover **T. campestre*, Dwarf Rush **Juncus capitatus* and Tiny Flat-Sedge **Cyperus tenellus*. Weeds constitute 22% of the cover and 31% of the species. Rock Isotome *Isotoma axillaris* is often present amongst the rocks.

Equivalent unit in other studies:

Granitic Hills Woodland (Muir *et al.* 1995).

Box Ironbark Forest

The following description is based on that of Muir *et al.* (1995). Box Ironbark Forest only occurs within the study area in the Chiltern Box-Ironbark National Park and is one of three communities of this EVC. The community that occurs in the study area is Box Ironbark Forest (North-eastern Victoria) and is restricted to the Chiltern Box Ironbark National Park and Reef Hills Regional Park.

Box Ironbark Forests in the north-east are found on undulating rises and low rolling hills of Ordovician sediments. These soils are often stony and have low fertility and poor water-holding capacity.

These forests differ from those of the Goldfields (further west) in the development of a much denser cover of grasses, commonly about 30%. This could be attributed to the higher annual rainfall this area receives. A more developed litter layer may provide more amenable growing conditions for plants.

The most obvious species difference compared with the Goldfields communities is the replacement of Red Ironbark *Eucalyptus tricarpa* with Mugga *Eucalyptus sideroxylon*. Common Goldfields species such as Yellow Gum *Eucalyptus leucoxylon*, Gold-dust Wattle *Acacia acinacea*, Spiky Guinea-flower *Hibbertia exutiacies* and Cranberry Heath *Astroloma humifusum* are absent or uncommon in the north-east, and species such as Grey Guinea-flower *Hibbertia obtusifolia* and Dense Spear-grass *Austrostipa densiflora* become prominent. The remnant nature of these north-eastern forests, in combination with slightly better site quality, has made them susceptible to weed invasion by species such as Cat's Ear *Hypochoeris radicata* and Large Quaking-grass *Briza maxima*.

Box Ironbark forest mapped south of the Hume Highway on the low hills of Reef Hills Regional Park is referable to Sub-community 22.2 of Muir *et al.* (1995). Red Box *Eucalyptus polyanthemus* is the most common tree species, with Red Stringybark *Eucalyptus macrorhyncha* and Mugga *Eucalyptus sideroxylon* also occurring. Silky Guinea-flower *Hibbertia sericea* and Showy Parrot-pea *Dillwynia sericea* are the most frequent shrubs present. Silver-top Wallaby Grass *Choinochloa pallida*, Kangaroo Grass *Themeda triandra* and Small St John's Wort *Hypericum gramineum* are common plants in the ground-layer.

Sub-community 22.3 of Muir *et al.*, is confined to Chiltern Box-Ironbark National Park within the study area and is characterised by the dominance of Mugga *Eucalyptus sideroxylon* with Grey Box *Eucalyptus microcarpa* as the sub-dominant tree. The dense shrub layer often contains Cat's Claws *Grevillea alpina*, Narrow-leaf Bitter-pea *Daviesia leptophylla*, Daphne Heath *Brachyloma daphnoides* and Erect Guinea-flower *Hibbertia riparia*. Grey Tussock-grass *Poa sieberiana*, Rough Spear-grass *Austrostipa scabra* ssp. *falcata*, Shiny Everlasting *Bracteantha viscosa* and Ivy Goodenia *Goodenia hederacea* are common elements of the ground layer.

Equivalent unit in other studies:

Box Ironbark Forest (North-eastern Hills) (Muir *et al.* 1995).

Clay Heathland

Clay Heathland is located in the northern section of the Mount Lawson State Park from four very restricted locations, with patch size being no more than 200m x 200m each and often much less. This vegetation is also of very limited extent in the Victorian context with the closest known location being in lowland East Gippsland. Most of the occurrences are on northern and western aspects on gentle lower slopes adjacent to or near small streams which is analogous with several sites in East Gippsland. The underlying geology is leucocratic granite and the rainfall is between 760-890mm per year. The soil (investigated at only one site in NE Victoria) was a pale yellowish brown in colour with a texture of clayey sand with quartz grains being prominent in the A horizon, becoming more compact in the B horizon and changing to a distinct white colour. The soils appear to have a water impeding capacity which often leads to the soil profile being sodden in winter and spring, however the soils appear to quickly dry out over summer. This is consistent with sites supporting this EVC in East Gippsland.

Dry forest tree species often invade over long dry periods, only to die or dieback during wet phases. Trees when present are stunted and commonly less than 20 m in height. The presence of species from both dry and moist environments may be a product of these soil characteristics which cause individual patches to have fluctuating boundaries associated with climatic fluctuations.

The overstorey consists of the ubiquitous eucalypts from the surrounding dry forests including Broad-leaved Peppermint *Eucalyptus dives*, Red Stringybark *Eucalyptus macrorhyncha* and Brittle Gum *Eucalyptus mannifera*. The structure of Clay Heathland is characterised by a dense shrub stratum consisting of Prickly Tea-Tree *Leptospermum continentale* and Silver Banksia *Banksia marginata*. Species more typical of the dry surrounding forest occur as a result of the small patch size such as Small-leaf Parrot-pea *Dillwynia phyllicoides* and Heathy Bush-pea *Pultenaea procumbens*.

Some of the forbs, grasses and small shrubs are also present in the surrounding vegetation and include Narrow Groundsel *Senecio tenuiflorus*, Grass Trigger Plant *Stylidium graminifolium*, Pink-bells *Tetradlea ciliata*, Common Plume Grass *Dichelachne rara*, Velvet Wallaby -grass

Austrodanthonia pilosa var. *paleacea*, Slender Rice-flower *Pimelea linifolia* ssp. *linifolia* and Grey Tussock-grass *Poa sieberiana* var. *sieberiana*. These species can tolerate seasonally wet soils, however there are a suite of species which are not common in the surrounding vegetation which prosper on wet soils, but can tolerate dry conditions over summer. These species include Dwarf Boronia *Boronia nana* var. *hyssopifolia*, Milkmaids *Burchardia umbellata*, Common Hedgehog-grass *Echinopogon ovatus*, Prickly Tea-tree *Leptospermum continentale*, Violet Kunzea *Kunzea parvifolia*, Weeping Grass *Microlaena stipoides* var. *stipoides*, Common Bog-sedge *Schoenus apogon*, Kangaroo Grass *Themeda triandra* and Showy Violet *Viola betonicifolia* ssp. *betonicifolia*. This flora combines to produce the characteristic composition and appearance of Clay Heathland.

Introduced species are generally low in cover and diversity, probably due to the seasonally waterlogged soils and the dense cover of the shrub stratum. Track construction in the vicinity of this class may have a detrimental effect by altering the drainage patterns influencing these sites.

Equivalent unit in other studies:

Clay Heathland (Woodgate *et al.* 1994).

Spring Soak Herbland

Spring-soak Herbland is widespread but rare and very localised in the study area. It is a seasonal wetland community dominated by indigenous herbaceous perennials. It is completely dependent on the continual availability of a reliable water supply and is threatened by changes to the hydrological regime, stock trampling and weed invasion. With intact and relatively weed-free stands now rare and of regional significance (Cameron and Moorrees unpubl.).

Spring Soak Herbland is a herbland. However, many other life forms such as sedges and rushes are common. The usual species are cited here from a site which is not in the study area but is a good example of this ecological vegetation class as it occurs within the study area. The common herbaceous species include the vulnerable Narrow Goodenia *Goodenia macbarronii* which is characteristic of this EVC, Common Onion Grass *Romulea rosea*, Square Cicienda *Cicienda quadrangularis*, Pale Sundew *Drosera peltata* ssp. *peltata*, Small Mud-mat *Glossostigma elatinoides*, Swamp Isotome *Isotoma fluviatilis*, Small St. John's Wort *Hypericum gramineum*, Matted St. John's Wort *Hypericum japonicum*, Smooth Cat's Ear *Hypochoeris glabra*, Cat's Ear *Hypochoeris radicata*, Small Wrinklewort *Rutidosus multiflora*, and Solenogyne *Solenogyne dominii*. The common sedges include Common Bog-sedge *Schoenus apogon*, Awned Club-sedge *Isolepis hystrix* and Slender Aphelia *Aphelia gracilis*. Rushes are represented by common species such as Dwarf Rush *Juncus capitatus*, and *Juncus sp. (A) sensu L. Johnson*. Grasses are mostly weed species like Lesser Quaking -grass *Briza minor* and Squirrel-tail Fescue *Vulpia bromoides*. Some sites have a eucalypt overstorey which may include Warby Swamp Gum *Eucalyptus cadens* (Mount Pilot area), Blakley's Red Gum *E. blakelyi* (Warby Range, Glenrowan and Euroa areas) and Long-leaf Box *E. goniocalyx/ E. nortonii* (Euroa area).

The pre-1750 mapping exercise determined that this EVC occurs within an association of several EVCs arranged in radial zones around a moisture source. The wetter centre (Wetland Formation) contains taller sedge species and occasionally Ground Fern *Hypolepis* sp.. This is surrounded by a shrubby woodland (Swampy Riparian Woodland or Clay Heathland) and the outer edge, which occasionally dries out, is predominantly herb-rich (Spring-soak Herbland/Woodland Mosaic).

Equivalent units in other studies:

Spring Soak Herbland (Cameron and Moorrees unpubl.).

Rocky Outcrop Shrubland/Herbland Mosaic

Rocky Outcrop Shrubland/Herbland Mosaic occurs mainly in the low to moderate elevations (400-1000 m) in areas such as the northern Strathbogie Ranges, Mount Wombat, Mount Pilot Multi Purpose Park, Mount Lawson State Park and Burrowa-Pine Mountain National Park. The EVC occurs mostly on Devonian igneous substrates primarily granites, but less commonly also on acid volcanics and rarely on the Carboniferous conglomerate on the escarpments of the Wabonga Plateau. The soils are generally skeletal and moisture availability is generally very low, except in the cracks between rock surfaces. Rainfall is generally less than 1000mm per year. Most sites have between 50-90% exposed rocky substrate, which with the absorption of sunlight become extremely hot, particularly in summer.

The structural characteristics of the EVC are generally the presence of low shrubs, occasional eucalypts, a low ephemeral ground cover and high bryophyte cover. Introduced species often form a significant component of this class, with 18 % of species and 13 % of cover.

Eucalypts may or may not be present, the most common being Hill Red Gum *Eucalyptus blakelyi*. Any of the eucalypts from the surrounding dry forest can be present. In the Mount Pilot area,

Burrowa-Pine Mountain National Park and Mount Lawson State Park Black Cypress-pine *Callitris endlicheri* can be an overstorey component. The shrub stratum is often dense, except in sites with higher cover of outcropping rock. The common species are Common Fringe-myrtle *Calytrix tetragona*, Shiny Cassinia *Cassinia longifolia*, Nodding Blue-lily *Stypandra glauca* and Vanish Wattle *Acacia verniciflua*. Daphne Heath *Brachyloma daphnoides* is a ubiquitous species of Rocky Outcrop Shrubland/Herbland Mosaic in Mount Pilot Multi-Purpose Park. The cover of ferns, forbs and grasses is generally low and the dominant species are Green Rock Fern *Cheilanthes austrotenuifolia*, Elegant Hair-grass *Aira elegans*, Rock Isotome *Isotoma axillaris*, Common Centaury **Centaurium erythraea*, Creeping Cudweed *Euchiton gymnocephalus*, Austral Cranesbill *Geranium solanderi*, Common Raspwort *Gonocarpus tetragynus*, Small St John's Wort *Hypericum gramineum* and Spoon Cudweed *Stuartina muelleri*. Tiny Daisy *Brachyscome ptychocarpa* and the Hairy Hop-bush *Dodonaea boroniifolia* are both rare species recorded Rocky Outcrop Shrubland/Herbland Mosaic.

Equivalent units in other studies:

Rocky Outcrop Shrubland (LCC 1991)

Rocky Outcrop Shrubland (Woodgate *et al.* 1994)

Rocky Outcrop Shrubland/Herbland Mosaic (Muir *et al.* 1995, in part)

Grassy Dry Forest

Grassy Dry Forest is scattered throughout the north-east in areas which receive moderate annual rainfall (700-1000mm). What remains, occurs mostly on lower slopes along the northern edge of the public land in close proximity to farmland. Although less fertile than the northern plains, these areas do have higher effective precipitation. Much of this marginal farmland at the foot-slopes of the Great Dividing Range in the study area was once Grassy Dry Forest. In these localities Grassy Dry Forest usually occurs on the drier northern or western aspects with gentle slopes. On the adjacent steeper slopes and rocky hill tops Heathy Dry Forest develops. However in areas of lower rainfall and poorer fertility, Heathy Dry Forest occupies the northern and western aspects and Grassy Dry Forest more commonly grows on the moister eastern or north-eastern aspects. Overall, Grassy Dry Forest occurs on a variety of gradients and altitudes ranging from 300m on gently undulating terrain to 850m mostly on steeper slopes. In the higher elevation areas, it can also occur on broad gentle ridges, and occasionally on isolated knolls at 1000m such as Mount Big Ben.

This EVC may occur on a range of geologies, the critical factor being that the resultant soils are moderately fertile and well developed with good moisture-holding capacity. Geologies include Ordovician mudstone and siltstone, Silurian metamorphics such as schist or gneiss with Devonian granite, rhyodacites are also common. Soils tend to be gradational sandy to clay loams which are brown in colour with moderate organic content.

Grassy Dry Forest is a low to medium height forest mostly 15 to 20m, sometimes resembling a woodland, with a sparse to densely grassy ground layer. At the moister sites this vegetation has a high diversity and cover of forbs and grasses. Shrub cover and diversity tends to be low. Close proximity to farmland and moderate fertility often result in the presence of weeds, averaging 15% of diversity and 12% of cover.

The most common eucalypts in Grassy Dry Forest are Red Stringybark *Eucalyptus macrorhyncha*, Long-leaved Box / Silver Bundy *E. gonicalyx / nortonii* and Broad-leaved Peppermint *E. dives*. Shrubs present may include Silver Wattle *Acacia dealbata*, Honey Pots *Acrotriche serrulata*, Common Hovea *Hovea linearis*, Grey Guinea-flower *Hibbertia obtusifolia*, Slender Rice-flower *Pimelea linifolia* ssp. *linifolia* and Cherry Ballart *Exocarpos cupressiformis*. The ground layer constitutes most of the species diversity for this EVC, with up to 60 species in this stratum. Common grasses include Silver-top Wallaby-grass *Chionochloa pallida*, Velvet Wallaby-grass *Austrodanthonia pilosa* var. *pilosa*, Common Plume-grass *Dichelachne rara*, Common Wheat-grass *Elymus scabrus*, Grey Tussock-grass *Poa sieberiana* var. *sieberiana*, Weeping grass *Microlaena stipoides*, and weedy grasses such as Large Quaking-grass **Briza maxima*, Elegant Hair-grass **Aira elegans*, Yorkshire Fog **Holcus lanatus*. Common herbaceous species include Stinking Pennywort *Hydrocotyle laxiflora*, Common Woodrush *Luzula meridionalis* var. *flaccida*, Small St. John's Wort *Hypericum gramineum*, Austral Cranesbill *Geranium solanderi*, Small Poranthera *Poranthera microphylla*, Common Raspwort *Gonocarpus tetragynus*, Creeping Cudweed *Euchiton gymnocephalus*, Cotton Fireweed *Senecio quadridentatus*, Tall Sundew *Drosera peltata* ssp. *auriculata* and the ubiquitous weedy species Cat's Ear **Hypochoeris radicata*. One species, Southern Tick-trefoil *Desmodium gunnii* occurs sporadically in Grassy Dry Forest but rarely in any other ecological vegetation class in the study area.

Addition mapping of pre-1750s vegetation found Grassy Dry Forest occurring at lower elevations (less than 500m) in both moister situations in the drier western end of the study area and in the more exposed situations in the wetter parts of the study area. In areas of higher rainfall (approximately 1000mm) it is found on the more exposed (northern and western) lower slopes. In the mid-range

rainfall areas it may develop on all aspects depending on slope. In areas of lower rainfall (700mm) Grassy Dry Forest tends to occupy the protected south facing slopes. 'Cappings' of EVCs which prefer drier habitats (eg. Heathy Dry Forest and Rocky Outcrop Mosaic) often occupy adjacent steep or exposed ridge-lines or slopes. There may be several floristic communities present based on geography, altitude and rainfall. On private land Grassy Dry Forest occupies lower altitude and lower rainfall habitats as the lower, grassy edges of the hills were more accessible for agriculture and thus often depleted.

Equivalent units in other studies:

Dry Sclerophyll Forest (LCC 1991).

Grassy Dry Forest (Woodgate *et al.* 1994)

Grassy Dry Forest (Northern Foothills) (Muir *et al.* 1995)

Shrubby Dry Forest

This common and widespread ecological vegetation class favours exposed aspects in the higher altitudes, generally from 550 to 1100 metres. Medium to steep eastern, northern and western upper slopes commonly support Shrubby Dry Forest and also occurs on ridge lines and near-ridge southern aspects that are marginally protected. Rainfall is frequently less than 1000mm per annum, but the class can occur in areas which receive up to 1500mm. However the effective rainfall on all sites is low as a result of the exposed aspects, shallow soils and often steep sites.

Shrubby Dry Forest exists on a range of geologies, predominantly Ordovician sediments, but Ordovician metamorphic schists and Devonian-Silurian igneous materials are also common. Resultant soils range from brown to dark brown sandy loams to clay loams, often rocky and usually quite shallow.

The height of the overstorey varies greatly, from 8 to 40 m, though 20-25 m is the most common. Compared to other dry forest vegetation classes the trees in Shrubby Dry Forest have a good form. The understorey consists of a moderately dense shrub layer up to 2 m and a very sparse ground layer of drought tolerant grasses, herbs and lilies. It is characteristically a non-weedy vegetation class because of its generally remote occurrence and moderate to low environmental site quality.

The dominant overstorey trees are Broad-leaved Peppermint *Eucalyptus dives* and Brittle Gum *E. mannifera*. Red Stringybark *E. macrorhyncha* is a more common component in the driest sites, and Mountain Gum *E. dalrympleana* occurs at the higher altitudes near this ecological vegetation class' boundary with Montane Dry Woodland.

The shrubby understorey commonly comprises Dwarf Geebung *Persoonia chamaepeuce*, Rough Coprosma *Coprosma hirtella*, Slender Rice-flower *Pimelea linifolia* ssp. *linifolia*, Common Cassinia *Cassinia aculeata*, Handsome Flat-Pea *Platylobium formosum*, Silver Wattle *Acacia dealbata* and Gorse Bitter-Pea *Daviesia ulicifolia*. Hop Bitter-Pea *Daviesia latifolia* can be dominant as a result of frequent burning. Low shrubs such as Heath Pink-Bells *Tetradlea bauerifolia*, Pink-Bells *Tetradlea ciliata* and Grey Guinea-Flower *Hibbertia obtusifolia* are also frequently present. Two shrubs, Heath Milkwort *Comesperma ericinum* and Rough Star-hair *Astrotricha asperifolia* occur sporadically in Shrubby Dry Forest, but rarely in any other ecological vegetation class in the study area.

If burnt very frequently, or left unburnt for long periods, the ground layer may have Silvertop Wallaby-grass *Chionochloa pallida* as the dominant species. Other grasses include Common Plume-grass *Dichelachne rara*, Plume-grass *Dichelachne sieberiana* s.s., and the rare grass Soft Ledge-grass *Poa hothamensis* var. *parviflora*. The drought and fire-tolerant mat-rushes, sedges and lilies present can include Wattle Mat-rush *Lomandra filiformis* ssp. *filiformis*, Cluster-headed Mat-Rush *Lomandra longifolia* ssp. *exilis*, Black-anther Flax-lily *Dianella revoluta* var. *revoluta* and Common Woodrush *Luzula meridionalis* var. *flaccida*. Though not present in large numbers the consistently represented forbs include Common Raspwort *Gonocarpus tetragynus*, Creeping Cudweed *Euchiton gymnocephalus*, Small Poranthera *Poranthera microphylla* and Stinking Pennywort *Hydrocotyle laxiflora*. The Purple Coral-pea *Hardenbergia violacea* and Grass Trigger-plant *Stylidium graminifolium* are also common.

In the altitudinal sequence of north east Victoria Shrubby Dry Forest often grades into Heathy Dry Forest at lower elevations (approximately 500-600 m) and Montane Dry Woodland at montane elevations (approximately 1000 m). However, on very exposed aspects in montane situations (up to 1200 m) Shrubby Dry Forest can persist but can abruptly become Montane Dry Woodland with a slight decrease in insolation allowing snow to persist.

Equivalent units in other studies:

Montane Dry Woodland (in part) (LCC 1991)

Shrubby Dry Forest (Woodgate *et al.* 1994).

Heathy Dry Forest

This EVC is widespread and common throughout most of the study area, particularly from low to moderate elevations (200-1000 m) on exposed northern and western slopes and ridge tops. The free-draining soils are derived from Ordovician sediments, Devonian granitoids and Rhyolite. The nutrient levels of these soils are low due to their generally sandy texture and low levels of organic matter. Rainfall is generally less than 1000 mm per annum. In higher rainfall areas, Heathy Dry Forest grows on sites that have a low effective rainfall.

The overstorey is characteristically low (mostly 15-20 m), but can reach 30 m on exceptional sites with higher rainfall. The overstorey mostly consists of Red Stringybark *Eucalyptus macrorhyncha* and Long-leaf Box /Silver Bundy *E. goniocalyx/nortonii*. These ubiquitous species combine with Broad-leaved Peppermint *E. dives* in some situations and with Red Box *E. polyanthemos* in higher environmental site quality locations grading into Grassy Dry Forest on less exposed aspects.

The shrub layer is the most characteristic and dominant stratum which gives Heathy Dry Forest its name. Ericoid and small-leaved shrubs, often of low stature (rarely exceeding 0.5 m) include Small-leaf Parrot-pea *Dillwynia phyllicoides* and Daphne Heath *Brachyloma daphnoides*. Less common species are Silky Guinea-flower *Hibbertia sericea*, Common Wedge-pea *Gompholobium huegelii*, Austral Grass-tree *Xanthorrhoea australis*, Heathy Bush-pea *Pultenaea procumbens* and Urn Heath *Melichrus urceolatus*. The Cat's Claws Grevillea *Grevillea alpina* and Hairy Geebung *Persoonia rigida* are common with Grey Bush-pea *Pultenaea cunninghamii* dominant in the Whitfield-Buffalo River area, mainly on acid volcanics. Other geology types include Lower Carboniferous and Ordovician sediments. There are a few species which sporadically occur in Heathy Dry Forest which do not generally inhabit other ecological vegetation classes in the study area. These species are Thin-leaf Wattle *Acacia aculeatissima*, Ploughshare Wattle *A. gunnii* and Hairy Plume-grass *Dichelachne hirtella*.

There are few grasses or forbs in this ecological vegetation class, although Silvertop Wallaby-grass *Chionochloa pallida* is usually present. Herbs present are drought tolerant. Ground layer species commonly include Black-anther Flax-lily *Dianella revoluta* var. *revoluta*, Large Quaking-grass **Briza maxima*, Common Hovea *Hovea linearis*, Variable Stinkweed *Opercularia varia*, Stinking Pennywort *Hydrocotyle laxiflora*, Many-flowered Mat-rush *Lomandra multiflora*, Narrow Groundsel *Senecio tenuiflorus* and Grass Trigger-plant *Stylidium graminifolium*. Weeds are generally not a major component of this EVC. However due to edge effects, sites near disturbed land can have a significant presence of weeds.

Many observations throughout the study area have indicated the critical importance of fire regimes in maintaining the shrub component of Heathy Dry Forest. A single fire at the wrong stage in the reproductive cycle of species in Proteaceae (particularly in the Genus *Grevillea*), can completely remove that species from a site. On granitic geologies repeated burning was observed to have produced a quantum shift in the floristics from Heathy Dry Forest to Grassy Dry Forest as the fire-sensitive shrub species (*Monotoca*, *Brachyloma*, *Grevillea*, *Persoonia*, *Banksia*, *Gompholobium* and *Dillwynia*) were eliminated and a diverse range of grasses and forbs established. This is particularly evident in the Mount Pilot Multi Purpose Park, where Heathy Dry Forest appears to be in severe decline in favour of Grassy Dry Forest as the result of past burning. Similarly, frequent burning in Heathy Dry Forest on sedimentary or acid volcanic (rhyodacite) geology appeared to lead to a loss in species from these genera as well. In contrast however to those sites on granitic geologies, these sites did not develop a diverse array of grasses and forbs, but were often only dominated by Silvertop Wallaby-grass *Chionochloa pallida*. This floristic entity is described separately, below.

Equivalent units in other studies:

Heathy Dry Forest (LCC 1991)

Heathy Dry Forest (Woodgate *et al.* 1994)

Heathy Dry Forest (North-eastern Hills), in part (Muir *et al.* 1995)

Heathy Dry Forest (Northern Foothills), in part (Muir *et al.* 1995)

The second floristic entity was encountered over substantial areas but in only four locations in the north and west of the study area and was generally not on granitic geology. Structurally this entity is a low open forest with a sparse shrub cover, the outstanding feature of which, being the dominance of Silvertop Wallaby-grass *Chionochloa pallida*. Large tussocks of Silver-top Wallaby-grass can crowd out most other ground layer species, often having a cover-abundance of over 50%. Consequently this entity is very species poor.

Aspects seem to vary for this form of Heathy Dry Forest, but most are exposed, north eastern to western slopes. Slopes range from gentle to steep, with most sites on a gentle gradient. Altitude varies

from 220 m to 680 m. Soils tend to have a high component of sand or rock with low to moderate nutrient status and poor moisture-holding ability.

Characteristic eucalypts are always dry forest species, namely Red Stringybark *Eucalyptus macrorhyncha*, Long Leaved Box / Silver Bundy *E. goniocalyx* / *nortonii*, Broad-leaved Peppermint *E. dives* and Brittle Gum *Eucalyptus mannifera*. Shrub species if present can include Grey Guinea-flower *Hibbertia obtusifolia*, Common Hovea *Hovea linearis*, Trailing Ground-berry *Acrotriche prostrata*, Narrow-leaf Bitter-Pea *Daviesia leptophylla* and Silver Wattle *Acacia dealbata*. Other species which may occur are Spiny-headed Mat-Rush *Lomandra longifolia*, Grassland Daisy *Brachyscome angustifolia*, Nodding Blue-Lily *Stypandra glauca* and Long-hair Plume-grass *Dichelachne crinita*. Weedy species have a low cover and diversity.

Equivalent unit in other studies:

Not previously described.

Herb-rich Foothill Forest

Herb-rich Foothill Forest is widespread and common throughout the study area on both public and private land except at the lowest elevations (200 -300m) and at higher elevations (greater than 1200 m). The EVC grows mostly on sheltered aspects and the occurrences on exposed sites are generally on lower slopes which afford sufficient protection, through afternoon shading by surrounding hills, or persistent high humidity such as along river or creek valleys. However, the amount of protection required varies with rainfall. For example, there are extensive areas of this EVC on plateau landforms such as in the Strathbogie Ranges, Whitfield and Freeburgh districts where higher rainfall and persistent cloud cover replaces the need for the requirement of topographic protection whilst under the lowest rainfall regimes this EVC is entirely restricted to gullies and valley sides with southern or eastern aspects. Optimal rainfall is wide ranging from 760-1600 mm per annum..

This ecological vegetation class occupies an extremely wide range of geological types which include outwash alluviums, Ordovician sandstones and metamorphics, Devonian and Silurian granitoids and Cambrian greenstone/diabase. As such, it appears aspect and moisture availability are the primary environmental determinants for this EVC. The consequent soil types vary from sandy loams to medium clays. On the drier sites tree height is 20-25 m and on the moister sites is commonly 40-50 m.

The structure is an open forest with a sparse to very dense shrub layer and commonly high cover of herbs in the ground layer. Austral Bracken *Pteridium esculentum* may tend to dominate following frequent disturbance, particularly by fire. The diversity is moderate to high with mean floristic richness being 54 species per site (higher elevation sites have lower diversity).

The most common overstorey species are Narrow-leaf Peppermint *Eucalyptus radiata* s.l. and less commonly: Eurabbie *Eucalyptus globulus* ssp. *bicostata* (often on granitic geology), Mountain Gum *Eucalyptus dalrympleana* ssp. *dalrympleana* (more prominent at higher altitudes) with Broad-leaved Peppermint *Eucalyptus dives* at drier localities. The shrub layer consists of sparse to dense Silver Wattle *Acacia dealbata*, Common Cassinia *Cassinia aculeata*, Prickly Currant-bush *Coprosma quadrifida* and Tree Lomatia *Lomatia fraseri* (prominent in the moist sites), while Handsome Flat-pea *Platylobium formosum*, and Pink-bells *Tetratheca ciliata* are conversely more abundant in the drier examples of Herb-rich Foothill Forest.

The forbs and grasses are the most distinctive floristic and structural indicator for Herb-rich Foothill Forest because of their generally high cover and diversity. Common species are Bidgee Widgee *Acaena nova-zelandiae*, Ivy-leaf Violet *Viola hederacea*, Prickly Woodruff *Asperula scoparia*, Kidney-weed *Dichondra repens*, Austral Bear's-ears *Cymbonotus preissianus*, Common Lagenifera *Lagenifera stipitata*, Common Woodrush *Luzula meridionalis* var. *flaccida* and the Tasmanian Flax-lily *Dianella tasmanica*.

Grasses are the other conspicuous life form, the most common species being Weeping Grass *Microlaena stipoides* var. *stipoides*, Common Wheat-grass *Elymus scabrus*, Common Hedgehog-grass *Echinopogon ovatus* and Grey Tussock-grass *Poa sieberiana* var. *sieberiana*. Austral Bracken occurs in almost all sampling sites and Mother Shield-fern *Polystichum proliferum* is often present in moist sites. Climbers are represented by Twining Glycine *Glycine clandestina* and Mountain Clematis *Clematis aristata*, particularly in moist sites with a moderate to dense shrub layer. The rare species Soft Ledge-grass *Poa hothamensis* var. *parviflora* appears to be largely restricted to Herb-rich Foothill Forest.

This vegetation can be adversely affected by disturbances resulting in weed invasion, the most serious weed species being *Blackberry *Rubus fruticosus* spp. agg..

Equivalent units in other studies:

Herb-rich Foothill Forest (LCC 1991)

Herb-rich Forest (in part) (Woodgate *et al.* 1994).

Damp Forest

Damp Forest is widespread, but not common in the study area. It grows in gullies or on sheltered southern and south eastern slopes and is often restricted and localised in extent, except in the highest rainfall areas. The elevation range is from 600-1000 m and the rainfall ranges from 900-1600 mm per annum. The parent geologies are wide ranging and include Devonian and Silurian igneous rocks, Ordovician metamorphic and sedimentary rocks, Cambrian, Lower Carboniferous and upper Devonian sediments.

The soils are generally deep loams with medium to high levels of humus which are colluvially-formed and are well structured. Moisture availability is generally good due to the high rainfall and the development of good peds in the regolith. The height of the overstorey varies from 30-50 m. Damp Forest is characterised by a moderate to dense broad-leaved shrub layer, the tree stratum consisting of species from moist environments and the ground layer normally mostly ferns with grasses and herbs being a minor component.

The overstorey is mostly represented by Messmate *Eucalyptus obliqua*, Narrow-leaved Peppermint *Eucalyptus radiata* s.l. and Eurabbie *Eucalyptus globulus* ssp. *bicostata*. There is consistently a medium to tall shrub layer of Musk Daisy-bush *Olearia argophylla*, Hazel Pomaderris *Pomaderris aspera*, Blackwood *Acacia melanoxylon* and Blanket Leaf *Bedfordia arborescens*. The most common species of the ground layer consists of ferns with Common Ground-fern *Calochlaena dubia*, Fishbone Water-fern *Blechnum nudum* and Austral Bracken *Pteridium esculentum* being common. Some herbs and grasses are usually present, but with a low dominance and include Ivy-leaf Violet *Viola hederacea*, Kidney Weed *Dichondra repens*, Cinquefoil Cranesbill *Geranium potentilloides*, Common Woodrush *Luzula meridionalis* var. *flaccida* and Weeping Grass *Microlaena stipoides*.

Equivalent units in other studies:

Damp Sclerophyll Forest (LCC 1991)

Damp Forest (Woodgate *et al.* 1994).

Wet Forest

This ecological vegetation class is relatively uncommon and occurs at moderate elevations (500-1300 m) and is characterised by a tall eucalypt overstorey, scattered understorey trees, a tall broad-leaved shrubby understorey and a fern-rich ground layer that is usually dominated by a dense layer of tree-ferns. It is largely restricted to protected sites in gullies and on southern aspects. Rainfall is high ranging from 1200-1800 mm per year. The parent geologies are variable, the common types being Ordovician sediments, followed by Silurian metamorphic and igneous rocks, Devonian igneous and Lower Carboniferous sediments.

Soils are deep gradational clay or sandy clay loams rich in humus. Moisture availability is high due to the high rainfall and moisture retaining ability of the humus and litter layer component of the soils. Trees are generally very tall when present, often surrounding or overhanging from an adjacent ecological vegetation class. Within Wet Forest there are very localised occurrences of Cool Temperate Rainforest species such as Southern Sassafras *Atherosperma moschatum*, which rarely coalesce to form patches with a continuous canopy.

The overstorey of Wet Forest is the tallest of any ecological vegetation class in the study area and may attain heights of 70 m. The dominant overstorey species are Alpine Ash *Eucalyptus delegatensis* and Mountain Gum *Eucalyptus dalrympleana* with Manna Gum *Eucalyptus viminalis* and Narrow-leaf Peppermint *Eucalyptus radiata* s.l. occurring less frequently. There is usually an understorey of small trees such as Silver Wattle *Acacia dealbata* and Blackwood *A. melanoxylon*. The tall shrub layer is dominated by Austral Mulberry *Hedycarya angustifolia*, Musk Daisy-bush *Olearia argophylla*, Hazel Pomaderris *Pomaderris aspera* and Blanket-leaf *Bedfordia arborescens*. Beneath these there is nearly always a dense layer of Soft Tree-fern *Dicksonia antarctica*.

The groundlayer is dominated by ferns with Fishbone Water-fern *Blechnum nudum*, Mother Shield-fern, *Polystichum proliferum*, Mother Spleenwort *Asplenium bulbiferum*, Bat's Wing-fern *Histiopteris incisa* and Hard Water-fern *Blechnum watsii* the most usual. There may be a scattering of herbs where light can penetrate to the forest floor. The common forbs include Ivy-leaf Violet *Viola hederacea*, Shade Nettle *Australina muelleri*, White Elderberry *Sambucus gaudichaudiana* and Forest Starwort *Stellaria flaccida*. The species described thus far are common in undisturbed forests. After disturbance such as fire, roading or logging a thick profusion of pioneer species clothe the groundlayer. These species grow and reproduce quickly, then largely die out. Such species include the shrubs Common Cassinia *Cassinia aculeata*, Victorian Christmas-bush *Prostanthera lasianthos*, the forbs Golden Everlasting *Bracteantha bracteata*, Fireweed Groundsel *Senecio linearifolius* and Raspwort *Gonocarpus sp.*. Blackberry **Rubus fruticosus* can be a serious weed in areas disturbed by roading, other infrastructure and timber harvesting.

Equivalent units in other studies:
Wet Sclerophyll Forest (LCC 1991)
Wet Forest (Woodgate *et al.* 1994).

Montane Dry Woodland

Montane Dry Woodland occurs on dry and exposed mid to upper slopes at montane elevations (greater than 1000 m), often extending onto the ridges. In the highly dissected terrain where Shrubby Dry Forest can exist at marginal montane levels on warm aspects where snow does not persist, Montane Dry Woodland develops on the adjacent slightly colder aspects where snow can remain for substantial periods. Influences from surrounding topography particularly cloud and cold-air drainage can also be significant in terms of the amount of snow fall and its persistence. Generally Montane Dry Woodland is widespread and common in the southern or highland part of the study area, up to 1350 m altitude. Precipitation is generally around 1000 mm, but reaching up to 1500 mm at Mount Buffalo and 2000 mm at Mount Bogong. Much of this precipitation outside the summer months falls as snow. Geologies are predominantly Ordovician sediments although there are also areas of Devonian igneous materials and Silurian metamorphics. Soils range from brown sandy loams to loamy clays, often tending to be shallow and rocky but sometimes better developed.

Montane Dry Woodland has a variable structure, from an open woodland to an open forest with a denser shrub stratum. The overstorey structure may be a result of past disturbance such as frequent burning which can increase tree density in this ecological vegetation class (Woodgate *et al.* 1994), or the structure may be site specific. Trees can attain heights of 40-45 m in sheltered positions (although generally less). The weed abundance is low, averaging 3% of species and 1% of cover. Species diversity is also low for this study area, with a mean diversity of 36 species per site.

Broad-leaved Peppermint *Eucalyptus dives* and Mountain Gum *E. dalrympleana* ssp. *dalrympleana* are common overstorey trees at the lower elevations within this class, whilst Alpine Ash *E. delegatensis* ssp. *delegatensis* is usual at higher altitudes or simply on more protected sites affording greater moisture availability. It is not uncommon for Snow Gum *Eucalyptus pauciflora* to be present in the overstorey on sites which are particularly cold and exposed, mostly towards the upper limit of the elevation range.

The understorey is an unusual combination of species which tolerate exposed montane conditions and species which enjoy the increased moisture available from cloud and fog drip. The generally shrubby understorey may have combinations of Hop Bitter-Pea *Daviesia latifolia*, Rough Coprosma *Coprosma hirtella*, Moth Daisy-bush *Olearia erubescens*, Mountain Hickory Wattle *Acacia obliquinervia*, Tree Lomatia *Lomatia fraseri*, Common Cassinia *Cassinia aculeata*, Elderberry *Panax Polyscias sambucifolia*, Mountain Pepper *Tasmannia lanceolata*, Alpine Podolobium *Podolobium alpestre* and Silver Wattle *Acacia dealbata*. If frequently burnt Austral Bracken *Pteridium esculentum* and Hop Bitter Pea can dominate. The ground layer is rarely high in grass and forb cover however some of the more typical grass species are Sword Tussock-grass *Poa ensiformis*, Tasman Bent-grass *Deyeuxia rodwayi*, Mountain Bent-grass *Deyeuxia monticola*, Common Wheat-grass *Elymus scabrus* and various Wallaby Grasses *Austrodanthonia* spp. and Tussock grasses *Poa* spp. Herbaceous species include Grass Trigger-plant *Stylidium graminifolium*, Showy Violet *Viola betonicifolia* ssp. *betonicifolia*, Narrow Groundsel *Senecio tenuiflorus*, Prickly Woodruff *Asperula scoparia*, Derwent Speedwell *Derwentia derwentiana*, Prickly Starwort *Stellaria pungens*, Australian Caraway *Oreomyrrhis eriopoda* and Mountain Cotula *Leptinella filicula*. The Lily Tasman Flax Lily *Dianella tasmanica* is often present.

Equivalent units in other studies:
Montane Dry Woodland (LCC 1991)
Montane Dry Woodland (Woodgate *et al.* 1994).

Montane Damp Forest

Montane Damp Forest is widespread and common in the moderate to high elevation (900-1500m) forests of the southern half of the study area. Rainfall is as low as 1000 mm increasing to 2000 mm per year. Montane Damp Forest is most common on sheltered south-western, southern and south eastern slopes and in gully heads. It also can develop on small Montane plateaus. In these localities cold air drainage has not had a chance to pool and depress minimum temperatures for substantial periods, so that periods of low temperature are only associated with late autumn, winter and early spring. Montane Damp Forest grows on a wide range of parent geologies including Ordovician sedimentary and metamorphic rocks, Devonian Silurian igneous rocks, Silurian and Lower Carboniferous sediments. The soils are generally deep friable well drained loams. Moisture availability is high due to the high rainfall. Trees are generally tall, mostly 30-45 m. The general appearance of this EVC is of a

tall open forest with a varying shrub density and a normally dense ground layer of ferns, herbs and grasses.

The overstorey is dominated by Alpine Ash *Eucalyptus delegatensis* with Mountain Gum *Eucalyptus dalrympleana* and Broad-leafed Peppermint *Eucalyptus dives* less common, occurring in the drier more exposed sites. Snow Gum on the areas exposed to coldest conditions at the higher altitudinal limits for Montane Damp Forest. The understorey often has an understorey tree layer of Silver Wattle *Acacia dealbata*. There is usually a well developed shrub-layer of Rough Coprosma *Coprosma hirtella*, Dusty Daisy-bush *Olearia phlogopappa* var. *phlogopappa*, White Elderberry *Polyscias sambucifolia* and Tree Lomatia *Lomatia fraseri*. Hop Bitter-pea *Daviesia latifolia* is common, particularly in frequently burnt sites.

The ground layer is dominated by grasses, forbs and ferns. The common grasses are Ledge Grass *Poa hothamensis*, Sword Tussock-grass *P. ensiformis* and Tall Tussock-grass *Poa helmsii*. Some of the common herbs include Bidgee Widgee *Acaena novae-zelandiae*, Showy Violet *Viola betonicifolia*, Ivy-leaf Violet *Viola hederacea*, Prickly Starwort *Stellaria pungens*, Cinquefoil Cranesbill *Geranium potentilloides*, Broad-leaf Woodruff *Asperula euryphylla* and Common Lagenifera *Lagenifera stipitata*. The most abundant fern is Mother Shield-fern *Polystichum proliferum*. The Tasman Flax-lily *Dianella tasmanica* is present at most sites. This EVC generally has a low cover and diversity of weeds except in specific areas where some form of disturbance occurred such as timber harvesting, roading, mining and fire. A major weed threat to this ecological vegetation class in the Bogong High Plains area is English Broom **Cytisus scoparius* whose seed is spread in the mud attached to the hooves of cattle which are agisted there during the warmer months of the year. The rare Velvety Geebung *Persoonia subvelutina* was recorded from Montane Damp Forest.

Equivalent units in other studies:

Montane Damp Forest (LCC (1991)

Montane Damp Forest (Woodgate *et al.* 1994).

Montane Riparian Thicket

Montane Riparian Thicket is mostly found along the riparian zones of Montane Damp Forest. It is occasionally found within non-montane areas where cold air drainage mimics the climate of higher montane elevations. The restricted nature of habitat of this class means that it has a restricted occurrence within the study area. The soils are colluviums or alluviums and are generally silty to sandy clay loams with a high organic matter content, often resembling a peaty texture and are generally waterlogged. This EVC reaches its best development on slow flowing streams with gentle gradients in broad valleys. Streams although small, are generally permanent. The elevation range is from 500 m in cold air drainage sites to 1400 m, sometimes extending into Sub-alpine Woodland. Rainfall is in excess of 1000 mm per year.

Montane Riparian Thicket characteristically has a thicket structure with a dense tall shrub layer which often significantly reduces the amount of light reaching ground level. The overstorey mostly consists of eucalypts from montane environments such as Alpine Ash *Eucalyptus delegatensis* and Mountain Gum *Eucalyptus dalrympleana*, however other species occur at lower levels. In such cases the most common lower elevation species are Narrow-leafed Peppermint *E. radiata* s.l. and Manna Gum *Eucalyptus viminalis*. The characteristic thicket species is Mountain Tea-tree *Leptospermum grandifolium*. Under this is a sparse to dense layer of ferns, forbs and grasses.

The common species include Fishbone Water-fern *Blechnum nudum*, Alpine Water-fern *B. pennamarina*, Mother Shield-fern *Polystichum proliferum*, Bidgee Widgee *Acaena novae-zelandiae*, Cinquefoil Cranesbill *Geranium potentilloides*, Forest Mint *Mentha laxiflora*, Small-leaf Bramble *Rubus parviflorus*, Tall Tussock-grass *Poa helmsii* and Ledge-grass *P. hothamensis*. The shrubs Dusty Daisy-bush *Olearia phlogopappa* and Mountain Pepper *Tasmannia lanceolata* are common. The Tall Sedge *Carex appressa* is frequently present.

Weeds are not generally a problem, however if disturbance has occurred in the catchment weeds such as Blackberry **Rubus fruticosus* spp. agg. can become established. Road construction often leads to weed invasion as a result of the disturbance to the dense shrub canopy which can normally limit the growth of most weed species.

Equivalent units in other studies:

Montane Riparian Thicket (LCC 1991)

Montane Riparian Thicket (Woodgate *et al.* 1994).

Sub-alpine Woodland

Sub-alpine Woodland grows on a wide range of geologies within the study area and has been sampled at elevations ranging from 1300-1720 m above sea level. It is reasonably common in the high

mountainous areas of the study area with Montane Damp Forest, Montane Dry Woodland and Treeless Sub-alpine Complex the most common nearby ecological vegetation classes. Soil types are variable, but mostly free draining skeletal sandy clay loams with a rich humus layer at or near the soil surface in most instances (although this may be reduced on exposed ridges and northern or western aspects).

Sub-alpine Woodland can occur equally on any aspect in the upper end of the altitudinal range, but is mainly restricted to the exposed western and northern aspects nearing its lower altitudinal limits. Annual precipitation is very high for the study area and ranges from 1200 mm east of Mount Pinnibar to around 2400 mm per year at Falls Creek Alpine Village. A large proportion of this precipitation falls as snow that persists for many months at a time. The average winter and summer temperatures are substantially lower in this environment than most of the rest of the study area.

The overstorey mostly consists of Snow Gum *Eucalyptus pauciflora*. At the lower end of the altitudinal range Alpine Ash *Eucalyptus delegatensis* and Mountain Gum *Eucalyptus dalrympleana* may have a minor presence.

The understorey varies from grass and forb dominated with scattered shrubs to a dense shrub stratum. The understorey shrub species which commonly occur are Leafy Bossiaea *Bossiaea foliosa*, Dusty Daisy-bush, *Olearia phlogopappa*, Alpine Podolobium *Podolobium alpestre* and Alpine Pepper *Tasmannia xerophila*. The ground-layer is rich, the most common species including Bidgee Widgee *Acaena novae-zelandiae*, Sheep Sorrel **Acetosella vulgaris*, Mountain Woodruff *Asperula gunnii*, Tasman Flax-lily *Dianella tasmanica*, Pale Everlasting *Helichrysum rutidolepis s.l.*, Australian Carraway *Oreomyrrhis eriopoda*, Prickly Starwort *Stellaria pungens*, Grass Trigger Plant *Stylidium graminifolium*, Showy Violet *Viola betonicifolia* and Royal Bluebell *Wahlenbergia gloriosa*.

Sub-alpine Woodland generally has a low open woodland structure except when frequently burnt. This may lead to altered species composition with Hop Bitter-pea *Daviesia latifolia* dominating in the lower altitudinal range in some areas. Cattle grazing has had detrimental effects such as weed introduction, trampling of delicate vegetation, particularly in creek lines, thus reducing the cover and abundance of herbs in heavily grazed areas such as on the Bogong High Plains.

Equivalent units in other studies:

Sub-alpine Woodland (LCC 1991)

Sub-alpine Woodland (Woodgate *et al.* 1994).

Treeless Sub-alpine Mosaic

This complex is restricted to the cold air drainage sites at sub-alpine elevations (1200-1700m) and the highest peaks and alpine plateaux of the study area where it is common but small in overall area. It consists of a number of floristic communities often closely associated with the alluvial flats and associated nearby slopes. The complex also exists towards the summits of mountains over 1500-1830 m in height where the local exposure or poor drainage is too severe for Snow Gum *Eucalyptus pauciflora* to be present. The overall altitudinal range for the complex is from 1400-1986 m and the rainfall varies from 1500-2400 mm per year.

The ecological vegetation classes within this complex were not mapped during the study and more detailed information can be found in McDougall (1982a; 1982b; 1982c); McDougall 1984; McDougall 1985; Walsh *et al.* (1983; 1984; 1986). Broadly, this EVC consists of a range of dry and wet classes including Blockstream Coniferous Heathland, Feldmark, Fen, Snowpatch Heathland, Sub-alpine Damp Heathland, Sub-alpine Dry Heathland, Sub-alpine Grassland, Sub-alpine Grassy Shrubland, Sub-alpine Shrubland, Sub-alpine Wet Heathland, Sub-alpine Wet Heathland/Fen Mosaic, Wet Sub-alpine Heathland. The geology is diverse and consists of Quaternary alluviums, Carboniferous, Silurian and Ordovician sediments, Devonian igneous and Ordovician metamorphic rocks. There is a wide variety of soil types, ranging from coarse lithosols, through alpine humus soils to peats and snow patch soils (Gibbons and Rowan 1993).

Research into plant succession suggest that certain sub-communities are possibly grazing and/or fire induced variants. The original character and distribution of the *Kunzea* heathlands have been significantly modified by grazing and fires. Some modification of the alpine vegetation has occurred as a result of clearing and/or revegetation of downhill ski-slopes (Conn 1993). Weeds can be prominent in disturbed sites, particularly the moist areas where cattle faeces introduce weeds from the lowlands. Sheep Sorrel **Acetosella vulgaris* is widely spread and common in this mosaic.

Equivalent units in other studies:

Bog (McDougall 1982)

Closed Heathland (McDougall 1982)

Kunzea Heathland (McDougall 1982)

Late-lying Snowpatch (McDougall 1982)

Open Heathland (McDougall 1982)
Poa costiniana Tussock Grassland (McDougall 1982)
Poa hiemata Tussock Grassland (McDougall 1982)
Podocarpus Heathland (McDougall 1982)
Relic Bog (McDougall 1982)
Rocky Grassland (McDougall 1982)
Short-turf Snowpatch (McDougall 1982)
Dry Sub-alpine Shrubland (LCC 1991)
Damp Sub-alpine Heathland (LCC 1991)
Wet Sub-alpine Heathland (LCC 1991)
Sub-alpine Shrubland (Woodgate *et al.* 1994)
Sub-alpine Treeless Complex (Woodgate *et al.* 1994).

Valley Heathy Forest

This EVC was identified in the Central Highlands RFA study area during the pre-1750 vegetation mapping project (Commonwealth of Australia 1997). Within the North East RFA study area this vegetation occurs as an open forest on the outwash slopes and in the valleys below low granitic or sedimentary hills. Soils are colluvial sands and rainfall ranges from 750 to 850mm. Structurally the vegetation is predominantly sedgy and grassy with a sparse or clumped stratum of tall shrubs and low ericoid shrubs.

North of Mount Samaria the overstorey is represented by Hill Red Gum *Eucalyptus blakelyi*, Red Stringybark *E. macrorhyncha*, Red Box *E. polyanthemos* and Long-leaf Box *E. goniocalyx*. The shrub layer includes Varnish Wattle *Acacia verniciflua*, Hedge Wattle *A. paradoxa*, Thin-leaved Wattle *A. aculeatissima*, Black Wattle *A. mearnsii*, Urn Heath *Melichrus urceolatus*, Rough-barked Honey Myrtle *Melaleuca parvistaminea* (often clumped), Prickly Tea-tree *Leptospermum continentale* and Violet Kunzea *Kunzea parvifolia* (often forming thickets). Large patches of Thatch Saw-sedge *Gahnia radula* can occur, possibly due to management (eg. fire regime) or seepage. These may also influence the clump and thicket formations of other understorey species. Ground layer is less well known and includes Common Sword-sedge *Lepidosperma laterale*, Common Raspwort *Gonocarpus tetragynus*, Brown-back Wallaby Grass *Austrodanthonia duttoniana* and exotic grasses.

A basin of sedimentary colluvium north of Cherry Tree Range (south-east of Seymour) carries Valley Heathy Forest represented by reasonably intact, roadside vegetation. Red Stringybark *E. macrorhyncha*, Red Box *E. polyanthemos*, Grey Box *E. microcarpa* and Yellow Box *E. melliodora* form the overstorey. Shrubs are sparse and only Black Wattle *Acacia mearnsii* and Grey Guinea-flower *Hibbertia obtusifolia* are present. Small Grass-trees *Xanthorrhoea minor* and Saw-sedges *Gahnia spp.* are common and, in some areas, dominant in cover. The ground-layer includes Pale Flax-lily *Dianella longifolia*, Wattle Mat-rush *Lomandra filiformis*, Rushes *Juncus spp.*, Dense Spear Grass *Austrostipa densiflora* and Spear Grass *Austrostipa sp.*

Correlation to a distinct attribute, such as soil type, is not clear and the absence of remnant vegetation precluded more detailed mapping. Around Moorngag, south of Benalla and in the valley south of Lima East

the unit mapped as Valley Grassy Forest may have contained Valley Heathy Forest. On private land adjacent to Wabonga Plateau in the National Park in the valley to the east of Paradise Falls the area to the north, mapped as Herb-rich Foothill Forest, may have included Valley Heathy Forest.

Valley Heathy Forest was found in association with Valley Grassy forest, Heathy Dry Forest, Plains Grassy Woodland and Herb-rich Foothill Forest.

Sand Ridge Woodland

This EVC has not been sampled and there are no known intact remnants in Victoria. The following description is based on field observation and sampling undertaken across the Murray River of similar sand ridges.

Source-bordering dunes composed of deep sandy soil (Sandmount Sand (Skene and Poutsma 1962), Lockington Sand (Skene and Hardford 1964) and Sand Rises (Skene 1963)) support this vegetation. These soils types are developed on sand blown up by wind action from a prior stream bed (Skene and Poutsma 1962). This geomorphological phenomenon occurs in close proximity to the larger rivers (Goulburn and Murray) at 400 to 550mm annual rainfall and merges into a flatter sandy plain which supports Pine-Box Grassy Woodland. Sand Ridge Woodland can also directly abut Floodplain EVCs and the Riverina (shrubby) Grassy Woodland.

The overstorey predominantly consists of White Cypress-pine *Callitris glaucophylla*, Yellow Box *Eucalyptus melliodora*, and rarely Drooping Sheoke *Allocasuarina verticillata*. Historically, Silver

Banksia *Banksia marginata* was also present on sand hills (Robinson and Mann 1993). The shrub layer consists of Common Fringe-myrtle *Calytrix tetragona*, Grey Mulga *Acacia brachybotrya*, Lightwood *A. implexa*, Golden Wattle *A. pycnantha*, Mallee Wattle *A. montana*, Gold-dust Wattle *A. acinacea*, Sweet Bursaria *Bursaria spinosa*, and Drooping Cassinia *Cassinia arcuata*. Historically the shrub layer also carried Yarran Wattle *Acacia omalophylla* (Robinson and Mann 1993). The ground layer contains *Digitaria* spp., *Panicum* spp., Nigger-heads *Enneapogon nigricans*, and Spear Grasses *Stipa* spp.

In similar soil, but drier environment, at a site north of the New South Wales border, the following species were recorded: Wallowa *Acacia calamifolia* Sticky Hop-bush *Dodonaea viscosa*, Wedge-leaf Hop-bush *D. viscosa* spp. *cuneata* Nodding Saltbush *Einadia nutans* Urn Heath *Melichrus urceolatus*, Wire Grass *Aristida* spp., Brown-clubbed Spider *Caladenia phaeoclavia*, Mountain Burr-daisy *Calotis cuneata*, Yellow Burr-daisy *Calotis lappulacea*, *Carduus* spp., Sedge *Carex* spp., Flat Spurge *Chamaesyce drummondii*, Green Rock Fern *Cheilanthes austrotenuifolia*, Narrow Rock Fern *Cheilanthes sieberi* spp. *sieberi*, Common Everlasting *Chrysocephalum apiculatum* s.l., Australian Stonecrop *Crassula sieberiana*, Common Wallaby-grass *Danthonia caespitosa*, Bristly Wallaby-grass *Danthonia setacea*, Austral Carrot *Daucus glochidiatus*, Common Wheat-grass *Elymus scabrus*, Spider Grass *Enteropogon acicularis*, Twining Glycine *Glycine clandestina*, Cut-leaf Goodenia *Goodenia pinnatifida*, *Hordeum* spp., Stinking Pennywort *Hydrocotyle laxiflora*, *Lepidosperma* spp., Many-flowered Mat-rush *Lomandra multiflora* spp. *multiflora*, Wingless Bluebush *Maireana enchylaenoides* *Microtis* spp., Grassland Wood-sorrel *Oxalis perennans*, Grey Tussock-grass *Poa sieberiana*, Grey Tussock-grass *Poa sieveriana* var. *sieberiana*, Pussy-tails *Ptilotus spathulatus*, Cotton fireweed *Senecio quadridentatus*, *Sida* spp., Rough Spear-grass *Stipa scabra*, *Stipa* spp., *Swainsona* spp., Common Sunray *Triptilodiscus pygmaeus*, Woolly New Holland Daisy *Vittadinia gracilis* *Wahlenbergia* spp., Common Early Nancy *Wurmbea dioica* spp. *dioica*.

Equivalent units in other studies:

- Sandmount Sand (Skene and Poutsma 1962)
- Sand Rises and Lunette Soils (Skene 1963)
- Lockington Sand (Skene and Hardford 1964)

Riverine Grassy Woodland/Riverine Sedgy Forest Mosaic

This unit represents a mosaic of Riverine floodplain vegetation types. The major components are grassy woodland typically dominated by River Red Gum *Eucalyptus camaldulensis* (but in ecotonal sites sometimes including Yellow Box *E. melliodora* or Grey Box *E. microcarpa*), in less frequently flooded areas, and taller, typically open forest formation of River Red Gum with a grassy-sedgy understorey in more frequently flooded sections. Smaller areas of treeless wetland and floodway vegetation of reedbed or rushland, grassland, sedgeland or herbland structure also occur within the mosaic. The component vegetation types are confined to alluvial soils (typically loams to clay-loams but sometimes gravelly or sandy), almost entirely along the Murray River and the lower reaches of its major tributaries where they traverse the riverine plain. Upstream, the mosaic grades into Floodplain Riparian Woodland/Billagong - wetland complex. Downstream, resolution of the component types is more readily achieved (eg. in the broader floodplains of the Cobram to Echuca area).

Component species include the following:

Riverine Grassy-Sedgy Forest and (other) wetland types

River Red Gum, Rush Sedge *Carex tereticaulis*, Veined Swamp Wallaby-grass *Amphibromus nervosus*, Brown-back wallaby-grass *Austrodanthonia duttoniana*, Warrengo Summer-grass *Setaria jubiflora*, Common spike-sedge *Eleocharis acuta*. Other graminoid species include Spiny Mud-grass *Pseudoraphis spinescens*, River Swamp Wallaby-grass *Amphibromus fluitans*, Silky Browntop *Eulalia aurea*, Common tussock-grass *Poa labillardierei*, Tall flat-sedge *Cyperus exaltatus* and various *Carex* spp.. A number of herb species are (often seasonally) apparent, including Water-ribbons *Triglochin procerum*, Upright Milfoil *Myriophyllum crispatum*, Common sneezeweed *Centipeda cunninghamii*, Yellow Twin-heads *Eclipta platyglossa*, Knotweeds *Persicaria* spp., Docks *Rumex* spp., Hypsela *Hypsela tridens*, Burr-daisies *Calotis* spp., Poison Pratia *Pratia concolor*, Starwort and *Stellaria caespitosa*. Floristics vary according to seasonal conditions and site factors, particularly relative to the time since and duration of flooding. Aquatics including Azollas *Azolla* spp., Clove-strip *Ludwigia peploides*, *Nymphaea crenata*, Milfoils *Myriophyllum* spp. and Tall Spike-sedge *Eleocharis sphacelata* occur in more permanent wetlands within this system.

Riverine Grassy Woodland

The floristics of remnants are often simplified by grazing. River Red Gum is typically dominant. Grey Box and/or Yellow box can also be present in more marginal sites. The major understorey grasses are Common wallaby-grass *Austrodanthonia caespitosa* and Bristly wallaby-grass *A. setacea*. Herbaceous species include Slender Dock *Rumex brownii*, Jersey Cudweed *Pseudognaphalium luteo-album*,

Saltbushes *Einadia* spp., Bluebells *Wahlenbergia* spp., Cotton Fireweed *Senecio quadridentatus* and Cranesbills *Geranium* spp. Other now rare species (eg. Woolly Buttons *Ixiolaena* sp.) were presumably previously far more common.

Perched Boggy Shrubland

In the north-east this EVC occurs in valleys on granitic massif plateaux at 400-600m altitude. Rainfall is high ranging from 900mm to 1150mm. It occurs on all aspects of very gentle slopes above drainage lines or across hillsides between drainage lines. The soils are extremely saturated sandy clay which may be associated with an impermeable clay layer or an hydrological phenomenon creating a soak or spring effect. It is common on the plateau north of the Strathbogie Range at Strathbogie, south of Boho South including Seven Creeks and tributaries, Munroes Swamp Creek, Spring Creek and along broad valleys and plateaux around Ruffy. A site is known (but not mapped) on public land near a pine plantation south-east of Mount Lawson (W.D. Peel, pers. comm.).

Perched Boggy Shrubland occurs as a dense shrubland 2-3 metres tall over a herb and sedge-rich ground layer. There is no detailed floristic information available, but the following observations were recorded during this study; the overstorey is a dense mosaic and may include a few or all of *Baeckea* *Baeckea* sp., Prickly Tea-tree *Leptospermum continentale* and Ovens Wattle *Acacia pravissima*; the understorey has a dense layer of bryophytes including Sphagnum Moss *Sphagnum* spp. In accessible areas the following understorey species were recorded: Creeping Raspwort *Gonocarpus micranthus*, Buttercup *Ranunculus* sp., Spiny-headed Mat-rush *Lomandra longifolia*, Common Woodrush *Luzula meridionalis*, Saw-sedge *Gahnia* sp., Rush *Juncus* spp.

Perched Boggy Shrubland was always found to be surrounded by Herb-rich Foothill Forest.

Equivalent units in other studies:

None

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APPENDIX D: IUCN Threat Ratings For Lower Risk And Data Deficient Plants

Plants rated as Lower Risk in the North East Region

A taxon is rated as Lower Risk if there was sufficient information to answer a particular rule but was not categorised as Critically Endangered, Endangered or Vulnerable. *Acacia phlebophylla*, *Brachyscome gracilis*, *Celmisia sericophylla* and *Scleranthus singuliflorus* were rated as Lower Risk based on having a regional population of more than 1000 mature individuals while *Baeckea crenatifolia* was rated as Lower Risk based on having stable population numbers. Taxa rated as Lower Risk can be considered secure in the North East and not at risk of extinction in the foreseeable future.

Plants rated as lower risk in the North East Region according to the IUCN Red List Categories (IUCN 1994)

TAXON	IUCN	RARE
<i>Acacia phlebophylla</i>	LR	LR
<i>Baeckea crenatifolia</i>	LR	LR
<i>Brachyscome gracilis</i> ssp. <i>gracilis</i>	LR	LR
<i>Celmisia sericophylla</i>	LR	LR
<i>Scleranthus singuliflorus</i>	LR	LR

Plants rated as Data Deficient in the North East Region

Twelve taxa were classified as Data Deficient with the IUCN (1994) rule set that were rated as either Critically Endangered, Endangered, Vulnerable or Lower Risk using the RARE rule set (Keith and Burgman, in press). These taxa were all rated using the RARE rule set based on an observed, estimated, inferred or suspected historical or projected future reduction in regional population numbers due to a decline in the 'extent' of habitat. This inclusion of the word 'extent' to IUCN sub-criterion A1C was the sole reason for the discrepancy. No clear justification was given for this modification in Keith & Burgman (in press).

Plants rated as data deficient in the North East Region according to the IUCN Red List Categories (IUCN 1994) but of a higher rating by Keith & Burgman (in press)

TAXON	IUCN	RARE
<i>Agrostis meionectes</i>	DD	LR
<i>Cyperus flavidus</i>	DD	LR
<i>Eleocharis plana</i>	DD	CR
<i>Eucalyptus neglecta</i>	DD	VU
<i>Eucalyptus sideroxylon</i> s.s.	DD	EN
<i>Eucalyptus yarraensis</i>	DD	EN
<i>Grammitis poeppigiana</i>	DD	LR
<i>Gratiola pumilo</i>	DD	LR
<i>Huperzia australiana</i>	DD	LR
<i>Hypsela tridens</i>	DD	LR
<i>Juncus brevibracteus</i>	DD	LR
<i>Parantennaria uniceps</i>	DD	LR

Plants with insufficient information

Sixty two taxa had insufficient information on their distribution, abundance, biology and ecology in the North East Region to make a direct or indirect assessment of their risk of extinction using either the IUCN or the RARE rule sets. These are:

<i>Acacia phasmoides</i>	<i>Agrostis australiensis</i>
<i>Asplenium trichomanes</i> ssp. <i>trichomanes</i>	<i>Astrotricha linearis</i>
<i>Austrostipa setacea</i>	<i>Bossiaea riparia</i>
<i>Brachyscome chrysoglossa</i>	<i>Bulbine glauca</i>
<i>Caladenia flavovirens</i>	<i>Corybas hispidus</i>
<i>Craspedia</i> sp. (Mt Stirling)	<i>Cystopteris tasmanica</i>
<i>Deyeuxia affinis</i>	<i>Digitaria coenicola</i>
<i>Digitaria divaricatissima</i>	<i>Diuris behrii</i>
<i>Eucalyptus alligatrix</i> ssp. <i>limaensis</i>	<i>Eucalyptus cinerea</i> ssp. <i>cinerea</i>
<i>Eucalyptus mitchelliana</i>	<i>Eucalyptus pauciflora</i> ssp. <i>hedraia</i>
<i>Eucalyptus rubida</i> ssp. <i>septemflora</i>	<i>Euphrasia crassiuscula</i> ssp. <i>crassiuscula</i>
<i>Euphrasia crassiuscula</i> ssp. <i>glandulifera</i>	<i>Euphrasia eichleri</i>
<i>Fimbristylis velata</i>	<i>Genoplesium nudum</i>
<i>Goodia medicaginea</i>	<i>Grevillea jephcottii</i>

<i>Grevillea polybractea</i>	<i>Grevillea ramosissima</i> ssp. <i>hypargyrea</i>
<i>Grevillea willisii</i>	<i>Hydrilla verticillata</i>
<i>Indigofera adesmiifolia</i>	<i>Isolepis wakefieldiana</i>
<i>Koeleria cristata</i>	<i>Leptospermum multicaule</i>
<i>Lepyrodia anarthria</i>	<i>Leucochrysum molle</i>
<i>Leucopogon montanus</i>	<i>Leucopogon piliferus</i>
<i>Luzula acutifolia</i> ssp. <i>acutifolia</i>	<i>Olearia adenophora</i>
<i>Oreomyrrhis argentea</i>	<i>Oxalis magellanica</i>
<i>Persoonia subvelutina</i>	<i>Poa labillardierei</i> var. <i>acris</i>
<i>Pomaderris aurea</i>	<i>Prasophyllum frenchii</i>
<i>Prostanthera monticola</i>	<i>Pterostylis boormanii</i>
<i>Pterostylis cucullata</i>	<i>Pterostylis dubia</i>
<i>Pterostylis fischii</i>	<i>Pterostylis maxima</i>
<i>Pultenaea polifolia</i>	<i>Pultenaea vrolandii</i>
<i>Santalum lanceolatum</i>	<i>Sclerolaena birchii</i>
<i>Spirodela polyrrhiza</i>	<i>Sporobolus creber</i>
<i>Uncinia compacta</i>	<i>Westringia lucida</i> .

APPENDIX E: Summary information of Listed (FFG Act or ESP Act) threatened plant taxa in the North East RFA Region

Notes on interpretation:

1. The following species summaries include information about the number of records within the North East 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 North East 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.

Swamp Fern

Thelypteris confluens

Family: Thelypteridaceae

Species Characteristics: Perennial rhizomatous ground fern. Rhizome creeping, slender and branched, covered with broad scales. Fronds erect, 30 - 100cm tall, herbaceous, dull green, glabrous except on mid-vein, pinnae deeply lobed. Sori small, round, in two rows. Indusium kidney-shaped, papery, spores brown. Slightly dimorphic with lobes of fertile frond strongly recurved (Duncan & Isaac, 1986). Distinctive features include the erect, almost 2-pinnate fronds bearing relatively large scales and kidney-shaped, glandular hairy indusia (Entwisle, 1994).

Conservation Status:

ROTAP/ANZECC: poorly known
 VROTS: endangered
 ESP Act (1992): not listed
 FFG Act (1988): listed; no Action Statement

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
0	0	100

Distribution in NE Region: In Victoria known from only one locality on private land in a drainage line near the Kiewa Valley Highway north of Tawonga. Also known to occur in Queensland, New Zealand, the Americas, Africa, Papua New Guinea, Sumatra and India. (Green & Walsh, 1984; Duncan & Isaac, 1986; Entwisle, 1994).

Habitat: The Kiewa Valley population is growing in an alpine bog dominated by Sphagnum (*Sphagnum cristatum*), Alpine Bottle Brush (*Callistemon sieberi*), Mountain Baeckea (*Baeckea utilis*), Small-fruit Hakea (*Hakea microcarpa*) and Alpine Heath (*Epacris paludosa*) situated in a drainage line. Soils are deep peat. Although typically found at altitudes in excess of 1000 m the vegetation community at this site is growing at only 300 m. Elsewhere this species is found in and associated with freshwater swampy situations. (Green & Walsh, 1984; S.A.C., 1995, nom.).

Life History: Perennial obligate helophyte, that is, it carries its rhizome in the soil or mud below water level and its aerial shoots above water level. Asexual reproduction occurs via rhizomes. Sexual reproduction occurs via spores which are dispersed by wind or water. Only a small percentage of these spores is likely to land on suitable habitat in which to germinate, that is, adequate water and suitable muddy substrate. Typical of all ferns this species passes through several stages in its life cycle: spores landing in a suitable environment develop a small flat thallus which produces sexual parts, and fertilisation occurs followed by formation of a sporophyte which is the familiar frond-like foliage normally associated with ferns. Availability of sufficient water is a requirement for successful fertilisation as the male and female structures are separate and the male sperm need to swim to the female parts (S.A.C., 1995, nom.). *T. confluens* requires long periods without major disturbance for survival and establishment (e.g. no fires, floods, clearing etc.), and it occurs in habitats that are not normally subject to fire.

Threatening Processes operating in NE Region:

T. confluens grows in a freshwater swamp, and is intolerant of desiccation. Any activities which threaten this habitat, such as changes to drainage or water availability, trampling from grazing stock, erosion and stream entrenchment, would have adverse effects on the species. (S.A.C., 1996, final rec.). The bog is bordered on one side by cattle-grazed pasture and a few common weed species have invaded the bog to some extent (Green & Walsh, 1984). The species is only found at one location in Victoria, and a chance event could destroy it.

Rating of Threats:

Disturbance	Rating	Source
Fragmentation of native veg.	3	Cheal, RFA database
Introduced plants	2	Green & Walsh, 1984
Grazing/trampling	2	S.A.C., 1996, final rec., Green & Walsh, 1984
Dams/changes to water regimes	3	S.A.C., 1996, final rec.

Current Management:

- Reservation/ protection status - only found on private land.

Wire-head Sedge

Family: Cyperaceae

Carex cephalotes

Species Characteristics: Small rhizomatous tussock-forming graminoid. Rhizome short; shoots densely tufted. Culms erect, smooth, terete, 5 - 20 (rarely to 30) cm long. Leaves glabrous, usually shorter than culms, 0.5-1.2 mm wide; gradually taper to a fine keeled tip, sheath yellow-brown; ligule rounded to truncate. Inflorescence erect, 0.5-1.2 cm long, with one spike; lowest involucre bract shorter than inflorescence (Wilson, 1993). It is distinguished from other species in the area by the compact solitary spike. At maturity the female part of the spike opens and the utricles become spreading or reflexed (S.A.C., 1990).

Conservation Status:

ROTAP/ANZECC: rare

VROTS: vulnerable

ESP Act (1992): not listed

FFG Act (1988): listed; no Action Statement

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
100	0	0

Distribution in NE Region: Very localised in Victoria where it is confined to sheltered rocky areas at high altitudes (Wilson, 1994). Recent records are from Mt. Loch-Machinery Spur and on the south-east slopes of Mt. Nelse in areas where snow persists late into the season, in the Alpine National Park (Frood, 1998, VROTOP, S.A.C., 1990, nom.). Early records were Mt. Hotham (1900) and Mt. Bogong (1923). There is also an unconfirmed record from the Bennis Plains area (Gippsland RFA Region). Elsewhere it is located in the Kosciuszko area of New South Wales and in New Zealand (Costin *et al.*, 1979).

Habitat: A species of treeless sub-alpine herbfields, sod tussock grasslands, bogs and fens (Costin *et al.*, 1979). At Mt. Nelse it occurs in Small Star Plantain (*Plantago glacialis*) - Cushion Carraway (*Oreomyrrhis pulvinifera*) dominated herbland along drainage lines and in the drier Prickly Snow-grass (*Poa costiniana*) dominated grassland in the inter-drainage line sections (McDougall, 1982).

Life History: This species is a summer flowering perennial herb. Little is known of its ecology. Sexual reproduction and subsequent establishment from the small seed-like nut. Rhizomatic asexual reproduction and establishment occurs commonly. *C. cephalotes* occurs in habitats that are not normally subject to fire and requires long periods without major disturbance for survival and establishment.

Threatening Processes operating in NE Region:

- The population has a long history of grazing by cattle during the summer period on the south-east slopes of Mt. Nelse. The inflorescences in all stages of development would be eaten, hence reducing seed development and regeneration (Adair, 1981, LaTrobe). Cattle grazing was phased out from the Mt. Nelse area in 1991, but weeds are a continuing legacy of this activity. Grazing by hares continues to reduce the reproductive capacity of the plants (Frood, 1998, VROTOP).
- The species is vulnerable to disturbance or degradation of habitat because of the limited availability of suitable habitat in Victoria and its very low population levels (S.A.C., 1990, nom.). The greenhouse effect could result in a reduction of area of suitable habitat (Busby, 1988).

Rating of Threats:

Disturbance	Rating	Source
Introduced animals	2	Frood, 1998, VROTOP
Introduced plants	2	Frood, 1998, VROTOP
Grazing/trampling	1	Frood, 1998, VROTOP, Adair, 1981, LaTrobe
Other:greenhouse effect	1	Busby, 1988

Current Management:

- Reservation/ protection status - Alpine National Park
- monitored for VROTOP database in last 5 years.
- Conservation and Environment (1992) Alpine National Park Bogong Unit and Wonnangatta-Moroka Unit Management Plans -
 - Planned management for nationally significant plant species: sites are to be included in the Special Protection Zone and will be managed with the aim of ensuring the survival of the significant species; a 'management statement' will be prepared, which will define the precise boundary of each site/area, and will provide management prescriptions covering conservation, monitoring, recreation, productive uses and other management activities; fire suppression, fuel reduction burning and the control of pest plants and animals will take into account the presence of significant species: efforts will be made to collate information on species distribution, ecology and threats; surveys will be undertaken at sites which are predicted to contain significant species.
 - Planned management for *C. cephalotes*: cattle grazing was withdrawn in 1991 in the Bogong Unit; the effects of grazing on the species will be monitored in the Wonnangatta-Moroka Unit.

Dwarf Sedge
Family: Cyperaceae

Carex paupera

Species Characteristics: Dwarf, tussock-forming graminoid. Densely rhizomatous species forming a short, closely packed sward of strap-like leaves <0.5m tall arising from distinct tussocks. Fertile spikelets hidden among the leaves (Scarlett, 1985, La Trobe).

Conservation Status:

ROTAP/ANZECC: rare
 VROTS: vulnerable
 ESP Act (1992): not listed
 FFG Act (1988): listed; no Action Statement

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
100	0	0

Distribution in NE Region: It occurs on the Bogong High Plains near Mt Jim in the Alpine National Park and the Mount Hotham area. It is also found within the Gippsland RFA Region on the Nunniong and Dargo High Plains (Scarlett, 1985, La Trobe). Endemic to Victoria (Willis, 1970).

Habitat: Strictly confined to shallow, seasonally inundated 'snow pools' in alpine and sub-alpine grassland at altitudes of 1200-1760 m above sea level. These grasslands are dominated by Prickly Snow-grass (*Poa costiniana*), Mud Pratia (*Pratia surrepens*) and Alpine Candles (*Stackhousia pulvinaris*). All known stands occur on shallow clay-loam soils derived from Tertiary basalt. *C. paupera* is possibly adapted to the microhabitat within the snow pools to which it is confined as the soil within them is peaty black clay loam whilst that of the surrounding areas is red-brown clay loam (Scarlett, 1985, La Trobe). On the Bogong High Plains the 'snow pools' become extremely dry in late summer to early autumn due to the shallow soils being underlain by basalt rock (McDougall, 1982).

Life History: Although there is no detailed information about the biology of this species (Scarlett, 1985, La Trobe), it appears to be an annual, biennial or short-lived perennial. Sexual reproduction and subsequent establishment from the small seed-like nut. Asexual reproduction occurs via rhizomes. *C. paupera* occurs in habitats that are not normally subject to fire and requires long periods without major disturbance for survival and establishment.

Threatening Processes operating in NE Region:

- The snow pool habitat of the species appears to be relatively stable and little affected by cattle grazing or trampling (Scarlett, 1985, La Trobe). *C. paupera* is palatable and readily eaten by stock, rabbits and other mammalian herbivores. However, it occurs in wetter areas which cattle visit only occasionally and it is probably not selectively grazed.
- Any general disturbance will be a threat on account of the species' rarity (S.A.C., 1991, final rec.). The developments of skiing facilities at Mt. Hotham may have obliterated the species at that locality (Scarlett, 1985, La Trobe).
- Presumed habitat at European settlement was isolated and separated by considerable areas of unsuitable habitat. Much of its original habitat has been destroyed or highly modified. The species is known from only two 10-minute grids in the State, at high altitudes. It is confined to shallow snow pools in grasslands, a type of vegetation that is rare in the alps (S.A.C., 1991, final rec.). The greenhouse effect could result in a reduction of area of suitable habitat (Busby, 1988).

Rating of Threats:

Disturbance	Rating	Source
Fragmentation of native veg.	1	Cheal, RFA database, S.A.C., 1991, final rec.
Grazing/trampling	1	Scarlett, 1985, La Trobe
Recreation	1	Scarlett, 1985, La Trobe
Other:greenhouse effect	1	Busby, 1988

Current Management:

- Reservation status - Alpine National Park
- Conservation and Environment (1992) Alpine National Park Bogong Unit Management Plan -
 - Planned management for nationally significant plant species: sites are to be included in the Special Protection Zone and will be managed with the aim of ensuring the survival of the significant species; a 'management statement' will be prepared, which will define the precise boundary of each site/area, and will provide management prescriptions covering conservation, monitoring, recreation, productive uses and other management activities; fire suppression, fuel reduction burning and the control of pest plants and animals will take into account the presence of significant species; efforts will be made to collate information on species distribution, ecology and threats; surveys will be undertaken at sites which are predicted to contain significant species.
 - Planned management for *C. paupera*: appropriate measures will be taken to protect the species from grazing.

Rock Poa
Family: Poaceae

Poa saxicola

Species Characteristics: Tufted or shortly rhizomatous, glabrous perennial. Culms erect, to 60 cm tall. Leaves abruptly tapered to a bluntish apex, to 25 cm long and 5 mm wide; ligule membranous, truncate but jagged or pointed in the centre, 1-5 mm long. Inflorescence a narrow, contracted panicle with few short, appressed branches to 12 cm long, but commonly 5 cm long (Walsh, 1994). It is distinguished by plump spikelets and the narrow, contracted panicles which usually droop at maturity (Vickery, 1970).

Conservation Status:

ROTAP/ANZECC: not listed
 VROTS: vulnerable
 ESP Act (1992): not listed
 FFG Act (1988): listed; no Action Statement

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
100	0	0

Distribution in NE Region: Mt. Spion Kopje, Mt. Cope, Watchbed Creek and Bucketty Plain areas of the Bogong High Plains in the Alpine National Park (Frood, 1998, VROTPOP). It is also recorded from the Cobberas mountains and Bennisons Plains (Gippsland RFA Region). Outside Victoria it extends to the ranges of the Australian Capital Territory and the high mountains of Tasmania (SAC, 1991).

Habitat: Alpine to subalpine areas, growing in to low wet heath, rocky grassland, open shrubland (Walsh, 1994), and meadows or herbfields, often in the shelter of rocky outcrops (Costin, *et al.*, 1979) at elevations of 1270-1850 metres.

Life History: Perennial grass. Asexual reproduction and establishment occurs occasionally but sexual reproduction and subsequent establishment from seeds is usual and *P. saxicola* occurs in habitats that are not normally subject to fire and requires long periods without major disturbance for survival and establishment.

Threatening Processes operating in NE Region:

- *P. saxicola* is palatable and readily eaten by stock, rabbits and other mammalian herbivores. It occurs in areas which were grazed by cattle, although not heavily due to rocky terrain. There is no evidence that it is selectively grazed, but it can still be damaged by trampling (S.A.C., 1991, final rec.). Grazing was removed from the Mt. Spion Kopje and Watchbed Creek areas in 1991 (Frood, 1998, VROTPOP).
- Presumed habitat at European settlement was isolated and separated by considerable areas of unsuitable habitat. Most of the original habitat is still present. The species is vulnerable to disturbance or degradation of habitat because of the limited availability of suitable habitat in Victoria and its low population levels (S.A.C., 1991, nom.). The species has had a serious decline, disappearing from two 10-minute grids in which it was reported prior to 1950, and now known only from four 10-minute grids. It occurs only rarely in small pockets within these grids, and may be on the point of disappearing from one of the 4 sites (S.A.C., 1991, final rec.). The greenhouse effect could result in a reduction of area of suitable habitat (Busby, 1988).

Rating of Threats:

Disturbance	Rating	Source
Fragmentation of native veg.	1	Cheal, RFA database, S.A.C., 1991, nom.
Grazing/trampling	1	S.A.C., 1991, final rec, Frood, 1998, VROTPOP
Other:greenhouse effect	1	Busby, 1988

Current Management:

- Reservation status - Alpine National Park
- monitored for VROTPOP database in last 5 years.
- Conservation and Environment (1992) Alpine National Park Bogong Unit Management Plan -
 - Planned management for nationally significant plant species: sites are to be included in the Special Protection Zone and will be managed with the aim of ensuring the survival of the significant species; a 'management statement' will be prepared, which will define the precise boundary of each site/area, and will provide management prescriptions covering conservation, monitoring, recreation, productive uses and other management activities; fire suppression, fuel reduction burning and the control of pest plants and animals will take into account the presence of significant species; efforts will be made to collate information on species distribution, ecology and threats; surveys will be undertaken at sites which are predicted to contain significant species.

Crimson Spider-orchid

Caladenia concolor

Family: Orchidaceae

Species Characteristics: Perennial geophyte to 30 cm high with a globose tuberoid, the underground stem and tuberoids invested in a fibrous tunic. Leaf solitary, hairy, narrow lanceolate to 15 cm long, green with crimson markings near the base. One or two flowers to 8 cm across, uniform deep purplish red on a slender, erect, hairy, dark green to greenish purple stem. Perianth segments to 5 cm long, hairy (Backhouse & Jeanes, 1995).

Conservation Status:

ROTAP/ANZECC: vulnerable
VROTS: endangered
ESPAct (1992): listed, vulnerable
FFG Act (1988): listed; no Action Statement

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
50	0	50

Distribution in NE Region: Chiltern Box-Ironbark National Park and One Tree Hill State Forest, Beechworth. Elsewhere in Victoria the species is widely scattered across central and eastern parts of the Goldfields within the West RFA Region (Backhouse & Jeanes, 1995).

Habitat: Found in open forests and woodlands, often among low heathy shrubs. Soils are generally sand and clay loams that are often gravelly or stony and always well drained (Backhouse & Jeanes, 1995). Sites are broadly of the Box-Ironbark vegetation alliance.

Life History: In common with all Spider-orchids *C. concolor* is a long-lived summer-dormant perennial herb. Sexual reproduction and establishment occurs only occasionally. It may be limited to a few seasons because of dormancy within the propagules, habitat requirements or because establishment needs the temporary removal of competitors. Generally, the tuberoid is dormant between late spring or early summer and autumn. During the winter to spring growing season the plant produces one leaf, and if sufficiently large, a flower stem develops from the centre of the leaf. The current season's tuberoid (parent) which produces the leaf and flower renews itself over the growing season to produce a 'daughter' tuberoid by which the plant survives over the next summer. The parent tuberoid dies at the end of the growing season. Flowers open in September or October and remain open if not pollinated for 4-6 weeks. It is likely that the flowers mimic female thynnid wasps and pollination is carried out by the deceived males attempting to mate. Flowers close a day or so after pollination and seed ripens and are shed 3-4 weeks later. Reproduction is by seed which are assumed to be short-lived (one year) so that there is no carry-over from one season to the next. Germination occurs in early winter requiring an obligatory mycorrhizal relationship to be formed with a free-living fungus. This mycorrhizal relationship continues throughout the life of the plant, the fungus apparently re-infecting the orchid tissue each autumn (S.A.C., 1995, nom.). *C. concolor* is an optional root resprouter where most plants survive fire and resprout from the underground tuber, but there is also significant re-establishment from seed germination. However it is sensitive to fire intensity (destroyed by hot fire) and by fire season (sensitive to spring fire).

Threatening Processes operating in NE Region:

- Unscrupulous collecting (and associated trampling) by amateur and professional biologists and casual collecting by recreational walkers is an ongoing threat (Tonkinson, 1989 - VROTPD form but not entered, Chiltern). The species is subject to minor collection only, but plants occur in small populations and are particularly susceptible to such collection.
- At the several locations reported, weed invasions are severe, the most seriously invasive species being Quaking Grass (*Briza maxima*). At Chiltern at least, this and other weed species have the potential to eliminate the orchid in a few years if not controlled. Most, if not all, populations are likely to be in serious decline because of weed invasion and other factors. Weeds directly compete with established plants causing their death by competition for light and water, and prevent seedling recruitment (S.A.C., 1995, nom.).
- The species previously had a wide distribution in central Victoria. Only six populations are currently known, and the rarity of this species makes it susceptible to catastrophic events (S.A.C., 1996, final rec.). It is presently found in one National park and several smaller nature reserves but in such small numbers that its future survival prospects are not good (Backhouse & Jeanes, 1995). All known populations of *C. concolor* are small with less than about 20 flowering plants seen at any one time (S.A.C., 1995, nom.).
- At Chiltern Box-Ironbark National Park illegal timber cutting in the past has caused serious but localised damage through soil disturbance and mechanical damage to plants. This could directly or indirectly harm plants, in the latter case by exacerbating weed invasion (S.A.C., 1995, nom.).
- It is potentially threatened across most of its range by gold exploration and mining operations (Backhouse & Jeanes, 1995). The *Mineral and Resources Development Act*, 1990 allows for mining without an FFG permit in areas of unrestricted Crown Land that do not contain taxa or communities listed under the FFG Act, 1988, or that are not Critical Habitat. Mining and exploration in restricted Crown Land will only be permitted with consent of the Minister for Conservation Land Management under section 44 of the MRD Act. FFG permits are not required for this type of activity. (Gill Earl - addition to nomination, 1995)
- Trail bikes and 4-wheel drive vehicles pose a possible threat to the orchids although there is no direct evidence that plants have been damaged in this way (S.A.C., 1995, nom.).
- Rabbits are likely to be present at all sites and could damage or destroy plants by grazing and digging (S.A.C., 1995, nom.).

Rating of Threats:

Disturbance	Rating	Source
Clearing of native vegetation	2	S.A.C., 1996, final rec
Fragmentation of native veg.	3	S.A.C., 1996, final rec, Backhouse & Jeanes, 95
Timber harvesting	2	S.A.C., 1995, nom.
Introduced animals	1	S.A.C., 1995, nom.
Introduced plants	3	S.A.C., 1995, nom.
Mining/quarrying	2	Backhouse & Jeanes, 1995
Recreation	1	S.A.C., 1995, nom.
Deliberate collecting/harvesting	3	Tonkinson, 1989, VROTPD, Cheal, RFA database
Reproductive problems	3	Backhouse & Jeanes, 1995, S.A.C., 1995, nom.

Current Management:

- Reservation/ protection status - Chiltern Box-Ironbark National Park and private land.
- monitored for VROTPOP database in last 5 years.
- an exclusion area has been fenced in One Tree Hill State Forest at Beechworth (Johnson, pers.com.).
- dead branches have been placed over one population in Chiltern to prevent grazing (VROTPOP).
- Parks Victoria (1998) Chiltern Box-Ironbark National Park Draft Management Plan -
 - Planned management for significant flora: encourage surveys of, and research into, significant flora in the Park to improve knowledge of their locations and management requirements; encourage research and prepare an ecological burning strategy for the Park which provides for ecological management of significant flora; maintain and improve a 'sites of significance' map which shows the location of significant plant species; consult the 'sites of significance' map before undertaking management activities which may impact on floral values; ensure flora surveys are undertaken before any mineral exploration, and do not consent to mineral exploration where this may impact on significant vegetation; prepare a pest plant and animal control strategy for the Park; progressively close and allow to rehabilitate as necessary tracks defined through past uses other than those trails identified in the management plan, giving priority to Special Protection Areas
 - Planned management for *C. concolor*: sites will be managed as Special Protection Areas; a program of regular monitoring will be prepared.

Yellow Hyacinth Orchid

Family: Orchidaceae

Dipodium hamiltonianum

Species Characteristics: Leafless, terrestrial saprophyte. Flower stem to 95 cm tall, stout, yellowish-green bearing 3-25 yellowish-green flowers with numerous scattered red or purple spots, each 45 mm across and arranged in a loose, open spike. The petals and sepals are widely spreading and are not reflexed or recurved near the tips. Easily distinguished from other species of *Dipodium* by the large yellowish green, red-spotted flowers. The pink and white labellum has a callus with two tapering keels (Jones, 1988; Backhouse & Jeanes, 1995; Jessup & Johnson, 1997).

Conservation Status:

ROTAP/ANZECC: not listed
VROTS: endangered
ESP Act (1992): not listed
FFG Act (1988): listed; Action Statement (Jessup & Johnson, 1997)

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
50	50	0

Distribution in NE Region: There are seven known populations in the North East Region. Four are in the Beechworth area (one in Beechworth Historic Park, two in Mt. Pilot Multi-Purpose Park and one on private land) in addition to single populations in Chiltern Box-Ironbark National Park, on private land in the Chesney Vale area and in Burrowa-Pine Mountain National Park. Elsewhere in Victoria the species has been recorded in Rainshadow Woodland near Wulgulmerang in the Alpine National Park (Cobberas-Tingaringy Unit) and Snowy River National Park (Jessup & Johnson, 1997). The latter two sites fall into the East Gippsland RFA Region.

Habitat: This species is confined to lower rainfall and rain-shadow areas and occurs on well-drained sandy loams over out-cropping Devonian granite (Backhouse & Jeanes, 1995; Jessup & Johnson, 1997). The Beechworth area sites occur in Granitic Hills Woodland dominated by Red Stringybark (*Eucalyptus macrorhyncha*), Red Box (*E. polyanthemos*), Blakley's Red Gum (*E. blakleyi*) and Black Cypress-pine (*Callitris endlicheri*). Most of the remaining sites have an understorey of shrubs commonly including Hairy Hop-bush (*Dodonaea boroniifolia*), Cat's Claws Grevillea (*Grevillea alpina*), Daphne Heath (*Brachyloma daphnoides*), Erect Guinea-flower (*Hibbertia riparia*) and Flat-leaf Bush-pea (*Pultenaea platyphylla*) (Jessup & Johnson, 1997). In Chiltern Box-Ironbark National Park this species grows in Box-Ironbark Forest. The vegetation at this site is species-rich though it includes a substantial component of exotic species (S.A.C., 1995, nom.). Elsewhere in Australia this species grows in a wide range of habitats.

Life History: *D. hamiltonianum* is a leafless saprophyte that derives its nourishment from relationships with mycorrhizal fungi (Backhouse & Jeanes, 1995). The reproductive biology (both sexual and asexual) of this species is unknown. However, it is known that the species flowers between December and February (Jones, 1988), reproduces by seed and generally one flower spike is produced, although the frequency of spike production appears to be variable (some monitored individuals flowering only once in five years). Specific invertebrate pollinators are unknown. However, Jones (1988) and Backhouse & Jeanes (1995) suggest that the flowers of *Dipodium* species may be pollinated by small native bees or wasps, which are attracted to the flowers, possibly by floral mimicry. For most of the year this orchid remains dormant underground as a large, fleshy, branched tuberous root (Jessup & Johnson, 1997). Regeneration is not dependent on disturbance but 'natural' disturbances, such as fires, floods, or occasional browsing/grazing are tolerated. In response to fire *D. hamiltonianum* is an obligate root resprouter where many plants survive fire and resprout from underground tubers. There is minimal re-establishment from seed germination.

Threatening Processes operating in NE Region:

- The species is palatable and readily eaten by herbivores. Browsing by Black Wallabies, although sporadic, has a significant impact due to the relatively low flower and pod production of the orchid. Rabbit grazing is also a threat (Jessup & Johnson, 1997).
- Removal of the tuberous roots of the orchid by enthusiasts is unlikely because the orchid cannot be successfully transplanted or cultivated due to a close symbiotic relationship with mycorrhizal fungi. However, the collection of flower spikes at more readily accessible sites is a problem, and has caused the extinction of the species at one locality at Beechworth (Jessup & Johnson, 1997).
- Weed invasion may threaten the Chiltern and Beechworth populations (S.A.C., 1995, nom.), the latter which is also close to an urban centre.
- Infrequent flower spike production and the development of few pods is thought to limit the abundance of the orchid (Jessup & Johnson, 1997).
- *D. hamiltonianum* is only known from nine sites (Jessup & Johnson, 1997), and the total population is estimated to be less than 100 plants (Backhouse & Jeanes, 1995). The rarity of the species makes it susceptible to catastrophic events (S.A.C., 1996, final rec.)
- Habitat fragmentation is also a threat. The presumed habitat at European settlement was isolated, and separated by considerable areas of unsuitable habitat. Much of the original habitat has been destroyed or highly modified.
- It is unclear whether altered fire regimes have had a detrimental effect on the orchid (Jessup & Johnson, 1997).

Rating of Threats:

Disturbance	Rating	Source
Clearing of native vegetation	2	Cheal, RFA database
Fragmentation of native veg.	3	Cheal, RFA database, Backhouse & Jeanes, 1995
Introduced animals	2	Jessup & Johnson, 1997
Introduced plants	3	S.A.C., 1995, nom
Deliberate collecting/harvesting	3	Jessup & Johnson, 1997
Reproductive problems	3	Jessup & Johnson, 1997
Other: native animal grazing	2	Jessup & Johnson, 1997

Current Management:

- Reservation/ protection status - occurrences in reserves - Chiltern Box-Ironbark National Park.
- monitored for VROTOP database in last 5 years.
- Parks Victoria (1998) Chiltern Box-Ironbark National Park Draft Management Plan -
 - Planned management of significant flora: encourage surveys of, and research into, significant flora in the Park to improve knowledge of their locations and management requirements; encourage research and prepare an ecological burning strategy for the Park which provides for ecological management of significant flora; maintain and improve a 'sites of significance' map which shows the location of significant plant species; consult the 'sites of significance' map before undertaking management activities which may impact on floral values; ensure flora surveys are undertaken before any mineral exploration, and do not consent to mineral exploration where this may impact on significant vegetation; prepare a pest plant and animal control

strategy for the Park; progressively close and allow to rehabilitate as necessary tracks defined through past uses other than those identified in the management plan, giving priority to Special Protection Areas.

- Planned management of *D. hamiltonianum*: sites will be managed as Special Protection Areas; a program for regular monitoring will be prepared.
- Natural Resources and Environment (1996) Burrowa-Pine Mountain National Park Management Plan-
 - Planned management of significant flora: encourage surveys of, and research into, significant flora in the Park to improve knowledge of their management requirements; ensure significant plants are protected from management activities, including fire protection works; as research brings a better understanding of fire regimes, ensure that this information is included in any ecological fire management strategy; prepare and implement a pest plant and animal control strategy for the Park.
- Jessup & Johnson (1997) Action Statement -
 - Past management actions: at Chiltern Box-Ironbark National Park, one orchid has been protected from browsing with a wire mesh guard, detailed monitoring and mapping was carried out with Friends of Chiltern Park, and hand pollination resulted in pods on 3 orchids; at Beechworth Historic Park, Natural Resources and Environment has commenced detailed monitoring, incorporating mapping and non-intrusive marking of orchid localities; a specimen on private land at Chesney Vale has been protected from browsing by a tree guard.
 - Intended management actions are to: monitor all populations annually to assess pod production, numbers of plants, threats and success of management; protect from herbivore browsing with tree guards on all public land sites; control pest plants and animals where necessary; search for other populations in suitable habitat; develop a hand-pollination protocol; provide information and incentives to landholders to conserve the orchid on private land, assist community groups with monitoring, encourage research into the ecological and biological requirements of the species.

Wedge Diuris
Family: Orchidaceae

***Diuris dendrobioides* (formerly *D. cuneata*)**

Species Characteristics: Deciduous terrestrial geophyte. Leaves one or two, produced annually, linear, green, slender and grass-like to 20 cm long and 5 mm wide. Flower stem to 40 cm tall, slender, green. Flowers one to six, to 35 mm across, pale mauve with purple blotches and stripes, lateral sepals green. Distinguished from the similar *Diuris punctata* and *D. fragrantissima* by the paler flowers, very long lateral sepals, tapered petals and the generally later flowering time (Backhouse & Jeanes, 1995).

Conservation Status:

ROTAP/ANZECC: not listed
 VROTS: endangered
 ESP Act (1992): not listed
 FFG Act (1988): listed, Action Statement (as *D. cuneata*) (Johnson, 1992a)

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
0	100	0

Distribution in NE Region: In Victoria it is restricted to two sites on rail reserves near Wodonga and Wangaratta. Endemic to north-eastern Victoria and central and south-coast NSW where it is widespread but generally uncommon (Jones, 1988).

Habitat: Near Wodonga this species grows on Quaternary alluvium with deep-red clay-loam soils in remnant Plains Grassy Woodland. The vegetation has an overstorey of Red Box (*Eucalyptus polyanthemos*) and Red Gum (*E. camaldulensis*) over a grassy understorey of Kangaroo Grass (*Themeda triandra*), Spear Grasses (*Stipa* spp.), Wallaby Grasses (*Danthonia* spp.) and Brush Wire-grass (*Aristida behriana*). Dense stands of Hop Bitter-pea (*Daviesia latifolia*) occur on disturbed areas. Mean annual rainfall is 700 mm which occurs mostly in winter and spring (Scarlett & Tonkinson, La Trobe, 1987; S.A.C., 1992, nom.). Elsewhere it grows in colonies in open forest, low coastal scrub communities, grasslands and grassy woodlands on relatively fertile, well-drained sandy loams (Jones, 1988; 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 inflorescence is produced. *D. dendrobioides* flowers from October 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. The attraction of other species (for pollination) is unclear (Jones, 1988). Asexual reproduction and establishment occurs occasionally. Generally, little is known in detail of the ecology of this species. Where the species occurs in dense grassy vegetation, successful regeneration from seed appears to be dependent on periodic burning. The reasons for this are likely to be complex but the simple removal on dense litter is clearly important (Scarlett, 1987a, La Trobe).

Threatening Processes operating in NE Region:

- The species was once widespread through north-east Victoria (Scarlett, 1987, LaTrobe). Now there is only one known Victorian population comprising 13 plants in a 0.6 ha area (S.A.C., 1992, final rec.). A single event could cause the extinction of *D. dendrobioides* in the wild in Victoria.
- The very small population size represents a threat to the survival of the species because of inbreeding depression and reduced fitness accompanying this (S.A.C., 1992, final rec.). Hybridisation between this species and Purple Diuris (*Diuris punctata*) has been observed, producing mostly sterile offspring. This long term process threatens the integrity of the species and its reproduction rate (Scarlett, 1987, La Trobe).
- Reproduction or recruitment of the species has seriously declined or is not occurring. Natural seed set is negligible and the overall number of plants has not increased from the mid 1980's. Only once has natural pollination been observed (1991) and natural pollinators (native bees) are scarce or absent at the time of flowering (S.A.C., 1992, final rec.). Invertebrate grazing (cane moth larvae) can also significantly affect flower production and destroy flower spikes (Johnson, 1992a).
- Illegal collection poses a serious threat as the species is highly prized due to its striking appearance and rarity. In recent times, one of the two remaining populations was removed by orchid collecting and only one population is known to survive (S.A.C., 1992, final rec.).
- The only site on which the species occurs is on a small rail and road reserve presently managed by NRE, but this not a permanent reserve, and is subject to habitat degradation (S.A.C., 1992, nom.). The reserve is small (5 ha) and linear, making edge effects, particularly weed invasion, significant (Johnson, 1992a).
- Competition from weeds, poses a serious threat to the species. Competition from the dominant native grass, Kangaroo Grass (*Themeda triandra*), due to lack of burning, also threatens the species. The vigorous growth of this grass smothers smaller herbs which require inter-tussock spaces created by burning. Ecological burns are difficult to implement because there is insufficient understanding of the response of *Diuris dendrobioides* to varying frequency, intensity and season of burning. Burning may also cause the proliferation of some weeds (Johnson, 1992a).
- Roadworks including grading, slashing and road widening represent a threat to the survival of the population through habitat degradation and weed invasion. (Johnson, 1992a).
- Grazing by domestic stock and rabbits, although currently at a low level, poses a future threat (Johnson, 1992a). The species is palatable to mammalian herbivores. Occasional horse riding in the reserve contributes to soil compaction and trampling (Johnson, 1992a).
- The species occurs in remnant native grassland, which is itself highly threatened. The presumed habitat at European settlement was largely contiguous. Considerable areas of original habitat have been destroyed or highly modified, and current habitat is highly fragmented.

Rating of Threats:

Disturbance	Rating	Source
Clearing of Native Vegetation	3	Scarlett, 1987, LaTrobe, S.A.C., 1992, final rec
Fragmentation of native veg.	3	Scarlett, 1987, LaTrobe, S.A.C., 1992, final rec.
Lack of fire	3	Johnson, 1992a
Introduced animals	2	Johnson, 1992a
Introduced plants	3	Johnson, 1992a
Grazing/trampling	2	Johnson, 1992a
Road construction/maintenance	3	Johnson, 1992a
Recreation	2	Johnson, 1992a
Deliberate collecting/harvesting	3	S.A.C., 1992, final rec.

Reproductive problems	3	S.A.C., 1992, final rec., Scarlett, 1987, La Trobe, Johnson, 1992a
Other:native plant competition	3	Johnson, 1992a

Current Management:

- Reservation/ protection status - 1 population on reserve owned by government agency and managed by NRE.
- monitored for VROTPOP database in last 5 years.
- Johnson (1992a) Action Statement -
 - Past management actions: managing authorities informed of the significance of the site and management guidelines, and management agreements made; hand pollination of all flowers and pods taken from the site; ecological burns; manual and chemical weed control; relocation of Telecom underground cables outside the reserve.
 - Intended management actions are to: establish and monitor permanent plots in 3 management units of the site; conduct burns in Kangaroo Grass dominant sections of the reserve; eradicate and control weeds; expand reserve to include extra public land; negotiate ecologically based grazing regimes; erect 'Native Plant Reserve' signs; liaise with public authorities to formalise management agreements; control rabbits as required; undertake hand pollination; propagate plants from seed held in store and possibly from NSW; cultivate seedlings for sale to the public; plant propagated tuberoids into reserve; restore grassland on nearby public land for planting propagated orchids; encourage research into biological and ecological requirements.

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, proportionately 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/ANZECC: not listed
 VROTS: vulnerable
 ESP Act (1992): not listed
 FFG Act (1988): listed; no Action Statement

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
0	20	80

Distribution in NE Region: There are several records of this species in the north east in the Benalla, Bonegilla, Chiltern, Glenrowan and Wangaratta areas (Scarlett & Tonkinson, 1980-87, La Trobe). Plants are mostly found on rail and road reserves, and on one bushland reserve and one private land block. 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: In the north east most records for this species occur on rail reserves and road reserves in remnant Plains Grassy Woodland with an overstorey of Grey Box (*Eucalyptus microcarpa*) and Red Box (*E. polyanthemos*) over a grassy field layer dominated by Kangaroo Grass (*Themeda triandra*) and herbaceous species. Shrubs may be scattered throughout. Soils vary and include fine, grey sandy-loam derived from Devonian granite; hard-setting grey loams derived from Quaternary alluvium; deep-red clay-loam derived from Quaternary alluvium and hard-setting grey loam derived from Ordovician sediments. Most sites appear to experience seasonal inundation (Scarlett & Tonkinson, 1980-87, La Trobe). Elsewhere this 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 inflorescence 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. The attraction of other species (for pollination) is unclear (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 (e.g. no fires, floods, clearing etc.).

Threatening Processes operating in NE 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 (S.A.C., 1991, final rec.). The presumed habitat at European settlement was largely contiguous. Considerable areas of original habitat have been destroyed or highly modified, and current habitat is highly fragmented.
- 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 (S.A.C., 1991, final rec.).
- Invasion and competition from weeds threatens the species (Scarlett & Tonkinson, 1980-87, La Trobe)
- Removal of plants and flowers by collectors is also a threat (Scarlett & Tonkinson, 1980-87, La Trobe)
- Fire prevention works, that is, slashing, ploughing and herbicide spraying, have the potential to cause serious damage at several sites (Scarlett & Tonkinson, 1980-87, La Trobe)
- The long term absence of burning may cause the decline of *D. punctata* (Scarlett & Tonkinson, 1980-87, La Trobe)
- Ground disturbance and rubbish dumping associated with vehicle access causes damage to some populations (Scarlett & Tonkinson, 1980-87, La Trobe).
- The species is palatable to mammalian herbivores but this is not considered to be a major threat (S.A.C., 1990, nom.).
- Hybridisation between this species and Wedge Diuris (*Diuris dendroboides*) has been observed, producing mostly sterile offspring. This long term process threatens the integrity of the species and its reproduction rate (Scarlett & Tonkinson, 1980-87, La Trobe).

Rating of Threats:

Disturbance	Rating	Source
Clearing of native vegetation	2	S.A.C., 1991, final rec.
Fragmentation of native veg.	3	S.A.C., 1991, final rec.
Lack of fire	1	Scarlett & Tonkinson, 1980-87, La Trobe
Introduced plants	3	Scarlett & Tonkinson, 1980-87, La Trobe
Grazing/trampling	2	S.A.C., 1990, nom.
Deliberate collecting/harvesting	2	Scarlett & Tonkinson, 1980-87, La Trobe
Vandalism/human disturbance	2	Scarlett & Tonkinson, 1980-87, La Trobe
Reproductive problems	2	Scarlett & Tonkinson, 1980-87, La Trobe
Other: fire prevention works	2	Scarlett & Tonkinson, 1980-87, La Trobe
soil disturbance	3	S.A.C., 1991, final rec.

Current Management:

- Reservation/ protection status - public land and private land .
- monitored for VROTOP database in last 5 years.
- A population in a bushland reserve has been monitored annually, weeds have been controlled and horse camping has been removed. The populations on rail lines are recognised flora reserves, and are either subject to management agreements with the Public Transport Corporation or are managed by NRE. Monitoring, weed control and ecological burns have been carried out. A private land site has been monitored annually, and NRE has provided funds for rabbit-proof fencing and weed control (Johnson, pers. com.).

Leafy Greenhood

Family: Orchidaceae

Pterostylis cucullata

Species Characteristics: Perennial geophyte. Leaves 3-7 in a ground-hugging, stem-encircling basal rosette, ovate to elliptic, 4-10 cm long, 1.5-2 cm wide, dark green, petiole short, margins entire or crinkled. 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/ANZECC: vulnerable

VROTS: vulnerable

ESP Act (1992): listed as vulnerable

FFG Act (1988): listed; Action Statement (Bramwells, 1993)

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
0	50	50

Distribution in NE Region: This species has been recorded from the southern escarpment of the Strathbogie Ranges, north-east of Merton and north-east of Eildon near Lake Eildon, in State forest. Elsewhere the species is widespread 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: In the Strathbogie Ranges it occurs in Herb-rich Foothill Forest with Narrow-leaf Peppermint (*Eucalyptus radiata*) and Eurabbie (*E. globulus* ssp. *bicostata*) over a diverse herb-rich understorey on friable, brown, freely-draining soils derived from outcropping Devonian granite. 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.

Threatening Processes operating in NE Region:

- Orchids growing at the Strathbogie State Forest site occur along a roadside and may be damaged by erosion of the road batter (Bramwells, 1993)
- The Lake Eildon population is threatened by weed invasion, intensive camping and recreation activities such as trail bike riding, horse riding and walkers (trampling).
- Collection by enthusiasts is a threat to *P. cucullata* (Bramwells, 1993).

Rating of Threats:

Disturbance	Rating	Source
Introduced plants	2	Bramwells, 1993
Road construction/maintenance	2	Bramwells, 1993
Recreation	2	Bramwells, 1993
Deliberate collecting/harvesting	2	Bramwells, 1993
Other:unclear management authority	1	Bramwells, 1993

Current Management:

- Reservation/ protection status - occurrences are on Crown land.
- Bramwells (1993) Action Statement -
 - Past management actions: Upper Goulburn Field Naturalists have assisted with surveys to relocate the species and describe habitat; the Ancona Landcare Group have offered to help with the stabilisation of a road batter where erosion is threatening the Strathbogie Ranges population.
 - Intended management actions are to: negotiate a public authority management agreement with Rural Water Corporation for the management of the Lake Eildon population; monitor all populations annually; search in areas where there are historic records of the orchid; where necessary protect populations with fences; carry out weed control where required; evaluate the impact of *ad hoc* camping and recreational use at Lake Eildon; encourage local conservation groups to carry out surveys; encourage research into the biology of the species.

Buloke

Allocasuarina luehmannii

Family: Casuarinaceae

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 cylindrical, 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/ANZECC: not listed
VROTS: in decline
ESP Act (1992): not listed
FFG Act (1988): listed; no Action Statement

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
20	0	80

Distribution in NE Region: 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). In the North-East Region it occurs mostly on private land and roadsides in the Boorhaman district. It has also been recorded in Tungamah Gravel Reserve, Chiltern Box-Ironbark National Park, Hume Freeway north of Seymour (Berwick, pers. com.), Beechworth, Springhurst and Eldorado (NRE, NE Area files).

Habitat: Usually growing in a woodland with Grey Box (*Eucalyptus microcarpa*) on non-calcareous soils (Entwisle, 1996a) on the alluvial plains and the fringes of low hills.

Life History: Plants are long-lived perennials, surviving more than 50 years. Male and female parts are held on separate plants and flowers are unisexual. Flowering time is between September and November (Entwhistle, 1996a). Sexual reproduction and subsequent establishment from seeds. Asexual reproduction and establishment occurs occasionally. Regeneration is not dependent on particular rare or unpredictable events such as fire or flood. The species is an obligate seed regenerator after fire; all (or 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 (e.g. no fires, clearing etc.).

Threatening Processes operating in NE Region:

- Presumed habitat at European settlement was largely contiguous, on a regional scale. Considerable areas of original habitat have been destroyed or highly modified, and current habitat is fragmented.
- 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 (S.A.C., 1991, final rec.).
- The reproductive capacity of *A. luehmannii* has seriously declined because of grazing of seedlings and young plants by stock and rabbits (S.A.C., 1991, final rec.).

Rating of Threats:

Disturbance	Rating	Source
Clearing of native vegetation	2	S.A.C., 1991, final rec.
Fragmentation of native veg.	2	
Introduced animals	2	S.A.C., 1991, final rec
Grazing/trampling	2	S.A.C., 1991, final rec

Current Management:

- Reservation/ protection status - occurrences are on Crown land and on private land.
- Populations on private land and roadsides in the Boorhaman district have been targeted by NRE in a program to conserve and enhance remnant Callitris Pine-Buloke woodlands. Grants have been provided to landholders for fencing remnants from stock grazing to enhance regeneration, and some planting has been carried out. Exclusion of grazing on some roadsides has been achieved after liaison with the local Shire. Negotiations have commenced for the acquisition of significant vegetation blocks (Johnson, pers. comm.).

Deane's Wattle
Family: Mimosaceae

Acacia deanei ssp. deanei

Species Characteristics: Erect shrub or small tree, to 7 m tall; bark smooth, grey-brown. Branchlets angular or flattened, glabrous or with appressed hairs; new growth yellow. Leaves bipinnate, dull to whitish green; rachis 1-4 cm long, with glands at the junction of each pinna pair and sometimes between successive pairs; pinnae in 2-8 pairs; pinnules in 10-30 pairs, 0.5-1 mm wide, hairy or glabrous. Flower heads globular, pale yellow, in racemes of 15-30. Pod more or less straight, flattish, 6-13 cm long, 6-9 mm wide, usually constricted between seeds, dark brown to blackish, hairy when young (Entwisle *et al.*, 1996).

Conservation Status:

ROTAP: not listed
 VROTS: endangered
 ESP: not listed
 FFG: listed; no Action Statement

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
90	10	0

Distribution in NE Region: In Victoria this species is restricted to the north-east where several stands have been recorded from Chiltern Box-Ironbark National Park and a single stand at Mt. Pilot Multi-purpose Park (S.A.C., 1995, nom.). It is also found in New South Wales and Queensland (Entwisle *et al.*, 1996; S.A.C., 1995, nom.).

Habitat: In Chiltern Box-Ironbark National Park this subspecies is found in Box-Ironbark Forest on soils derived from Ordovician sediments which are often stony and have poor water-holding capacity. The overstorey is dominated by Mugga (*Eucalyptus sideroxylon*) with Grey Box (*E. microcarpa*) as sub-dominant over a dense shrub layer including Cat's Claws Grevillea (*Grevillea alpina*), Narrow-leaf Bitter-pea (*Daviesia leptophylla*) and Daphne Heath (*Brachyloma daphnoides*) and includes Grey Tussock-grass (*Poa sieberiana*) and Rough Spear-grass (*Stipa scabra ssp. falcata*) as common elements in the field layer (Muir *et al.*, 1995). In New South Wales *A. deanei ssp. deanei* grows in sclerophyll communities on a variety of soil types (Morrison & Davies, 1991).

Life History: Acacias are essentially insect-pollinated, usually by beetles, wasps or bees, although birds and mammals may occasionally be implicated. Spring growth takes place after flowering and will continue into summer if sufficient water is available. After pollination the ovary develops into a pod containing a number of seeds. The seed coat is hard and resistant to moisture penetration. An external agency is required to fracture the seed coat so that moisture can penetrate and initiate germination. This may include heat or abrasion. Germination or establishment is promoted by fire for *A. deanei ssp. deanei*. *Acacia* seed is mostly dispersed by ejection from the pod under the influence of the hot sun. Ants have been observed harvesting fallen seed and it is thought that they consume the fleshy funicle and aril which attach the seed to the pod, leaving the seed buried and safe from predators and unfavourable conditions. Some seed will be stimulated to germinate after fire but may then fail due to lack of adequate follow-up rains, while the remainder of the seed will germinate over time as adequate moisture and oxygen penetrate to the seed (Tame, 1992). *A. deanei ssp. deanei* flowers over winter from May to August and appears to have a low rate of seed production (S.A.C., 1995, nom.). Asexual reproduction is unknown. In response to fire this species is an obligate seed regenerator where all, or nearly all, plants are killed by fire, and regeneration is solely from seed stored in the soil pre-fire.

Threatening Processes operating in NE Region:

- Most populations are small and threatened by changes in current management practices (S.A.C., 1996, final rec.).
- The Box-Ironbark Forest community in which the taxon grows is a focus for gold mining, and exploration and mining activities are potential threats (S.A.C., 1995, nom.).
- *A. deanei ssp. deanei* appears to have a low rate of seed production. The reasons are unknown, but this may limit its regeneration potential (S.A.C., 1995, nom.).
- Future siting of a tip adjoining Chiltern Box-Ironbark National Park threatens the largest and most significant stand (S.A.C., 1996, final rec.).
- The recently discovered population at Mt Pilot is along a roadside and in a recreation and production zone of the park. The threats are from indiscriminate firewood collection and army training exercises (S.A.C., 1995, nom.).

Rating of Threats:

Disturbance	Rating	Source
Firewood collection	2	S.A.C., 1995, nom.
Road construction/maintenance	2	S.A.C., 1995, nom.
Mining/quarrying	2	S.A.C., 1995, nom.
Vandalism/human disturbance	2	S.A.C., 1995, nom.
Reproductive problems	2	S.A.C., 1995, nom.
Other:tip site	2	S.A.C., 1996, final rec

Current Management:

- Reservation/ protection status - most occurrences in reserves (Chiltern Box-Ironbark National Park) and other Crown land reserves.
- monitored for VROTPOP database in last 5 years.
- Parks Victoria (1998) Chiltern Box-Ironbark National Park Draft Management Plan -
 - Planned management of significant flora: encourage surveys of, and research into, significant flora in the Park to improve knowledge of their locations and management requirements; encourage research and prepare an ecological burning strategy for the Park which provides for ecological management of significant flora; maintain and improve a 'sites of significance' map which shows the location of significant plant species; consult the 'sites of significance' map before undertaking management activities which may impact on floral values; ensure flora surveys are undertaken before any mineral exploration, and do not consent to mineral exploration where this may impact on significant vegetation; prepare a pest plant and animal control strategy for the Park; progressively close and allow to rehabilitate as necessary tracks defined through past uses other than those identified in the management plan.

Phantom Wattle
Family: Mimosaceae

Acacia phasmoides

Species Characteristics: Open shrub, 1-4 m high. Stems silvery-grey; branches slender, with scattered, appressed, short, straight and silvery hairs. Phyllodes narrowly linear, 5-11 cm long, 1-2 mm wide, flat or quadrangular, incurved to twisted, glabrous to subglabrous, midrib prominent. Flowers heads yellow, 2 per axil, obloid to globular, approximately 0.5-1 cm long, sessile, rachis densely hairy. Pods to 9 cm long, 2.5-4.5 mm wide, curved to sigmoid, often white-pubescent (Costermans, 1989; Entwisle *et al.*, 1996).

Conservation Status:

ROTAP/ANZECC: vulnerable
 VROTS: vulnerable
 ESP Act (1992): listed as vulnerable
 FFG Act (1988): not listed

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
100	0	0

Distribution in NE Region: Extremely localised species; in Victoria known only from Burrowa-Pine Mountain National Park, east of Wodonga. Also recorded in the nearby Dora Dora State Forest in New South Wales (Entwisle *et al.*, 1996).

Habitat: At Pine Mountain *A. phasmoides* grows among granite rocks in sheltered gullies (Entwisle *et al.*, 1996).

Life History: There is sparse information on the ecology of this species. Generally, Acacias are insect-pollinated, usually by beetles, wasps or bees, although birds and mammals may occasionally be implicated. Spring growth takes place after flowering and will continue into summer if sufficient water is available. After pollination the ovary develops into a pod containing a number of seeds. The seed coat is hard and resistant to moisture penetration. An external agency is required to fracture the seed coat so that moisture can penetrate and initiate germination. This may include heat or abrasion. *Acacia* seed are mostly dispersed by ejection from the pod under the influence of the hot sun. Ants have been observed harvesting fallen seed and it is thought that they consume the fleshy funicle and aril which attach the seed to the pod, leaving the seed buried and safe from predators and unfavourable conditions. Some seed will be stimulated to germinate after fire but may then fail due to lack of adequate follow-up rains, while the remainder of the seed will germinate over time as adequate moisture and oxygen penetrate to the seed (Tame, 1992). *A. phasmoides* flowers from September to November (Entwisle *et al.*, 1996). Asexual reproduction is unknown. It tolerates occasional major ('natural') disturbances and requires fire for germination and establishment. In response to fire this species is an obligate seed regenerator where all, or nearly all, plants are killed by fire, and regeneration is solely from seed stored in the soil pre-fire.

Threatening Processes operating in NE Region:

- Presumed habitat at European settlement was isolated, and separated by considerable areas of unsuitable habitat. Most of the original habitat is present.
- Lack of fire may pose a threat to the long term regeneration of the species.

Rating of Threats:

Disturbance	Rating	Source
Lack of fire	1	Tame, 1992

Current Management:

- Reservation/ protection status - Burrowa-Pine Mountain National Park
- Natural Resources and Environment (1996) Burrowa-Pine Mountain National Park Management Plan-
 - Planned management of significant flora: encourage surveys of, and research into, significant flora in the Park to improve knowledge of their management requirements; ensure significant plants are protected from management activities, including fire protection works; as research brings a better understanding of fire regimes, ensure that this information is included in any ecological fire management strategy; prepare and implement a pest plant and animal control strategy for the Park.

Slender Parrot pea

Family: Fabaceae

Almaleea capitata

Species Characteristics: Slender, trailing shrub, branches to 1 m long, stems appressed pubescent. Leaves narrowly elliptic, 3-9 mm long, 0.5-1.5 mm wide, upper surface glabrous, lower surface minutely scabrous, stipules to 1 mm long. Inflorescence a head of 4-10 flowers. Calyx hairy, 5-6 mm long including pedicel 1.5-2 mm. Corolla orange-yellow with red markings, wings longer than keel. Pod turgid, rounded, dark grey to brown, hairy (Jeanes, 1996a)

Conservation Status:

ROTAP: Rare

VROTS: rare

ESP: not listed

FFG: listed, no Action Statement

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
50	50	0

Distribution in NE Region: The species is found ENE of Mt Howitt (SAC, 1990). In the Gippsland RFA region it occurs on plains near Mt Cobberas. Also found in NSW (Jeanes, 1996a).

Habitat: Subalpine and montane snow plains and open valleys on moist gently sloping sites on the edges of wet, badly drained flats. Altitudes are above 1200 m and precipitation more than 900 mm per annum. The species is usually a component of shrubland dominated by Coral Heath (*Epacris microphylla*) or of mixed shrubland/grassland, and may extend into Black Sallee (*Eucalyptus stellulata*) or Broad-leaved Peppermint (*E. dives*) woodland (Scarlett, 1984, La Trobe).

Life History: Perennial. Sexual reproduction, with establishment from seeds occurs only occasionally. It may be limited to a few seasons because of dormancy within the propagules, habitat requirements or because establishment needs the temporary removal of competitors. Asexual reproduction is unknown. Regeneration is habitat dependent on particular rare and unpredictable events, and between such events plants may appear to be absent. Following fire, the species is an obligate seed regenerator, and all plants are killed. It tolerates occasional disturbance.

Threatening Processes operating in NE Region:

- The rarity of the species, which is only known from four locations in Victoria, makes it susceptible to extinction through catastrophic events (S.A.C., 1991, final rec.).
- *Almaleea capitata* requires a specialised habitat on an ecotone between swamp and forest which is likely to be damaged by trampling, and by people and vehicles in emergency situations such as fire control activities (S.A.C., 1991, final rec.).
- Soil disturbance also increases the likelihood of weed invasion (S.A.C., 1990, nom.).
- The greenhouse effect could result in a reduction of area of suitable habitat (Busby, 1988)

Rating of Threats:

Disturbance	Rating	Source
Introduced plants	1	S.A.C., 1990, nom.
Grazing/trampling	2	S.A.C., 1991, final rec.
Vandalism/human disturbance	1	S.A.C., 1991, final rec.
Other: greenhouse effect	1	Busby, 1988

Current Management:

- Conservation and Environment (1992) Alpine National Park Wonnangatta-Moroka Unit Management Plan -
 - Planned management for all nationally threatened plant species: sites are to be included in the Special Protection Zone and will be managed with the aim of ensuring the survival of the significant species; a 'management statement' will be prepared, which will define the precise boundary of each site/area, and will provide management prescriptions covering conservation, monitoring, recreation, productive uses and other management activities; fire suppression, fuel reduction burning and the control of pest plants and animals will take into account the presence of significant species; efforts will be made to collate information on species distribution, ecology and threats, and known populations of significant species will be monitored.

Clover Glycine

Family: Fabaceae

Glycine latrobeana

Species Characteristics: Decumbent or ascending herb. Stems short, non-stoloniferous, hirsute to strigose. Leaves palmately trifoliolate, dimorphic, petiole 0.5-5 cm long; leaflets sessile to subsessile, those on mature leaves obovate to more or less orbicular, 5-20 mm long, 4-12 mm wide, those of immature leaves often elliptic, upper surface glabrous, lower surface silky-strigose; stipules suborbicular to broad-ovate or reniform, 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, 1996a).

Conservation Status:

ROTAP/ANZECC: vulnerable

VR0TS: vulnerable

ESP Act (1992): listed as vulnerable

FFG Act (1988): listed; no Action Statement

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
0	100	0

Distribution in NE Region: In the North-East there is a single record for Reef Hills Park. It has mostly been recorded from the lowland plains of south-west Victoria through to the Gippsland plains with an extension to Omeo (S.A.C., 1993, nom.).

Habitat: At Reef Hills the species grows in the herb-rich ground layer of a woodland, on seasonally waterlogged soils. 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, La Trobe).

Life History: Perennial. Little is known of its biology. Flowering is in summer (Scarlett, 1980, La Trobe). Sexual reproduction from seed. Following fire, the species is an obligate seed regenerator, with all plants being killed. Ecological burns are preferable in autumn, no more frequently than once every 5 years (Scarlett, 1980, La Trobe).

Threatening Processes operating in NE Region:

- *G. latrobeana* has suffered severe depletion throughout its range, as a result of land clearance, cultivation and grazing (S.A.C., 1994, final rec.).
- Roadside stands are at risk from disturbance caused by firebreak ploughing and slashing (S.A.C., 1993, nom.).
- Populations on some public land blocks are potentially threatened by trail bikes and cars (S.A.C., 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 (S.A.C., 1993, nom.).
- The only population in the North-East region is on the edge of public land near a track, which makes it vulnerable to disturbance.

Rating of Threats:

Disturbance	Rating	Source
Clearing of native vegetation	2	S.A.C., 1994, final rec.
Fragmentation of native veg.	3	S.A.C., 1994, final rec.
Unplanned fire	2	S.A.C., 1993, nom
Road construction/maintenance	1	S.A.C., 1994, nom.
Recreation	1	S.A.C., 1994, nom.

Current Management:

- Reservation/ protection status - occurrences are on Crown land reserves and on private land.
- Conservation, Forests and Lands (1987) Reef Hills Park Management Plan -
- Management of threatened species: record the locations of significant species; investigate the impact of fuel reduction burning on the vegetation, and the use of fire as a management tool for the natural systems in the Park; develop and implement a control program for relevant weeds; develop and implement a monitoring program for significant species.

Smooth Darling Pea

Swainsona galegifolia

Family: Fabaceae

Species Characteristics: Renascent perennial, hairless or sparsely hairy forb to shrub, varying from a compact plant to 60 cm tall to a more robust shrub to 2 m tall with many trailing or erect stems (Cunningham *et al.*, 1981). Leaves pinnately divided, 5-12 cm long consisting of 21-25 closely-spaced leaflets which are characteristically notched at the tip. Flowers, 12-16 mm long, in dense terminal racemes about 20 cm long, calyx glabrous. Flower colour varies throughout its range but in Victoria they are mostly coppery red. Fruits are hairless, leathery and bladder-like, lime-green pods which ripen over summer and release up to 30 small (2-4 mm) brown seeds (Johnson, 1996b).

Conservation Status:

ROTAP/ANZECC: not listed
VROTS: vulnerable
ESP Act (1992): not listed
FFG Act (1988): listed; Action Statement (Johnson, 1996b)

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
0	50	50

Distribution in NE Region: In Victoria this species is known only from two populations, in the Indigo Creek and Felltimber Creek catchments, west of Wodonga. The vast majority of land on which the species occurs is privately owned by the Albury-Wodonga Development Corporation, and leased to an adjoining landholder. The population overlaps into a road reserve managed by Wodonga Rural City Council. The Indigo Creek population occurs in a Bushland Reserve (Johnson, 1996b). Also in Queensland and New South Wales (Johnson, 1996b).

Habitat: The Felltimber Creek population occurs on steep, heavily timbered south-facing slopes in Grassy Dry Forest dominated in the overstorey by Red Stringybark (*Eucalyptus macrorhyncha*), and Red Box (*E. polyanthemos*) on the upper slopes and Apple Box (*E. bridgesiana*) and, to a lesser degree, Long-leaf Box (*E. goniocalyx*) on the lower slopes and gullies. On the steeper slopes Smooth Darling Pea is the dominant feature of the ground flora, the associated vegetation including Rock Fern (*Cheilanthes austrotenuifolia*), Wallaby Grasses (*Danthonia* spp.) and various herbs. The more open areas are disturbed and introduced grasses and broad-leaf weeds dominate (Scarlett, 1987b, La Trobe). The Indigo Creek population occurs on drier northerly aspects on hill-tops, slopes and gullies dominated by Granitic Hills Woodland where Hill Red Gum (*E. blakleyi*), White Box (*E. albens*), Drooping Sheoke (*Allocasuarina verticillata*) and Lightwood (*Acacia implexa*) are prominent in the overstorey. In New South Wales and Queensland this species occurs in various habitats (Johnson, 1996b).

Life History: Smooth Darling Pea is a renascent perennial, that is, it dies down each year and regrows from a below-ground rootstock. Plants emerge from this rootstock in autumn, flower and seed in late spring and early summer and die back in late summer. The rhizomatous nature of the rootstock appears to be the primary means of spread. The species may require fire to stimulate regeneration of soil-stored seed (Johnson, 1996b).

Threatening Processes operating in NE Region:

- The initial decline of *S. galegifolia* was attributed to clearing and subsequent cultivation and grazing after settlement in the mid 1880's. The aerial application of superphosphate after World War 2 on steep hill country has been linked to the decline of the species in its last stronghold (Johnson, 1996b).
- Although the land owned by Albury-Wodonga Development Corporation has been recommended to revert to Crown land by the Land Conservation Council, no action has been taken and no formal agreement exists regarding its conservation (S.A.C., 1992, nom.).
- The species occurs in small remnants surrounded by cleared farming land, and therefore subject to edge effects (Johnson, 1996b). Presumed habitat at European settlement isolated, and much of the original habitat destroyed or highly modified.
- The weed species St. John's Wort (*Hypericum perforatum*) is dominant in the more open previously disturbed areas. *S. galegifolia* germination and seedling recruitment may be inhibited, leading to its decline. Weed control is difficult because the stems of the two species intertwine (Johnson, 1996b). Competition from weeds such as Spear Thistle (*Cirsium vulgare*) and Large Quaking-grass (*Briza maxima*) threaten the long-term viability of the species, particularly on roadsides (Johnson, 1996b).
- Road widening and maintenance works threaten roadside habitat, by clearing or smothering plants and helping the spread of weeds (Johnson, 1996b).
- Grazing by sheep has had little direct impact on the plants because stock tend to avoid the plant and stocking levels are low. However, indirect effects of soil compaction and weed spread by sheep are considerable on steeper slopes (Johnson, 1996b).
- Grazing by rabbits in years when their numbers are high has been recorded as having a significant impact, causing the extinction of one small population (Scarlett, 1987)
- Illegal trail bike riding within the road and adjoining creek reserve has caused trail formation and spread of weeds in the vicinity of the population (Johnson, 1996b).

Rating of Threats:

Disturbance	Rating	Source
Clearing of native vegetation	2	Johnson, 1996b
Fragmentation of native veg.	3	Johnson, 1996b
Introduced animals	3	Scarlett, 1987
Introduced plants	3	Johnson, 1996b
Grazing/trampling	2	Johnson, 1996b
Road construction/maintenance	2	Johnson, 1996b
Recreation	2	Johnson, 1996b
Other:no management agreement	1	S.A.C., 1992, nom

Current Management:

- Reservation/protection status - occurrences on Crown land and private land.
- monitored for VROTPOP database in last 5 years.
- Johnson (1996b) Action Statement -
 - Past management actions: Albury-Wodonga Development Corporation has excluded domestic stock from a 0.25 ha. area with a fence; Department of Conservation and Environment and North East Field Naturalists Inc. have undertaken detailed flora surveys and expanded the known distribution of the species; weed control has been carried out with particular emphasis on St Johns Wort involving both hand-pulling and biological control; seedlings have been propagated by Indigo Valley Landcare Group; Natural Resources and Environment has liaised with AWDC and the local municipality, to determine land tenure, lease

arrangements, grazing management and site protection for the species; the Australian National Botanic Gardens is collecting *S. galegifolia* for taxonomic studies.

- Intended management actions are to: monitor populations annually using VROTPOP database and establishing permanent quadrats; undertake surveys for the species in potential habitat within ten km; transfer two recommended land parcels from AWDC to NRE to be managed for nature conservation; prepare a management plan for domestic stock grazing in the two land parcels; control pest plants and animals, particularly St Johns Wort through the use of French Mite; negotiate a 'Significant Roadside Area' sign agreement for road reserves; establish guidelines for seed collection, propagation and reintroduction of *S. galegifolia*; replant the species in to high priority sites; maintain liaison with community groups and adjacent landholders to encourage participation in conservation works; undertake a small ecological burn as a trial.

Kelleria
Family: Thymelaceae

Kelleria laxa

Species Characteristics: Creeping shrublet to 3 cm high, 40 cm diameter. Stems approximately 1 mm diameter, slightly hairy. Leaves 0.5-3.5 mm long, narrowly elliptic to lanceolate. Inflorescence of 1-4 flowers with one or two central vegetative buds. The small flowers are borne in heads at the tip of shoots. Sepals 4, white. Bracts narrowly oblong, often larger than leaves (Entwistle, 1996).

Conservation Status:

ROTAP/ANZECC: vulnerable
 VROTS: vulnerable
 ESP Act (1992): listed as vulnerable
 FFG Act (1988): listed; no Action Statement

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
100	0	0

Distribution in NE Region: Only known in Australia from a single population on the Bogong High Plains about 0.5 km west of Mt Jim, in the Alpine National Park. A number of 'Poa depressions' occur in the general area which appear to provide suitable habitat, and therefore it may be possible that the species occurs in other locations (S.A.C., 1991, nom.). It is also found in New Zealand (Entwistle 1996b)

Habitat: The species grows between snow-grass tussocks in alpine grassland (Entwistle 1996b). It occurs around the perimeters of seasonally inundated depressions within Prickly Snow-grass (*Poa costiniana*) and Horny Snow-grass (*P. fawcettiae*) grasslands. These grasslands occur on fairly heavy basalt derived soils which stay moist for longer periods than surrounding areas, and the depressions fill in spring and dry out in summer. *Kelleria laxa* is confined to the relatively well drained slopes at the sides of depressions where *Poa* tussocks do not form complete cover (S.A.C., 1991, nom.).

Life History: Perennial shrublet, surviving for more than fifty years. Flowering time is January (Entwistle, 1996b). Sexual reproduction, and subsequent establishment from seeds. Asexual reproduction is unknown. The species occurs in habitats that are not normally subject to fire, and requires long periods without major disturbance for survival and establishment.

Threatening Processes operating in NE Region:

- *K. laxa* occurs in an area where cattle grazing is continuing. Although it does not appear to be affected by light cattle grazing, heavy grazing could threaten the species' survival due to trampling damage or smothering by faeces (S.A.C., 1991, nom.).
- The only known population is close to a pole line used by skiers and walkers and therefore may be damaged by trampling (S.A.C., 1991, final rec.).
- The species has a very small population size and any habitat degradation could threaten it (S.A.C., 1991, nom.). The greenhouse effect could result in a reduction of area of suitable habitat (Busby, 1988)

Rating of Threats:

Disturbance	Rating	Source
Grazing/trampling	2	S.A.C., 1991, nom
Recreation	1	S.A.C., 1991, final rec.
Other:greenhouse effect	1	Busby, 1988

Current Management:

- Reservation/ protection status - occurrences in reserves - Alpine National Park.
- monitored for VROTPOP database in last 5 years.
- Conservation and Environment (1992) Alpine National Park Bogong Unit Management Plan -
 - Planned management of nationally significant plant species: sites are to be included in the Special Protection Zone and will be managed with the aim of ensuring the survival of the significant species; a 'management statement' will be prepared, which will define the precise boundary of each site/area, and will provide management prescriptions covering conservation, monitoring, recreation, productive uses and other management activities; fire suppression, fuel reduction burning and the control of pest plants and animals will take into account the presence of significant species and communities; efforts will be made to collate information on species distribution, ecology and threats; surveys will be undertaken at sites which are predicted to contain significant species.
 - Planned management of *K. laxa*: further research will be carried out on its ecology to assist with its conservation; appropriate measures will be taken to protect the species from grazing; the pole line will be re-routed at an appropriate distance from the population.

Fern leaf Beackea***Baeckea crenatifolia*****Family: Myrtaceae**

Species Characteristics: Erect shrub 1-3 m high. Leaves ovate to orbicular, 3-7 mm long, 2-5 mm wide, spreading, margins crenulate. Flowers 2-3 in axillary umbels, white (rarely pale pink), to 8 mm across; peduncle as long or longer than leaf. Fruit cup-like, brown, approximately 3 mm diameter (Jeanes, 1996b).

Conservation Status:

ROTAP/ANZECC: vulnerable

VROTS: rare

ESP Act (1992): listed as vulnerable

FFG Act (1988): not listed

RESERVATION STATUS

% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
100	0	0

Distribution in NE Region: Endemic to Victoria, confined to rocky streamsides on lower parts of Mt Buffalo (Jeanes, 1996b) in the Buffalo and Eurobin Creek catchments (Frood & Stuwe, 1997/8, VROTPOP).

Habitat: Rocky streamsides at subalpine elevation (Jeanes, 1996b). The species grows in Riparian Forest with an overstorey of eucalypts and Blackwood (*Acacia melanoxylon*) and a ground layer of grasses and ferns such as Water-fern (*Blechnum* spp.) (Frood & Stuwe, 1997/8, VROTPOP)

Life History: Perennial shrub. Sexual reproduction, with establishment from seed occurs only occasionally. It may be limited to a few seasons because of dormancy within the propagules, habitat requirements or because establishment needs the temporary removal of competitors. Asexual reproduction is unknown. The species is an obligate seed regenerator after fire; all or nearly all plants are killed by fire, and regeneration is solely from seeds stored in the canopy or short term soil store. Fire also promotes germination and establishment.

Threatening Processes operating in NE Region:

- Riparian weed invasion, particularly Blackberry (*Rubus fruticosus*) and Willow (*Salix* sp.) (Frood & Stuwe, 1997/8, VROTPOP) threatens the species at some sites.
- Presumed habitat at European settlement was isolated and separated by considerable areas of unsuitable habitat.

Rating of Threats:

Disturbance	Rating	Source
Introduced plants	2	Frood & Stuwe, 1997/8, VROTPOP

Current Management:

- Reservation/ protection status - Mt Buffalo National Park.
- monitored for VROTPOP database in last 5 years.
- Natural Resources and Environment (1996) Mount Buffalo National Park Management Plan -
 - Planned management of significant plant species: develop a computer-based sites register for significant sites; encourage research into the status, distribution, ecology and management requirements of significant plant species; minimise damage to vegetation communities caused by management and visitor activities; prepare and implement a fire management strategy, recognising the need to integrate any burning for ecological conservation with fuel reduction burning; prepare a pest (plant and animal) management strategy which details species and areas to be treated and methods of control (blackberry is one of the priority species for certain areas).

Lima Stringybark

Eucalyptus alligatrix ssp. *limaensis*

Family: Myrtaceae

Species Characteristics: Tree to 30 m tall, rarely multi-stemmed from the base. Bark rough to the small branches, thick, fibrous, coarsely furrowed longitudinally. Juvenile leaves sessile, mostly opposite, orbicular to broadly ovate, to 4.5 cm long, 4.5 cm wide, glaucous, rarely green. Adult leaves petiolate, alternate, lanceolate to falcate, 5.5-20 cm long, glossy, grey to bluish green or light green. Inflorescence axillary, 3-flowered; peduncles flattened. Buds and fruits sessile or rarely shortly pedicellate. Distinguished from *E. alligatrix* ssp. *alligatrix* by its crown which is composed wholly of narrowly lanceolate adult leaves, each to 1.5 cm wide and by its much greater height (Brooker & Slee, 1996).

Conservation Status:

ROTAP/ANZECC: vulnerable

VROTS: vulnerable

ESP Act (1992): listed, vulnerable

FFG Act (1988): not listed

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
0	100	0

Distribution in NE Region: Endemic to Victoria, and restricted to the Lima and Swanpool districts east of the Strathbogies Ranges (Brooker and Slee, 1996). It has only been recorded from roadsides and private property.

Habitat: The species grows on brown or dark grey gritty loams in a broad, very gently undulating valley at an altitude of about 220 m. The trees are found largely in cleared areas, but associated species include Red Stringybark (*E. macrorrhyncha*), Narrow-leaf Peppermint (*E. radiata*), Red Box (*E. polyanthemos*), Yellow Box (*E. melliodora*), Long-leaf Box (*E. goniocalyx*), Blackwood (*Acacia melanoxylon*), Black Wattle (*A. mearnsii*), Silver Wattle (*A. dealbata*) and Ovens Wattle (*A. pravissima*) (Brooker *et al.*, 1995).

Life History: Long-lived tree, surviving for more than 50 years. Flowering time is in April (Brooker *et al.* 1995). Sexual reproduction, and subsequent establishment from seeds. Asexual reproduction is unknown. 'Natural' disturbances are tolerated, but regeneration is not dependent on these. Following fire, plants re-establish by both resprouting and by seed germination. Most plants survive fire and resprout from dormant buds along the stems, at ground level or from underground, but also have a significant establishment from seed germination.

Threatening Processes operating in NE Region:

- The species is restricted to a small area (Brooker *et al.* 1995) and the largest population is only about 30 individuals (Stuwe, 1997, VROTPOP).
- The habitat has almost entirely been cleared for pasture. Most trees are in roadside stands or single trees in paddocks (Brooker *et al.* 1995).
- Little regeneration is evident (Brooker *et al.* 1995) and dieback is threatening the remaining trees (Stuwe, 1997, VROTPOP).

Rating of Threats:

Disturbance	Rating	Source
Clearing of native vegetation	3	Brooker <i>et al.</i> 1995
Fragmentation of native veg.	3	Brooker <i>et al.</i> 1995
Introduced plants	3	Brooker <i>et al.</i> 1995
Disease	3	Stuwe, 1997, VROTPOP
Reproductive problems	3	Brooker <i>et al.</i> 1995

Current Management:

- Reservation/protection status - occurrences are on private land.
- monitored for VROTPOP database in last 5 years.
- The local shire has developed a management plan for roadsides where the species occurs, which includes signage, management prescriptions, protection and weed control (Johnson, pers. com.).

Warby Swamp Gum

Eucalyptus cadens

Family: Myrtaceae

Species Characteristics: Spreading tree, 8-25 m tall. Bark dark grey and rough on lower trunk, grey-brown to yellow-brown and smooth above. Juvenile leaves petiolate, opposite for a few pairs then alternate, ovate, often emarginate, to 7 cm long and 5 cm wide, dull green. Adult leaves petiolate, elliptic to broadly lanceolate or ovate, 8-15 cm long, 2.5-6 cm wide, slightly glossy, green or blue-green. Inflorescence axillary, unbranched, 7-flowered; flowers cream-coloured, buds pedicellate, diamond-shaped. Distinguished by its glaucous new growth and by the tendency of mature trees to lean or fall over. They continue to grow from new vertical shoots (Briggs & Crisp, 1989; Brooker & Slee, 1996).

Conservation Status:

ROTAP/ANZECC: vulnerable

VROTS: vulnerable

ESP Act (1992): listed as vulnerable

FFG Act (1988): listed; Action Statement (Johnson, 1992b)

RESERVATION STATUS

% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
0	80	20

Distribution in NE Region: Endemic to Victoria and known only from a few localities east of the Warby Range to Beechworth (Brooker and Slee, 1996). It has been recorded from four subcatchments of the Ovens River, the majority of stands on the south-eastern foothills of the Pilot Range near Beechworth and Wooragee. Additional locations in the eastern foothills of the Warby Range, including the Type locality are just outside the North-East Region. 33 stands have been recorded from 11 sub-populations (groupings on the same tributaries). Over 75% of the population occurs on private land, with the remainder occurring on road reserves, public land water frontages, Beechworth Historic Park and Mt Pilot Multi-Purpose Park (Johnson, 1992b).

Habitat: The species occurs in almost pure stands surrounding permanent springs or creeklines (Brooker and Slee, 1996). Soils are grey loams overlaying white gravelly clays, which are permanently moist and seasonally waterlogged. The trees form an open forest with an understorey of scattered shrubs commonly including Blackwood (*Acacia melanoxylon*), Prickly Tea-tree (*Leptospermum continentale*), Golden Spray (*Viminaria juncea*) and a dense ground layer dominated by Tall Sedge (*Carex appressa*) and rushes (*Juncus* spp) (Briggs & Crisp, 1989).

Life History: Long-lived tree, surviving for more than fifty years. Flowering period is from late March to early May (Briggs and Crisp, 1989). Sexual reproduction, and subsequent establishment from seeds. Seed will only germinate successfully and grow to maturity in permanently moist sites (Johnson, 1992b). Asexual reproduction is unknown. 'Natural' disturbances are tolerated, but regeneration is not dependent on these. Most plants survive fire and resprout from dormant buds along the stems, at ground level or from underground, but also have a significant establishment from seed germination.

Threatening Processes operating in NE Region:

- The vast majority of plants occur on private land and therefore have no conservation security (S.A.C., 1991, final rec.). Presumed habitat at European settlement was isolated and separated by considerable areas of unsuitable habitat. Much of the original habitat has been destroyed or highly modified by past clearing and changes to water courses.
- The species is subject to grazing by cattle, and while adult trees may withstand light to moderate grazing pressure, seedling regeneration appears to be adversely affected by prolonged grazing (S.A.C., 1991, final rec.). Domestic stock on private land and marsupials on public land tend to congregate in these stands for shelter and water, and could inhibit seedling recruitment by excessive trampling and grazing. The impact of different grazing regimes on seed germination and recruitment is not well understood (Johnson, 1992b). Rabbit grazing may also have an impact.
- Land clearing, and alteration of its swamp/perennial spring habitat due to drainage area threatens the species (S.A.C., 1991, final rec.). Altering the water flow, or draining or damming remaining springs on private land, particularly upstream sources, could destroy or degrade habitat (Johnson, 1992b).
- *E. cadens* may in part of its range hybridise with Mountain Swamp Gum (*Eucalyptus camphora*), and progeny of such crosses may produce sterile seed (Johnson, 1992b).
- At Mt Pilot Multi-purpose Park future earthworks on a pipeline feeding the water supply dam for Chiltern pose a potential threat to the population. Works associated with the pipeline in the past have led to the removal of a large number of trees (Stuwe, 1997, VROTPOP).

Rating of Threats:

Disturbance	Rating	Source
Clearing of native vegetation	2	Cheal, RFA database
Fragmentation of native veg.	3	Cheal, RFA database
Introduced animals	2	Johnson, 1992b
Grazing/trampling	2	S.A.C., 1991, final rec., Johnson, 1992b
Dams/alteration to water regimes	3	S.A.C., 1991, final rec., Johnson, 1992b
Reproductive problems	2	Johnson, 1992b
Other: earthworks	2	Stuwe, 1997, VROTPOP
native animal grazing	2	Johnson, 1992b

Current Management:

- Reservation/ protection status - occurrences are on private land and Crown land.
- monitored for VROTPOP database in last 5 years.
- Johnson (1992b) - Action Statement -
 - Past management actions: liaison between Department of Conservation and Environment and landholders towards co-operative management agreements; conservation covenant entered into by landholder in conjunction with Trust for Nature; DCE funded fencing on private land; type locality included in National Estate Register; several surveys by DCE reveal additional populations; Australian National Botanical Gardens and CSIRO collection of material in Mt Pilot area; seed from stands across the species' range collected by La Trobe University Genetics Department to analyse DNA; seedling morphology trials undertaken by CSIRO to assess hybridisation; Rural Water Commission requested to stop diverting water from type locality.
 - Intended management actions are to: establish permanent reference points at five key sites to monitor regeneration and groundcover changes under different grazing and fire regimes; continue surveys for further populations; encourage the protection and enhancement of habitat by private landholders through incentives and advice with fencing and weed control, and by encouraging conservation covenants; liaison with other authorities to ensure protection of roadside and other public

land sites; ensure sites at Mt Pilot Multi-purpose Park and Beechworth Historic Park are excluded from harvesting and burning by mapping stand locations.

Northern Sandalwood

Santalum lanceolatum

Family: Santalaceae

Species Characteristics: Tall shrub or small tree, 2-8 m high. Bark furrowed, dark, persistent to the smaller, pendulous branches. Wood highly aromatic. Leaves thick, grey-green, 5-12 cm long, opposite, glabrous, tapering to a short petiole. Flowers white-yellow, 7-10 mm long in short terminal or axillary panicles. The mature fruit is an edible, 6-9 mm wide dark-blue drupe (Black, 1963; Willis, 1972).

Conservation Status:

ROTAP/ANZECC: not listed

VROTS: endangered

ESP Act (1992): not listed

FFG Act (1988): listed; Action Statement (Johnson, 1996a)

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
0	0	100

Distribution in NE Region: Only locality is on private land at Springhurst, consisting of about 70 plants. Other Victorian localities are Warby Range State Park, 3 sites in Mt Meg area south west of Warby Range, Boundary Bend southeast of Robinvale, and Murphy's Island west of Echuca, (Johnson, 1996a). Northern Sandalwood is found in the arid and semiarid interior of all Australian states (Willis, 1972) and northern Victoria is the southern edge of its range.

Habitat: The species occurs in a wide range of woodland communities (Cunningham *et al.*, 1981). The Warby Range, Springhurst and Mt Meg populations are associated with rocky, generally northern slopes, with well drained granite soils. The associated vegetation is low open woodland dominated by Hill Red Gum (*Eucalyptus blakelyi*), Red Stringybark (*E. macrorrhyncha*), Lightwood (*Acacia implexa*), Currawang (*A. doratoxylon*) (Johnson, 1996a).

Life History: A perennial shrub, surviving for more than fifty years. As a member of the Santalaceae, *S. lanceolatum* is parasitic on the roots of other plants (Cunningham *et al.*, 1981), but its specific host relationships and whether the species is an obligate parasite for all or only part of its life cycle are unknown (Johnson, 1996a). Sexual reproduction and subsequent establishment from seed. Asexual reproduction and establishment occurs commonly. Following fire the species is an obligate root resprouter; many plants survive fire and resprout from dormant buds either along the stem, at ground level or from underground, and there is minimal re-establishment from seed germination. However, resilience to repeated fire is doubtful (Johnson, 1996a).

Threatening Processes operating in NE Region:

- Much of the decline of the species is thought to have occurred late last century when consignments of the highly fragrant timber were exported to Asia (Johnson, 1996a).
- The most serious threat to the remaining populations is grazing by sheep and rabbits, which destroys plants under one metre high and inhibits seedling and sucker recruitment (Johnson, 1996a).
- The apparent low rate or absence of sexual reproduction is a considerable threat. Although buds and flowers form annually, fruit are rarely seen. The role of invertebrate or vertebrate pollinators, and their possible absence, is unknown. Asexual reproduction (root suckering) alone is presumed responsible for the recorded increase in numbers of plants at some sites (Johnson, 1996a).
- As a result of its highly fragmented distribution, there is inadequate genetic diversity within and genetic isolation between populations. This could predispose the species to increased susceptibility to insect attack and disease (Johnson, 1996a).
- Environmental weeds are abundant (Red-ink Weed (*Phytolacca octandra*) at the Springhurst locality) and may compete with *S. lanceolatum* (Johnson, 1996a).
- Resilience to repeated burning is doubtful, and therefore poses a potential threat (Johnson, 1996a).
- The rarity of *S. lanceolatum* makes it susceptible to environmental catastrophes (S.A.C., 1992, final rec.).
- Trampling, soil erosion and weed invasion resulting from recreational pressure at sites outside the North-East Region (S.A.C., 1992, final rec.).

Rating of Threats:

Disturbance	Rating	Source
Clearing of native vegetation	2	Johnson, 1996a
Fragmentation of native veg.	3	Johnson, 1996a
Unplanned fire	2	Johnson, 1996a
Introduced animals	3	Johnson, 1996a
Introduced plants	2	Johnson, 1996a
Grazing/trampling	3	Johnson, 1996a
Reproductive problems	3	Johnson, 1996a

Current Management:

- Reservation/ protection status - occurrences are on private land.
- Johnson (1996a) Action Statement -
 - Past actions: voluntary agreement with landholder resulted in entire stand (0.3 ha) being protected by stock and rabbit-proof fencing; rabbit eradication and weed control were conducted within fenced area; monitoring after 2-5 years identified extensive vegetative recruitment.
 - Intended actions are to: monitor all known populations annually and establish permanent quadrats; conduct field surveys for additional stands in analogous habitat; maintain landholder liaison to encourage co-operative agreements and provide financial assistance for protection of the species on private land; collect seed for propagation and storage, and conduct trials to develop techniques to propagate the species from seed and cuttings; introduce propagated plants from the Springhurst private land gene pool into a nearby area of public land of similar geology and vegetation (eg. Sugarloaf Hill Bushland Reserve) and protect with fences to exclude rabbits and stock.

Concave Pomaderris

Pomaderris subplicata

Family: Rhamnaceae

Species Characteristics: Erect, often multi-stemmed shrub to approximately 2 m high. Characterised by a dense covering of minute stellate hairs on its branches and leaves. Leaves slightly concave to almost conduplicate, upper surface velutinous, lower surface appearing whitish from the close stellate tomentum and with occasional longer, coppery simple hairs. Stipules mostly 1-2 mm long, not retained beyond the current season's growth. Inflorescence of small, pale yellow flowers crowded in small, axillary clusters or racemes and confined to the terminal 1-2 cm of the branchlets; petals shed shortly after flowering. Capsules ovoid and pointed (Walsh, 1992; Johnson *et al.*, 1996).

Conservation Status:

ROTAP/ANZECC: vulnerable

VROTS: vulnerable

ESP Act (1992): listed as vulnerable

FFG Act (1988): listed; Action Statement (Johnson *et al.*, 1996)

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
0	0	100

Distribution in NE Region: Endemic to Victoria, and only known from the type population of about 200 plants in an area of 0.25 ha at Carboor Upper approximately 40 km south-east of Wangaratta. The plants grow beside Hurdle Creek on land owned by the Victorian Plantations Corporation (Walsh, 1992).

Habitat: *P. subplicata* grows on a steep, rocky, south to south-west facing slope, about 50 m from a permanent creek. The soil is shallow and derived from Ordovician sediments, and annual rainfall is about 1000 mm. The population forms a dense shrubland with scattered Long-leaf Box (*Eucalyptus goniocalyx*), Red Stringybark (*E. macrorrhyncha*) and Silver Wattle (*Acacia dealbata*) (Walsh, 1992). This vegetation is a small remnant of modified Grassy Dry Forest and Valley Grassy Forest (Johnson *et al.*, 1996).

Life History: Perennial shrub. Little is known of the biological and ecological requirements of this species. Limited observations and propagation trials suggest seed production and viability may be low. The importance of animals in the pollination process is unknown, although the genus is generally regarded as being insect-pollinated (Johnson *et al.*, 1996). Sexual reproduction is the only method of re-establishment; asexual reproduction is unknown. In the event of fire the species is thought to be an obligate seed regenerator, that is, plants are killed by fire and regeneration is solely from seed stored in the soil, and germination is promoted by fire.

Threatening Processes operating in NE Region:

- Low plant numbers and the small area occupied by *P. subplicata* make it susceptible to catastrophic events such as fire (Johnson *et al.* 1996).
- Much of the similar habitat in the area has been cleared for pine plantations or agriculture, and there is little remnant vegetation (Johnson *et al.* 1996).
- Low seed production and viability may be linked to the fact that the native forest remnant supporting the species, which is surrounded by pine plantations and cleared farmland, may not be sufficient to attract and sustain suitable insect pollinators (Johnson *et al.* 1996).
- Weed invasion, primarily Blackberry (*Rubus procerus*), is restricting regeneration of seedlings (Johnson *et al.* 1996). Competition from Bracken (*Pteridium esculentum*) may be a threat (Johnson *et al.* 1996).
- Grazing by native and introduced animals; European Rabbits, Common Wombats and Black Wallabies, affects a large proportion of seedlings (Johnson *et al.* 1996).
- A proposed log dump for the adjoining plantation poses a potential threat by increasing weed invasion (Johnson *et al.* 1996).

Rating of Threats:

Disturbance	Rating	Source
Clearing of native vegetation	2	Johnson <i>et al.</i> 1996
Fragmentation of native veg.	3	Johnson <i>et al.</i> 1996
Unplanned fire	3	Johnson <i>et al.</i> 1996
Introduced animals	2	Johnson <i>et al.</i> 1996
Introduced plants	2	Johnson <i>et al.</i> 1996
Reproductive problems	3	Johnson <i>et al.</i> 1996
Other:native plant competition	1	Johnson <i>et al.</i> 1996
native animal grazing	2	Johnson <i>et al.</i> 1996

Current Management:

- Reservation/ protection status - only occurrence on Crown land.
- Johnson *et al.* (1996) Action Statement -
 - Past management actions: 'Native Plant Reserve' signs erected to alert plantation workers to the site's significance; Blackberry control undertaken; plant cuttings and seeds collected for propagation by Society for Growing Australian Plants and Royal Botanic Gardens Melbourne; liaison with Victorian Plantations Corporation.
 - Intended management actions are to: establish permanent quadrats, and undertake annual monitoring of recruitment, plant health, environmental weed and Austral Fern invasion, and grazing levels; search for additional populations in areas of similar forest; undertake seed, cutting and tissue propagation trials to produce plants for revegetation; negotiate a Public Authority Management Agreement with VPC prescribing guidelines for road maintenance, location of log dump, weed and rabbit control, herbicide application and fuel break construction; erect a 'Rare Plant Reserve' sign to protect plants from unintentional disturbance; establish two new populations on secure nearby public land and expand existing site; control environmental weeds; determine the impact of Austral bracken on seedling recruitment; control rabbits if necessary; encourage local landholder and community group participation in the conservation of the species.

Purple Eyebright
Family: Scrophulariaceae

Euphrasia collina ssp. muelleri

Species Characteristics: Erect, semi-parasitic, many-branched perennial herb to 40 cm high. Leaves serrate, ovate-elliptical, opposite, 7-12 mm long and 3-6 mm wide. Flowers lilac to purple, sometimes with paler tube, to 15 mm long in racemes terminating the upper branches, each with prominent leafy bracts at their base. Calyx covered with dense, stiff, eglandular hairs (Barker, 1982).

Conservation Status:

ROTAP/ANZECC: endangered
 VROTS: endangered
 ESP Act (1992): listed as endangered
 FFG Act (1988): recommended for listing; Action Statement in prep.

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
0	100	0

Distribution in NE Region: Wren's Flat on the Jamieson River, where about 200 plants occur in State Forest on the east side of a southern branch of the river. Other Victorian localities are Mornington Peninsula, south-eastern part of Bowen Mountains east of Benambra, Deep Lead Flora Reserve near Stawell, Little River Gorge near McKillop Bridge (Scarlett, in prep). Once distributed from northern New South Wales near the Queensland border south through mainland south-eastern Australia and extending westwards as far as Mt Lofty and southern Flinders Ranges in South Australia, but now known only from Victoria (Barker, 1982).

Habitat: At Wren's Flat the species occurs on a lower western slope on Cambrian shale and chert. Soils range from shallow light brown fine sandy loam to red clay-loam with some rock outcrops. Altitude is 480 m and rainfall 1400 mm per year. It occurs in the ground stratum of Narrow-leaf Peppermint (*Eucalyptus radiata*) - Candlebark (*E. rubida*) open forest, which has an understorey of shrubs and a well developed herbaceous ground layer dominated by Kangaroo grass (*Themeda triandra*)(Scarlett, in prep).

Life History: A short-lived perennial, surviving from one to three years. Flowering is between August and November. Flowers are bisexual, and are cross-pollinated by insects, mainly by native bees. Asexual reproduction is unknown. The plants are all able to parasitise roots of other plants, but this is not obligatory and there are no specific hosts (Barker, 1982). The semi-parasitic biology of this plant has not been investigated but is expected to be important in reproductive requirements, habitat preferences and seedling establishment. There is a marked tendency for relatively dense, discreet stands to develop, which may be due to low dispersal capacity or specialised habitat or host plant requirements (Scarlett, 1986). The plant is an obligate seed regenerator after fire; nearly all plants are killed by fire and regeneration is solely from seed, germination and establishment is promoted by fire.

Threatening Processes operating in NE Region:

- The species has suffered a significant decline in both range and abundance since European settlement because much of its habitat of grasslands, grassy open forests and woodlands has been cleared for agriculture and heavily grazed (S.A.C., 1997, final rec.).
- Numbers have declined since monitored in 1984, and this is thought to be due to lack of burning (Scarlett, 1998, VROTPOP).
- The Wren's Flat population is adjacent to a camping area and is potentially threatened by trail bike riding and possible widening of Mitchell's Creek Track (Scarlett, 1986, La Trobe)
- Weed invasion is an additional threat to the species (Scarlett, 1998, VROTPOP).

Rating of Threats:

Disturbance	Rating	Source
Clearing of native vegetation	2	S.A.C., 1997, final rec.
Fragmentation of native veg.	3	S.A.C., 1997, final rec.
Lack of fire	3	Scarlett, 1998, VROTPOP
Introduced plants	2	Scarlett, 1998, VROTPOP
Road construction/maintenance	2	Scarlett, 1986, La Trobe
Recreation	2	Scarlett, 1986, La Trobe

Current Management:

- Reservation/ protection status - occurrences are on Crown land.
- monitored for VROTPOP database in last 5 years.

Bogong Eyebright
Family: Scrophulariaceae

Euphrasia eichleri

Species Characteristics: Erect, semi-parasitic, annual herb, to 16 cm high. Stem leaves 8-20 mm long and 2.9-8.5 mm wide, serrate to crenate-serrate, usually elliptic, recurved margins, upper surface covered by dense glandular hairs mixed with short eglandular hairs, lower surface usually covered by sparse to moderately dense, moderately long glandular hairs. Inflorescence dense racemes of white to lilac flowers with indigo to deep red-purple striations each lobe; calyx externally bearing dense long glandular hairs. Flowers to 13 mm long (Barker, 1982).

Conservation Status:

ROTAP/ANZECC: vulnerable
 VROTS: vulnerable
 ESP Act (1992): listed as vulnerable
 FFG Act (1988): not listed

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
100	0	0

Distribution in NE Region: Recorded from Mt Nelse, Mt Bogong, Cope Creek and Watchbed Creek in the Alpine National Park. The species is confined to alpine and subalpine tracts of the Victorian alps between Mt Bogong and the Bogong High Plains, and on the Dargo High Plains to the south (Gippsland RFA Region)(Barker, 1982).

Habitat: Little is known of its specific ecological requirements. The species has been recorded from low open shrubland commonly including Snow Beard-heath (*Leucopogon montanus*), Soft Snow-grass (*Poa hiemata*) grassland and sphagnum bogs (Barker, 1982, Frood *et al.*, 1998, VROTPOP).

Life History: Flowers are bisexual, and are cross-pollinated by insects, mainly by native bees. The plants are all able to parasitise roots of other plants, but this is not obligatory and there are no specific hosts (Barker, 1982). Asexual reproduction is unknown. The species occurs in habitats where fire does not normally occur, and it requires long periods without major disturbance for survival and establishment.

Threatening Processes operating in NE Region:

- Cattle grazing at one location is causing damage to the plants, and at other sites where grazing was removed in 1991 the species has been slow to recover (Frood *et al.*, 1998, VROTPOP).
- A walking track close to Cope Creek poses a potential threat to one population (Frood *et al.*, 1998, VROTPOP).
- Small population sizes make *E. eichleri* vulnerable to catastrophic events leading to localized extinction (Frood *et al.*, 1998, VROTPOP).
- Presumed habitat at European settlement was isolated and separated by considerable areas of unsuitable habitat, and much of the original habitat has been destroyed or highly modified. The greenhouse effect could result in a reduction of area of suitable habitat (Busby, 1988)

Rating of Threats:

Disturbance	Rating	Source
Fragmentation of native veg.	2	Cheal, RFA database
Grazing/trampling	2	Frood <i>et al.</i> , 1998, VROTPOP
Recreation	1	Frood <i>et al.</i> , 1998, VROTPOP
Other:greenhouse effect	1	Busby, 1988

Current Management:

- Reservation/ protection status - occurrences in reserves - Alpine National Park.
- monitored for VROTPOP database in last 5 years.
- Conservation and Environment (1992) Alpine National Park Bogong Unit Management Plan -
 - Planned management of nationally significant plant species: sites are to be included in the Special Protection Zone and will be managed with the aim of ensuring the survival of the significant species; a 'management statement' will be prepared, which will define the precise boundary of each site/area, and will provide management prescriptions covering conservation, monitoring, recreation, productive uses and other management activities; fire suppression, fuel reduction burning and the control of pest plants and animals will take into account the presence of significant species; efforts will be made to collate information on species distribution, ecology and threats; surveys will be undertaken at sites which are predicted to contain significant species.

Rough Eyebright
Family: Scrophulariaceae

Euphrasia scabra

Species Characteristics: Erect, semi-parasitic annual herb to 50 cm tall. Leaves serrate, ovate-elliptic to elliptic 6-20 mm long and 1-9.5 mm wide, covered by dense, short to moderately long, scabrous, eglandular hairs, margins recurved. Inflorescence terminal, dense racemes of yellow flowers sometimes with red-brown striations on hood and lower lip behind each lobe, distal parts covered externally by dense, moderately long eglandular hairs. Flowers to 14 mm long (Barker, 1982).

Conservation Status:

ROTAP/ANZECC: poorly known
 VROTS: endangered
 ESP Act (1992): not listed
 FFG Act (1988): listed; Action Statement (Thompson, 1992)

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
0	100	0

Distribution in NE Region: King Spur, Clearwater Creek and McNamara's Hut in the Alpine National Park (Scarlett & Bartley, 1998, VROTPOP). Other Victorian locations are Delegate River and Little Bog Creek (East Gippsland RFA Region), Mundy Plain, Bentley Plain and Mt Dawson (Gippsland RFA Region). The species was widely collected last century from montane and riparian sites in Victoria, Western Australia, South Australia, New South Wales and Tasmania, but has dramatically declined in all states and is considered extinct in New South Wales and South Australia (Thompson, 1992).

Habitat: All Victorian populations are in herbfields or grasslands with low tree or shrub cover. In the North-East Region the species is found in montane and subalpine woodlands with herb-rich understoreys. Snow Gum (*Eucalyptus pauciflora*), Bidgee-widgee (*Acaena novae-zelandiae*) and Prickly Starwort (*Stellaria pungens*) are typically present (Scarlett & Bartley, 1998, VROTPOP). The lowland form is usually found beside streams on organic loam or peat, where seasonal inundation may occur. The highland form occurs on sites with indications of high groundwater tables. It is most abundant between tall herbs in gaps which appear to be maintained by grazing (Thompson, 1992).

Life History: Flowering time is between October and April; the later part of this range for alpine areas. Flowers are bisexual, and are cross-pollinated by insects, mainly by native bees. The plants are all able to parasitise roots of other plants, but this is not obligatory and there are no specific hosts (Barker, 1982). The species is strictly annual. Limited observations indicate that numbers of plants, their aggregation and stage of development are strongly influenced by seasonal conditions, and populations are subject to extreme fluctuations. *E. scabra* is semi-parasitic, but has no host plant specificity (Scarlett, 1986). Sexual reproduction occurs only occasionally, and may be limited to a few seasons because of dormancy within the propagules, habitat requirements or because establishment needs the temporary removal of competitors. Asexual reproduction is unknown. The species occurs in habitats where fire does not normally occur, and it requires long periods without major disturbance for survival and establishment.

Threatening Processes operating in NE Region:

- Its rarity and the small size of existing stands exposes the species to damage from environmental fluctuations (S.A.C., 1991, final rec.). The species is an annual requiring frequent availability of suitable seed beds and ecological conditions, which increases the species vulnerability (S.A.C., 1990, nom.).
- Invasion and competition by introduced weeds is a threat. Blackberries are present at McNamara's Hut and have the potential to spread to the habitat of *E. scabra* (Thompson, 1992).
- Populations in the North-East Region are in areas covered by cattle grazing licences with variable grazing pressure. Most sites are also grazed by rabbits. It is unclear whether grazing by introduced herbivores is deleterious by contributing to the species' decline through trampling, spreading weeds and affecting soil structure and nutrient status (Thompson, 1992).
- Damage to the species through recreational activities is a potential problem. The King Spur population is beside a minor walking track, and increased use could lead to weed invasion, trampling and illegal collection. The McNamara's Hut population occurs just below a vehicle track, and could be subject to spread of weeds, mechanical disturbance associated with track maintenance and increased accessibility to walkers (Thompson, 1992).
- Any changes in hydrological conditions would be detrimental, as successful reproduction of the species appears to be closely related to water table levels (Thompson, 1992).

Rating of Threats:

Disturbance	Rating	Source
Fragmentation of native veg.	2	S.A.C., 1991, final rec.
Introduced animals	2	Thompson, 1992
Introduced plants	2	Thompson, 1992
Grazing/trampling	2	Thompson, 1992
Road construction/maintenance	2	Thompson, 1992
Recreation	2	Thompson, 1992
Dams/alteration to water regimes	2	Thompson, 1992

Current Management:

- Reservation/ protection status - occurrences in reserves - Alpine National Park.
- monitored for VROTPOP database in last 5 years.
- Conservation and Environment (1992) Alpine National Park Bogong Unit and Wonnangatta-Moroka Unit Management Plans -
 - Planned management for nationally significant plant species: sites are to be included in the Special Protection Zone and will be managed with the aim of ensuring the survival of the significant species; a 'management statement' will be prepared, which will define the precise boundary of each site/area, and will provide management prescriptions covering conservation, monitoring, recreation, productive uses and other management activities; fire suppression, fuel reduction burning and the control of pest plants and animals will take into account the presence of significant species; efforts will be made to collate information on species distribution, ecology and threats; surveys will be undertaken at sites which are predicted to contain significant species.
 - Planned management for *E. scabra*: McNamara Track will be subject to an extended seasonal closure between 1 May and 30 November inclusive and the *E. scabra* site adjacent to the track monitored; the track will be given a high priority for maintenance and control of pest plants, and protection will be given to the *E. scabra* site during and following these works; all known populations will be monitored, with priority being given to the King Spur site, and if the species is suffering from trampling or grazing appropriate action will be taken; seed will be collected from known populations and lodged with the Royal Botanic Gardens.
- Thompson (1992) Action Statement -

- Past management actions: seed has been collected and propagated by La Trobe University researchers.
- Intended management actions: annual monitoring to record presence, abundance, seed set; searches for the species in the Bogong Unit of the Alpine National Park in habitat predicted as suitable by computer modelling; applications to carry out sphagnum moss harvesting which will have a detrimental effect on *E. scabra* will be refused; Blackberry will be controlled at McNamara's Hut; McNamara's Hut Track will be subject to seasonal closure when conditions are wet to avoid damage to the population; if upgrading of the King Spur walking track is required it will be re-routed around the species' site; *E. scabra* sites will be noted on fire management maps so fire related activities will not cause damage; seed will be collected from all sites and lodged with the Royal Botanic Gardens seed bank; small numbers will be propagated and introduced to existing sites or sites where it previously occurred; encourage research into the biology of *E. scabra*.

Narrow Goodenia

Goodenia macbarronii

Family: Goodeniaceae

Species Characteristics: Annual or short-lived erect perennial herb. Leaves thick, glabrous, mostly basal, narrow-obovate to linear-oblancoolate, 5-11 cm long and 2-6 mm wide, narrowing very gradually into an indistinct petiole, a few coarse teeth on margin. Flowers with linear bracts, yellow, glandular-pubescent, in erect terminal cluster, to 9 mm long. Scapes to 30 cm high. Fruit sub-globular to ovoid to 4 mm long and 2 mm wide (Carolin, 1990).

Conservation Status:

ROTAP/ANZECC: vulnerable

VROTS: vulnerable

ESP Act (1992): listed, vulnerable

FFG Act (1988): listed; Action Statement (Berwick, 1996)

RESERVATION STATUS

% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
10	10	80

Distribution in NE Region: Recorded from Teneriffe (road reserve), Glenrowan (Uncommitted Crown Land, Bushland Reserve), Greta West (road reserve), Chiltern (National Park), Beechworth (private, road reserve), Mount Pilot (Multi-purpose Park). Populations just outside the boundaries of the North-East Region are at Euroa (private land), Chesney Vale (private land, road reserve), Warby Range (Bushland Reserve, private, State Park). In Victoria there are 24 known sites comprising 32 populations (Berwick, 1996). The species is found on the inland foothills of the Great Dividing Range across eastern Australia. It ranges from the Darling Downs in southern Queensland to the Western Plains, Western Slopes and Tablelands of New South Wales and into north-east Victoria.

Habitat: Narrow Goodenia occurs in spring soaks, alluvial fans of drainage lines and areas which are moist if not wet year all year, including sites which are artefacts of human disturbance such as roadside drains and dams. The majority of populations occur on granite or granodiorite parent rock and associated colluvial areas. One site is on the northern outwash slopes of the metamorphic Creighton Hills (Berwick, 1996). Narrow Goodenia grows in a herbland commonly with Swamp Isotome (*Isotoma fluviatilis*), Purple Bladderwort (*Utricularia dichotoma*) and Common Love-grass (*Eragrostis brownii*). These spring-soak herblands are sometimes surrounded by a dense sedgeland/rushland of Tuber Spike-sedge (*Eleocharis atricha*), Soft Twig-sedge (*Baumea rubiginosa*) and Joint-leaf Rush (*Juncus holoshoenus*), or a shrubland of Prickly Tea-tree (*Leptospermum continentale*) and Golden Spray (*Viminaria juncea*) (Muir *et al.*, 1995).

Life History: The species can act as an annual or a perennial which may be a response to water availability and climatic variation. Flowering period is generally from October to March, but can vary depending on soil moisture. Little is known of the reproduction of *G. macbarronii*. It commonly expands vegetatively by short rhizomes, but also has a long and continuous flowering period suggesting seedling reproduction is important as well (Berwick, 1996). The species is an obligate seed regenerator after fire; plants are killed by fire and regeneration is solely from seed stored in the soil, with germination and establishment promoted by fire.

Threatening Processes operating in NE Region:

- The decline of the species is probably linked to the destruction and disturbance of habitat by clearing of native vegetation, creation of dams in foothill gullies and grazing (Berwick, 1996). Considerable areas of original habitat have been destroyed or highly modified, and current habitat is highly fragmented.
- *G. macbarronii* has a specific habitat requirement of seasonally saturated soils, and is therefore likely to be threatened by any action or land management practice which affects the hydrology of the site. This may range from small on-site alterations to the clearing of part of the catchment above. Removal of native vegetation around springs or soaks is also likely to alter the water regime of the site (Berwick, 1996).
- Invasion of exotic plants, such as Yorkshire Fog Grass (*Holcus lanatus*) and Cat's Ear (*Hypochoeris radicata*) threatens the existence of the species through competition for space, light and water. Sites on private land are more badly affected (Berwick, 1996).
- Trampling by hooved animals, compaction and disturbance of soil is common at sites on private land and is contributing to the decline of the vegetation community as a whole (Berwick, 1996).
- Rabbit grazing may have an impact on the species (Berwick, 1996).
- Small block subdivision and subsequent pressure for dam construction are increasing in the Wooragee-Beechworth area and around the Warby Range, which threaten the habitat of the species (Berwick, 1996).
- Populations occurring on roadsides are extremely vulnerable to destruction by road maintenance activities (Berwick, 1996).

Rating of Threats:

Disturbance	Rating	Source
Clearing of native vegetation	3	Cheal, RFA database
Fragmentation of native veg.	3	Cheal, RFA database
Introduced animals	1	Berwick, 1996
Introduced plants	3	Berwick, 1996
Grazing/trampling	3	Berwick, 1996
Road construction/maintenance	2	Berwick, 1996
Dams/alteration to water regimes	3	Berwick, 1996

Current Management:

- Reservation/ protection status - occurrences are on Crown land reserves, and on private land.
- monitored for VROTOP database in last 5 years.
- Parks Victoria (1998) Chiltern Box-Ironbark National Park Draft Management Plan -
 - Planned management for significant flora: encourage surveys of, and research into, significant flora in the Park to improve knowledge of their locations and management requirements; encourage research and prepare an ecological burning strategy for the Park which provides for ecological management of significant flora; maintain and improve a 'sites of significance' map which shows the location of significant plant species; consult the 'sites of significance' map before undertaking management activities which may impact on floral values; ensure flora surveys are undertaken before any mineral exploration, and do not consent to mineral exploration where this may impact on significant vegetation; prepare a pest plant and animal control strategy for the Park; progressively close and allow to rehabilitate as necessary tracks defined through past uses other than those identified in the management plan.
- Berwick (1996) - Action Statement -

- Past management actions: a management plan has been prepared for the proposed rubbish tip site at Euroa, which includes protection of significant species; Euroa Environment Group has carried out surveys and discovered new populations; one population on private land has been fenced as part of a gully revegetation area.
- Intended management actions are to: examine the range of morphological variation and compare with Swamp Goodenia to determine the status of specimens from drier sites; search for new populations in typical habitat with assistance from community groups; record and map all populations using VROTPOP database; rate populations according to importance to prioritise resources; formulate prescriptions for management of populations on public land; review status of some uncommitted crown land and bushland reserves; erect signs for the protection of the species on road reserves; monitor selected populations annually to determine changes in numbers with time and hydrological variation; control weeds as necessary; monitor weed species on private land where grazing has been excluded; provide advice on protection and training in identification of the species to NRE extension officers, shires and other authorities; liaise with landholders about the importance of managing site hydrology; provide information to other public authorities about conservation goals for the species; encourage Catchment Management and Sustainable Agriculture staff to prevent indiscriminate aerial spraying of weedicide and seeding with exotic pasture species; provide financial assistance to private landholders for fencing and weed control; repair fences on public land to prevent stock straying; encourage research into biology, genetics, effects of different grazing and burning regimes.

Dookie Daisy
Family: Asteraceae

Brachyscome gracilis ssp. gracilis

Species Characteristics: Erect to decumbent annual herb to 30 cm high but usually less than 10 cm high. Loosely woolly with septate hairs and scattered glandular hairs. Leaves cauline, spatulate, deeply lobed, 10-15 mm long and 0.5-2.5 mm wide, stem-clasping. Flower heads white, usually solitary, to 7 mm diameter on slender peduncles to 7.5 mm long (Everett, 1992).

Conservation Status:

ROTAP/ANZECC: not listed
 VROTS: vulnerable
 ESP Act (1992): not listed
 FFG Act (1988): recommended for listing; no Action Statement

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
20	30	50

Distribution in NE Region: Killawarra State Forest, Beechworth Historic Park, Chiltern Box-Ironbark National Park, Mt Pilot Multi-purpose Park, Mt Samaria State Park, Watchbox Creek in the Toombullup State Forest. Sites in the Warby Ranges State Park and Dookie Agricultural College are just outside the boundaries of the North-East Region (S.A.C., 1996, nom.). The species may have originally extended westerly to central Victoria (Scarlett, 1984, Latrobe). Outside Victoria only one record for the species at Lake Cargellico in New South Wales (Cunningham *et al.*, 1981).

Habitat: Found in a variety of habitats including; Box-Ironbark Forests with a grassy field layer or understorey of shrub species belonging to the genera *Acacia*, *Grevillea* and *Calytrix*; in moss beds and crevices in slabs of granite rock; in woodlands of Grey Box (*Eucalyptus microcarpa*) and White Box (*E. albens*) on shallow red brown loam soils; and in forests and woodlands of Hill Red Gum (*E. blakelyi*) Red Box (*E. polyanthemos*) and Red Stringybark (*E. macrorhyncha*) on soils derived from granite (S.A.C., 1996, nom.).

Life History: Plants are strictly annual, and numbers are expected to vary markedly with seasonal conditions. Little is known about the biology of this species (Scarlett, 1984, La Trobe). Flowering is between September and November (Everett, 1992). Sexual reproduction and subsequent establishment from seeds. Asexual reproduction is unknown. In response to fire, *B. gracilis* is an obligate seed regenerator, where all (or nearly all) plants are killed and regeneration is solely from seed stored in the soil short term, and germination and establishment are promoted by fire.

Threatening Processes operating in NE Region:

- Considerable areas of original habitat have been destroyed or highly modified, and current habitat is highly fragmented. Its range has contracted mainly to areas of public land which have escaped extensive disturbance or heavy grazing by stock (S.A.C, 1996, nom).
- Some populations have been damaged by recreational vehicles (S.A.C, 1996, nom).
- Soil disturbance from mineral exploration or development poses a potential threat in mineral rich areas (S.A.C, 1996, nom).
- Rabbit grazing may cause some damage (S.A.C, 1996, nom).
- Weed invasion and competition at some sites is a problem (S.A.C, 1996, nom).
- The species is an annual and therefore susceptible to unseasonal wildfire (S.A.C, 1996, nom).

Rating of Threats:

Disturbance	Rating	Source
Clearing of Native Vegetation	2	Cheal, RFA database
Fragmentation of native veg.	3	Cheal, RFA database
Unplanned fire	2	S.A.C, 1996, nom
Introduced animals	2	S.A.C, 1996, nom
Introduced plants	2	S.A.C, 1996, nom
Grazing/trampling	2	S.A.C, 1996, nom
Mining/quarrying	2	S.A.C, 1996, nom
Recreation	2	S.A.C, 1996, nom

Current Management:

- Reservation/ protection status - occurrences are on Crown land reserves.
- monitored for VROTOP database in last 5 years at Chiltern Box-Ironbark National Park.
- Parks Victoria (1998) Chiltern Box-Ironbark National Park Draft Management Plan -
 - Planned management of significant flora: encourage surveys of, and research into, significant flora in the Park to improve knowledge of their locations and management requirements; encourage research and prepare an ecological burning strategy for the Park which provides for ecological management of significant flora; maintain and improve a 'sites of significance' map which shows the location of significant plant species; consult the 'sites of significance' map before undertaking management activities which may impact on floral values; ensure flora surveys are undertaken before any mineral exploration, and do not consent to mineral exploration where this may impact on significant vegetation; prepare a pest plant and animal control strategy for the Park; progressively close and allow to rehabilitate as necessary tracks defined through past uses other than those identified in the management plan.
- Natural Resources and Environment (1996) Mount Samaria State Park Management Plan -
 - Planned management of significant flora: encourage surveys of, and research into, significant flora in the Park to improve knowledge of their management requirements; ensure significant plants are protected from management activities, including fire protection works; ensure the results of relevant research are included in any ecological fire management strategy; prepare and implement a pest plant and animal control strategy for the Park.

Mountain Daisy

Family: Asteraceae

Brachyscome tenuiscapa

Species Characteristics: Erect stoloniferous perennial to 26 cm high, with glandular-septate hairs. Leaves in a basal rosette, sessile, slightly fleshy or rigid, oblanceolate to cuneate, 2-10 cm long and 6-18 mm wide, margins apically toothed. Flower heads mauve, solitary, to 10 mm diameter on peduncle 6-19 mm long (Everett, 1992).

Conservation Status:

ROTAP/ANZECC: not listed
VROTS: vulnerable
ESP Act (1992): not listed
FFG Act (1988): listed; no Action Statement

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
60	40	0

Distribution in NE Region: Rocky Valley, Pretty Valley, Cope East aqueduct, Mt Jim and Mt Loch in the Bogong High Plains part of the Alpine National Park. The species is also found on the Dargo High Plains and Lankey Plain in the Gippsland RFA Region (Adair and Scarlett, 1983, La Trobe, Frood *et al.*, 1998, VROTPop). Outside Victoria it occurs in the Mt Kosciuszko area of New South Wales and mountains of Tasmania (Costin *et al.*, 1979).

Habitat: Restricted to alpine areas at altitudes in excess of 1500 m, with precipitation greater than 1200 mm per year. The species occurs in open grassland and herbfield, on gentle to moderate slopes, usually on shallow soils developed on Tertiary basalt, Ordovician metamorphics and Silurian granite (Scarlett, LaTrobe, 1984). It occupies inter-tussock bare patches in dense sod tussock grassland and *Celmisia-Poa* tall alpine herbfield (Costin *et al.*, 1979).

Life History: Flowering time is November (Everett, 1992). Sexual reproduction has not been observed; reproduction is by rhizomes. Plants occur in habitats not normally subject to fire. The species requires natural disturbances for the rare opportunity to establish and spread.

Threatening Processes operating in NE Region:

- The species grows in some areas where grazing occurs and it may be palatable. It is presumed to be susceptible to grazing but there is no evidence that the species is preferred by cattle or that grazing has caused populations to decline. However, grazing may be a potential threat through habitat damage and trampling (S.A.C., 1991, final rec.).
- Competition by the introduced plant Cat's Ear (*Hypochoeris* spp.) is possible (S.A.C., 1991, final rec.). At one site seedlings from a nearby pine plantation are invading the edges of the population (Frood *et al.*, 1998, VROTPop).
- In areas managed for ski activity, populations are threatened by the invasion of Brown-top Bent (*Agrostis capillaris*) used in soil stabilisation works on adjacent ski slopes. Fertilisers used in ski run construction may also cause eutrophication and change the structure of the native vegetation. Physical destruction by machinery used by the ski industry is possible. (Frood *et al.*, 1998, VROTPop).
- Hare grazing may cause some damage to the species (Frood *et al.*, 1998, VROTPop).
- Presumed habitat at European settlement was isolated, and much of the original habitat has been destroyed or highly modified. The greenhouse effect could result in a reduction of area of suitable habitat (Busby, 1988)

Rating of Threats:

Disturbance	Rating	Source
Fragmentation of native veg.	2	Cheal, RFA database
Introduced animals	1	Frood <i>et al.</i> , 1998, VROTPop
Introduced plants	2	S.A.C., 1991, final rec., Frood <i>et al.</i> , 1998, VROTPop
Grazing/trampling	2	S.A.C., 1991, final rec.
Recreation	2	Frood <i>et al.</i> , 1998, VROTPop
Other:greenhouse effect	1	Busby, 1988
eutrophication	1	Frood <i>et al.</i> , 1998, VROTPop

Current Management:

- Reservation/ protection status - occurrences are in reserves - Alpine National Park.
- monitored for VROTPop database in last 5 years.
- Conservation and Environment (1992) Alpine National Park Bogong Unit Management Plan -
 - Planned management of nationally significant plant species: sites are to be included in the Special Protection Zone and will be managed with the aim of ensuring the survival of the significant species; a 'management statement' will be prepared, which will define the precise boundary of each site/area, and will provide management prescriptions covering conservation, monitoring, recreation, productive uses and other management activities; fire suppression, fuel reduction burning and the control of pest plants and animals will take into account the presence of significant species; efforts will be made to collate information on species distribution, ecology and threats; surveys will be undertaken at sites which are predicted to contain significant species.

Silky Daisy
Family: Asteraceae

Celmisia sericophylla

Species Characteristics: Perennial, tussock-forming herb. Leaves silvery-grey, oblanceolate-linear to 25 cm long and 10-25 mm wide, flaccid, drooping, both surfaces covered with thick permanent vestiture of appressed silky hairs. Bracts densely villous outside. Achenes 5-6 mm long, white (Willis, 1954; Willis, 1972).

Conservation Status:

ROTAP/ANZECC: rare
 VROTS: rare
 ESP Act (1992): not listed
 FFG Act (1988): listed; no Action Statement

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
80	20	0

Distribution in NE Region: Mt Cope, Mt Nelse, Watchbed Creek, Mt Spion Kopje, Mt Bogong and Mt Loch on the Bogong High Plains in the Alpine National Park (Frood *et al.*, 1998, VROTPOP). It is endemic to Victoria.

Habitat: It occurs mostly in the steep rocky drainage lines below springs of alpine snow patches, and is the dominant species of the *Celmisia sericophylla* herbland community (McDougall, 1982), and occurs in wet heath dominated by Candle Richea (*Richea continentis*) and Spreading Rope-rush (*Empodisma minus*) (Frood *et al.*, 1998, VROTPOP).

Life History: *C. sericophylla* may be an annual, biennial or short-lived perennial. Flowering time is January. Both sexual and asexual reproduction is common. The species occurs in habitats not normally subject to fire, and requires long periods without major disturbance for survival and establishment.

Threatening Processes operating in NE Region:

- Where cattle are still present, grazing and trampling is causing a reduction in the number and size of plants and preventing flowering (S.A.C., 1992, final rec.) (Frood *et al.*, 1998, VROTPOP).
- Human trampling and flower collecting is another threat (S.A.C., 1992, final rec.).
- The population at Falls Creek may be threatened by further development of ski facilities (S.A.C., 1992, final rec.).
- At one site near Rocky Valley pondage, weed invasion by species such as Soft Rush (*Juncus effusus*) and Sheep Sorrel (*Acetosella vulgaris*) from the disturbed road edge and reservoir bank is a minor threat but may increase (Frood *et al.*, 1998, VROTPOP).
- The greenhouse effect could result in a reduction of area of suitable habitat (Busby, 1988).

Rating of Threats:

Disturbance	Rating	Source
Introduced plants	1	Frood <i>et al.</i> , 1998, VROTPOP
Grazing/trampling	2	Frood <i>et al.</i> , 1998, VROTPOP
Recreation	1	S.A.C., 1992, final rec.
Deliberate collecting/harvesting	1	S.A.C., 1992, final rec.
Other:greenhouse effect	1	Busby, 1988

Current Management:

- Alpine National Park - occurrences in reserves.
- monitored for VROTPOP database in last 5 years.
- Conservation and Environment (1992) Alpine National Park Bogong Unit Management Plan -
 - Planned management of nationally significant plant species: sites are to be included in the Special Protection Zone and will be managed with the aim of ensuring the survival of the significant species; a 'management statement' will be prepared, which will define the precise boundary of each site/area, and will provide management prescriptions covering conservation, monitoring, recreation, productive uses and other management activities; fire suppression, fuel reduction burning and the control of pest plants and animals will take into account the presence of significant species; efforts will be made to collate information on species distribution, ecology and threats; surveys will be undertaken at sites which are predicted to contain significant species.

Shining Cudweed

Family: Asteraceae

Euchiton nitidulus

Species Characteristics: Mat- or cushion-forming perennial with creeping rhizomes. Leaves crowded, oblong-spathulate, 5-7 mm long, 2-3 mm wide, both surfaces with dense, shiny, silvery to rust-coloured appressed hairs; petiole flat, a third the length of the leaf. Flower heads to 10 mm diameter, solitary, on inconspicuous cottony peduncles to 3 cm long; involucre bracts brown with long hairs at the base, glabrous, shining and scarious above (Everett, 1992).

Conservation Status:

ROTAP/ANZECC: vulnerable

VROTS: vulnerable

ESP Act (1992): listed as vulnerable

FFG Act (1988): not listed

RESERVATION STATUS		
% of NE Region population in biological conservation reserve	% of NE Region population in other public land	% of NE Region population on private land
90	10	0

Distribution in NE Region: Northern side of Mt Jim (**vrotpd**), Mt Nelse snowpatch, south-east of Mt Cope and near Wallaces Hut (Frood *et al.*, 1998, VROTPOP) in the Alpine National Park. It is found south from Kosciuszko, and also in New Zealand (Everett, 1992).

Habitat: The species grows near streams and bogs in alpine and subalpine areas (Everett, 1992) and in sod tussock grassland (Costin *et al.*, 1979)

Life History: Perennial forb. Both sexual and asexual reproduction is common. The species occurs in habitats not normally subject to fire.

Threatening Processes operating in NE Region:

- Weed invasion by Brown-top Bent (*Agrostis capillaris*) is a potential threat at some sites (Frood *et al.*, 1998, VROTPOP).
- The species does not appear to be adversely affected by cattle and hare grazing (Frood *et al.*, 1998, VROTPOP).
- The greenhouse effect could result in a reduction of area of suitable habitat (Busby, 1988)

Rating of Threats:

Disturbance	Rating	Source
Introduced plants	1	Frood <i>et al.</i> , 1998, VROTPOP
Other: greenhouse effect	1	Busby, 1988

Current Management:

- Reservation/ protection status - Alpine National Park - occurrences in reserves.
- monitored for VROTPOP database in last 5 years.
- Conservation and Environment (1992) Alpine National Park Bogong Unit Management Plan -
 - Planned management of nationally significant plant species: sites are to be included in the Special Protection Zone and will be managed with the aim of ensuring the survival of the significant species; a 'management statement' will be prepared, which will define the precise boundary of each site/area, and will provide management prescriptions covering conservation, monitoring, recreation, productive uses and other management activities; fire suppression, fuel reduction burning and the control of pest plants and animals will take into account the presence of significant species; efforts will be made to collate information on species distribution, ecology and threats; surveys will be undertaken at sites which are predicted to contain significant species.

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VROTPD database

FIS database

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APPENDIX F: List of vascular flora species for inclusion in the review of threatened species and disturbance in the North East Comprehensive Regional Assessment

AROTS - Australian Rare or Threatened Species

VROTS - Victorian Rare or Threatened Species

National rating system follows Briggs and Leigh (1995); Victorian rating system follows Gullan, Cheal and Walsh (1990)

(a) threatened vascular species in the North East Regional Forest Agreement region

Species name	Common name	AROTS	VROTS
<i>Abrotanella nivigena</i>	Snow-wort	R	v
<i>Acacia ausfeldii</i>	Ausfeld's Wattle	R	v
<i>Acacia dallachiana</i>	Catkin Wattle	R	r
<i>Acacia dawsonii</i>	Poverty Wattle		v
<i>Acacia deanei</i> ssp. <i>deanei</i>	Deane's Wattle		e
<i>Acacia decora</i>	Western Silver Wattle		v
<i>Acacia penninervis</i>	Hickory Wattle		r
<i>Acacia phasmoides</i>	Phantom Wattle	V	v
<i>Acacia phelobophylla</i>	Buffalo Sallow Wattle	R	r
<i>Acacia triptera</i>	Spur-wing Wattle		v
<i>Agrostis meionectes</i>	Alpine Bent	R	k
<i>Allocasuarina luehmannii</i>	Buloke		d
<i>Almaleea capitata</i>	Slender Parrot-pea	R	r
<i>Aristida calycina</i> var. <i>calycina</i>	Dark Wire-grass		r
<i>Asplenium trichomanes</i> ssp. <i>trichomanes</i>	Common Spleenwort		r
<i>Astrotricha linearis</i>	Narrow-leaf Star-hair		r
<i>Austrodanthonia richardsonii</i>	Straw Wallaby-grass		v
<i>Austrostipa gibbosa</i>	Spurred Spear-grass		r
<i>Austrostipa setacea</i>	Corkscrew Spear-grass		r
<i>Baeckea crenatifolia</i>	Fern-leaf Baeckea	R	v
<i>Barbarea grayi</i>	Native Wintercress		v
<i>Bossiaea riparia</i>	River Bossiaea		r
<i>Brachyscome chrysoglossa</i>	Yellow-tongue Daisy		v
<i>Brachyscome gracilis</i> ssp. <i>gracilis</i>	Dookie Daisy		v
<i>Brachyscome obovata</i>	Baw Baw Daisy		r
<i>Brachyscome Ptychocarpa</i>	Tiny Daisy		r
<i>Brachyscome tadgellii</i>	Tadgell's Daisy		r
<i>Brachyscome tenuiscapa</i>	Mountain Daisy		v
<i>Bulbine glauca</i>	Bluish Bulbine-lily		r
<i>Caladenia concolor</i>	Crimson Spider-orchid	V	v
<i>Caladenia flavovirens</i>	Summer Spider-orchid		r
<i>Callitris glaucophylla</i>	White Cypress-pine		d
<i>Calochilus imberbis</i>	Naked Beard-orchid		r
<i>Carex archeri</i>	Archer's Sedge		v
<i>Carex capillacea</i>	Hair Sedge	R	r
<i>Carex cephalotes</i>	Wire-head Sedge	R	v
<i>Carex echinata</i>	Star Sedge		v
<i>Carex paupera</i>	Dwarf Sedge	R	v
<i>Carex raleighii</i>	Raleigh Sedge	R	r
<i>Celmisia sericophylla</i>	Silky Daisy	R	r
<i>Colobanthus affinis</i>	Alpine Colobanth		r
<i>Coprosma moorei</i>	Turquoise Coprosma		r
<i>Coprosma nivalis</i>	Snow Coprosma		r
<i>Corybas hispidus</i>	Bristly Helmet-orchid		r
<i>Craspedia alba</i>	White Billy-buttons	R	-
<i>Craspedia</i> sp. (Mt Stirling)	Mt Stirling Billy-buttons		v
<i>Cyperus flavidus</i>	Yellow Flat-sedge		v
<i>Cystopteris tasmanica</i>	Bristle-fern	R	r
<i>Dampiera purpurea</i>	Mountain Dampiera		r
<i>Daviesia genistifolia</i>	Broom Bitter-pea		r
<i>Derwentia nivea</i>	Snow Speedwell	R	-
<i>Deschampsia caespitosa</i>	Tufted Hair-grass		r
<i>Desmodium varians</i>	Slender Tick-trefoil		r
<i>Deyeuxia affinis</i>	Allied Bent-grass	R	r
<i>Digitaria coenicol</i>	Finger Panic-grass		v
<i>Digitaria diffusa</i>	Open Summer-grass		v
<i>Digitaria divaricatissima</i>	Spreading Summer-grass		v
<i>Dipodium hamiltonianum</i>	Yellow Hyacinth-orchid		e
<i>Diuris behrii</i>	Golden Cowslips		v
<i>Diuris dendrobioides</i>	Wedge Diuris		e
<i>Diuris punctata</i> var. <i>punctata</i>	Purple Diuris		v
<i>Dodonaea boroniifolia</i>	Hairy Hop-bush		r
<i>Dodonaea rhombifolia</i>	Broad-leaf Hop-bush	R	r
<i>Eleocharis plana</i>	Flat Spike-sedge		v
<i>Epacris glacialis</i>	Reddish Bog Heath		r

Species name	Common name	AROTS	VROTS
<i>Epilobium pallidiflorum</i>	Showy Willow-herb		d
<i>Epilobium tasmanicum</i>	Tasman Willow-herb		r
<i>Eucalyptus alligatrix</i> ssp. <i>limaensis</i>	Lima Stringybark	R	r
<i>Eucalyptus cadens</i>	Warby Swamp Gum	V	v
<i>Eucalyptus cinerea</i> ssp. <i>cinerea</i>	Argyle Apple		r
<i>Eucalyptus mitchelliana</i>	Buffalo Sallee	R	r
<i>Eucalyptus neglecta</i>	Omeo Gum	R	r
<i>Eucalyptus pauciflora</i> ssp. <i>hedraia</i>	Snow Gum		r
<i>Eucalyptus rubida</i> ssp. <i>septemflora</i>	Candlebark	V	v
<i>Eucalyptus yarraensis</i>	Yarra Gum	R	r
<i>Euchiton nitidulus</i>	Shining Cudweed	V	v
<i>Euchiton umbricolus</i>	Cliff Cudweed		r
<i>Euphrasia caudata</i>	Tailed Eyebright		r
<i>Euphrasia collina</i> ssp. <i>muelleri</i>	Purple Eyebright	E	e
<i>Euphrasia crassiuscula</i> ssp. <i>crassiuscula</i>	Thick Eyebright		r
<i>Euphrasia crassiuscula</i> ssp. <i>eglandulosa</i>	Thick Eyebright		r
<i>Euphrasia crassiuscula</i> ssp. <i>glandulifera</i>	Thick Eyebright		v
<i>Euphrasia eichleri</i>	Bogong Eyebright	V	v
<i>Euphrasia lasianthera</i>	Hairy Eyebright		r
<i>Euphrasia scabra</i>	Rough Eyebright	K	e
<i>Fimbristylis velata</i>	Veiled Fringe-sedge		r
<i>Genoplesium nudum</i>	Tiny Midge-orchid		r
<i>Glycine latrobeana</i>	Clover glycine	V	v
<i>Goodenia macbarronii</i>	Narrow Goodenia	V	v
<i>Goodia medicaginea</i>	Western Golden-tip		r
<i>Grammitis poeppigiana</i>	Alpine Finger-fern		r
<i>Gratiola pumilio</i>	Dwarf Brooklime	K	-
<i>Grevillea jephcottii</i>	Green Grevillea	R	r
<i>Grevillea polybractea</i>	Crimson Grevillea		r
<i>Grevillea ramosissima</i> ssp. <i>hypargyrea</i>	Fan Grevillea		r
<i>Grevillea willisii</i>	Rock Grevillea	R	r
<i>Hibbertia humifusa</i> ssp. <i>erigens</i>	Euroa Guinea-flower		v
<i>Hierochloa submutica</i>	Holy Grass	R	v
<i>Huperzia australiana</i>	Fir Clubmoss		r
<i>Hydrilla verticillata</i>	Hydrilla		r
<i>Hypsela tridens</i>	Hypsela		v
<i>Indigofera adesmiifolia</i>	Tick Indigo		v
<i>Isolepis wakefieldiana</i>	Tufted Club-sedge		r
<i>Juncus antarcticus</i>	Cushion Rush		v
<i>Juncus brevibracteus</i>	Alpine Rush		r
<i>Juncus thompsonianus</i>	Rush		r
<i>Kelleria laxa</i>	Kelleria	V	v
<i>Koeleria cristata</i>	Crested Hair-grass		r
<i>Leptorhynchus elongatus</i>	Lanky Buttons		r
<i>Leptospermum multicaule</i>	Silver Tea-tree		v
<i>Lepyrodia anarthria</i>	Scale-rush		r
<i>Leucopogon montanus</i>	Snow Beard-heath		r
<i>Leucopogon pilifer</i>	Trailing Beard-heath		r
<i>Luzula acutifolia</i> ssp. <i>acutifolia</i>	Sharp-leaf Woodrush		r
<i>Lycopodium scariosum</i>	Spreading Clubmoss		r
<i>Olearia adenophora</i>	Scented Daisy-bush	R	r
<i>Olearia frostii</i>	Bogong Daisy-bush	R	r
<i>Oreomyrrhis argentea</i>	Silver Carraway		v
<i>Oreomyrrhis brevipes</i>	Branched Carraway	R	r
<i>Oreomyrrhis pulvinifera</i>	Cushion Carraway		v
<i>Oxalis magellanica</i>	Snowdrop Wood-sorrel		r
<i>Panicum decompositum</i>	Australian Millet		r
<i>Parantennaria uniceps</i>	Parantennaria	R	v
<i>Persoonia subvelutina</i>	Velvety Geebung		r
<i>Pimelea biflora</i>	Matted Rice-flower		r
<i>Pimelea treyvaudii</i>	Grey Rice-flower		v
<i>Plantago glacialis</i>	Small Star Plantain		v
<i>Poa hothamensis</i> var. <i>parviflora</i>	Soft Ledge-grass	R	r
<i>Poa labillardieri</i> var. <i>acris</i>	Common Tussock-grass		r
<i>Poa saxicola</i>	Rock Poa		v
<i>Pomaderris aurea</i>	Golden Pomaderris		r
<i>Pomaderris subplicata</i>	Concave Pomaderris	V	v
<i>Prasophyllum campestre</i>	Northern Plains Leek-orchid	R	e
<i>Pratia gelida</i>	Snow Pratia	R	v
<i>Prostanthera decussata</i>	Dense Mint-bush		r
<i>Prostanthera monticola</i>	Buffalo Mint-bush	R	r
<i>Pterostylis aestiva</i>	Long-tongue Summer Greenhood		r
<i>Pterostylis boormanii</i>	Sikh's Whiskers	r	r
<i>Pterostylis cucullata</i>	Leafy Greenhood	V	v
<i>Pterostylis dubia</i>	Blue-tongue Greenhood		e
<i>Pterostylis fischii</i>	Fisch's Greenhood		r
<i>Pterostylis hamata</i>	Scaly Greenhood		r
<i>Pterostylis maxima</i>	Large Rustyhood		v

Species name	Common name	AROTS	VROTS
<i>Pultenaea polifolia</i>	Dusky Bush-pea		r
<i>Pultenaea vrolandii</i>	Cupped Bush-pea		r
<i>Pultenaea williamsonii</i>	Highland Bush-pea	K	r
<i>Ranunculus eichlerianus</i>	Eichler's Buttercup	R	r
<i>Rytidosperma australe</i>	Southern Sheep-grass		r
<i>Santalum lanceolatum</i>	Northern Sandalwood		e
<i>Schizacme montana</i> var. <i>montana</i>	Mountain Mitrewort		r
<i>Schizeilema fragoseum</i>	Alpine Pennywort		v
<i>Scleranthus singuliflorus</i>	Mossy Knawel		r
<i>Sclerolaena birchii</i>	Galvanised Bassia		r
<i>Spiranthes sinensis</i>	Austral Ladies' Tresses		d
<i>Spirodela polyrrhiza</i>	Large Duckweed		v
<i>Sporobolus creber</i>	Rat-tail Grass		r
<i>Swainsona galegifolia</i>	Smooth Darling Pea		v
<i>Taraxacum aristum</i>	Austral Dandelion	R	r
<i>Templetonia stenophylla</i>	Leafy Templetonia		d
<i>Thelypteris confluens</i>	Swamp Fern	K	e
<i>Tripogon loliiformis</i>	Rye Beetle-grass		r
<i>Uncinia compacta</i>	Compact Hook-sedge		r
<i>Utricularia monanthos</i>	Tasmanian Bladderwort		v
<i>Viola caleyana</i>	Swamp Violet		r
<i>Westringia lucida</i>	Shining Westringia	R	v
<i>Wurmbea biglandulosa</i>	Glandular Early Nancy		r

(b) indicator vascular species included in the disturbance review

Indicator species were used in the disturbance review in addition to the rare or threatened species (above) as surrogate indicators of disturbance. They were selected to represent a broad range of environments and on the basis of their susceptibility to disturbance and hence their ability to indicate the presence of it.

Species name	Common name
<i>Acacia dealbata</i>	Silver Wattle
<i>Acacia melanoxylon</i>	Blackwood
<i>Acacia pycnantha</i>	Golden Wattle
<i>Acaena echinata</i>	Sheep's Burr
<i>Acrotriche serrulata</i>	Honey-pots
<i>Allocasuarina littoralis</i>	Black Sheoke
<i>Asperula euryphylla</i>	Broad-leaf Woodruff
<i>Asplenium flabellifolium</i>	Necklace Fern
<i>Atherosperma moschatum</i>	Southern Sassafras
<i>Austrostipa densiflora</i>	Dense Spear-grass
<i>Austrostipa scabra</i> ssp. <i>falcata</i>	Rough Spear-grass
<i>Azolla filiculoides</i>	Pacific Azolla
<i>Banksia canei</i>	Mountain Banksia
<i>Bedfordia arborescens</i>	Blanket-leaf
<i>Blechnum cartilagineum</i>	Gristle Fern
<i>Blechnum watsii</i>	Hard Water-fern
<i>Brachychiton populneus</i> ssp. <i>populneus</i>	Kurrajong
<i>Callitris endlicheri</i>	Black Cypress-pine
<i>Calytrix tetragona</i>	Common Fringe-myrtle
<i>Carex appressa</i>	Tall Sedge
<i>Cassinia trinerva</i>	Three-nerved Cassinia
<i>Clematis aristata</i>	Mountain Clematis
<i>Comesperma volubile</i>	Love Creeper
<i>Coprosma hirtella</i>	Rough Coprosma
<i>Coprosma quadrifida</i>	Prickly Currant-bush
<i>Crassula sieberiana</i> ssp. <i>tetramera</i>	Australian Stonecrop
<i>Cyathea australis</i>	Rough Tree-fern
<i>Deyeuxia quadriseta</i>	Reed Bent-grass
<i>Dianella revoluta</i> s.s.	Black-anther Flax-lily
<i>Dianella tasmanica</i>	Tasman Flax-lily
<i>Dicksonia antarctica</i>	Soft Tree-fern
<i>Dillwynia phyllicoides</i>	Small-leaf Parrot-pea
<i>Elaeocharis acuta</i>	Common Spike-sedge
<i>Eucalyptus albens</i>	White Box
<i>Eucalyptus blakleyi</i>	Hill Red Gum
<i>Eucalyptus camaldulensis</i>	River Red Gum
<i>Eucalyptus camphora</i> ssp. <i>humeana</i>	Mountain Swamp Gum
<i>Eucalyptus chapmaniana</i>	Bogong Gum
<i>Eucalyptus delegatensis</i>	Alpine Ash
<i>Eucalyptus macrorhyncha</i>	Red Stringybark
<i>Eucalyptus microcarpa</i>	Grey Box
<i>Eucalyptus obliqua</i>	Messmate
<i>Eucalyptus pauciflora</i>	Snow Gum
<i>Eucalyptus radiata</i> s.l.	Narrow-leaved Peppermint
<i>Glossostigma elatinoides</i>	Small Mud-mat
<i>Glycine clandestina</i>	Twining Glycine
<i>Grevillea alpina</i>	Cat's Claws Grevillea
<i>Grevillea australis</i>	Alpine Grevillea

Species name	Common name
<i>Grevillea lanigera</i>	Woolly Grevillea
<i>Grevillea linearifolia</i>	Small-flower Grevillea
<i>Grevillea miqueliana</i>	Oval-leaf Grevillea
<i>Grevillea rosmarinifolia s.l.</i>	Rosemary Grevillea
<i>Grevillea victoriae</i>	Royal Grevillea
<i>Hakea decurrens</i>	Bushy Hakea
<i>Hakea eriantha</i>	Tree Hakea
<i>Hakea lissosperma</i>	Mountain Needlewood
<i>Hakea microcarpa</i>	Small-fruit Hakea
<i>Hakea nodosa</i>	Yellow Hakea
<i>Hymenophyllum cupressiforme</i>	Common Filmy Fern
<i>Isotoma axillaris</i>	Rock Isotome
<i>Isotoma fluviatilis ssp. australis</i>	Swamp Isotome
<i>Kunzea ericoides</i>	Burgan
<i>Kunzea parvifolia</i>	Violet Kunzea
<i>Lagenifera stipitata</i>	Common Lagenifera
<i>Leptorhynchus squamatus</i>	Scaly Buttons
<i>Leptospermum brevipes</i>	Slender Tea-tree
<i>Leptospermum continentale</i>	Prickly Tea-tree
<i>Leptospermum grandifolium</i>	Mountain Tea-tree
<i>Leucopogon lanceolatus var. lanceolatoatus</i>	Lance Beard-heath
<i>Luzula meridionalis var. flaccida</i>	Common Woodrush
<i>Monotoca scoparia</i>	Prickly Broom-heath
<i>Olearia argophylla</i>	Musk Daisy-bush
<i>Olearia phloggopappa</i>	Dusty Daisy-bush
<i>Oreomyrrhis eriopoda</i>	Australian Carraway
<i>Oxalis perennans</i>	Grassland Wood-sorrel
<i>Pandorea pandorana</i>	Wonga Vine
<i>Persoonia chamaepeuce</i>	Dwarf Geebung
<i>Persoonia confertifolia</i>	Cluster-flower Geebung
<i>Persoonia juniperina</i>	Prickly Geebung
<i>Persoonia rigida</i>	Hairy Geebung
<i>Phragmites australis</i>	Common Reed
<i>Poa ensiformis</i>	Sword Tussock-grass
<i>Poa hothamensis</i>	Ledge-grass
<i>Polyphlebium venosum</i>	Veined Bristle-fern
<i>Polystichum proliferum</i>	Mother Shield-fern
<i>Pteridium esculentum</i>	Austral Bracken
<i>Rubus parvifolius</i>	Small-leaf Bramble
<i>Schoenus apogon</i>	Common Bog-sedge
<i>Senecio quadridentatus</i>	Cotton Fireweed
<i>Stypandra glauca</i>	Nodding Blue-lily
<i>Tasmania xerophila ssp. xerophila</i>	Alpine Pepper
<i>Tetratheca ciliata</i>	Pink-bells
<i>Themeda triandra</i>	Kangaroo Grass
<i>Tricoryne elatior</i>	Yellow Rush-lily
<i>Xanthorrhoea australis</i>	Austral Grass-tree

APPENDIX G: Life History Parameters - Fauna Species

Note: 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 North East 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;
- 2 Process is a moderate threat, which is likely to lead to some decline of the species, especially if it 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 North East.

MAMMALS

Broad-toothed Rat

Mastacomys fuscus

RARITY

a) Geographic Range

- Classification of range size within North East Region: Small
- Distribution of records within North East Region: In alpine and subalpine areas from Mt Stirling to Lake Dartmouth
- Proportion of North East Region recorded from (%): 6.4
- 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: Narrow
- Vegetation types inhabited in the Region: Tall alpine herffield, subalpine sedgeland, fen bog heath and woodland. Recorded in the following EVCs: Subalpine Woodland, Treeless Subalpine Complex, Herb-rich Foothill Forest, Montane Dry Woodland, Montane Damp Forest, Damp Forest, Shrubby Dry Forest
- Source: Menkhorst (1995f), BioMap NRE (Nov 1997)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Unknown
- Source: J. Seebeck pers. comm.

Population trend since discovery by Europeans

- Increased, stable or declined: Possibly declined (based on past clearing of known habitat and altered fire regimes)
- Source: Seebeck (1971), Braithwaite *et al.* (1978)

SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: 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, probably 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: Short-lived
- 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: Colonial during winter in subalpine Region
- 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 (1)** J. Seebeck pers. comm.

2. **Timber Harvesting: Ranking (1)** 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)** J. Seebeck pers. comm.

6. **Introduced Species: Ranking (2)** Mansergh and Marks (1993), J. Seebeck pers. comm.

7. **Grazing/Trampling: Ranking (2)** Menkhorst (1995f), J. Seebeck pers. comm.

8. **Pest Control: Ranking (0)** J. Seebeck pers. comm.

9. **Road Construction and Maintenance: Ranking (-)**

10. **Mining/Quarrying: Ranking (0)** J. Seebeck pers. comm.

11. **Tree Dieback: Ranking (-)**

12. **Recreation: Ranking (1)** Menkhorst (1995f), 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 (1)** J. Seebeck pers. comm.

16. **Other: Climate change: Ranking (2)** Bennett *et al.* (1991)

Current Management:

The Broad-toothed Rat is classified as "rare" in Victoria (CNR 1995a). A portion of its range, the Alpine Bog Community is listed under the *Flora and Fauna Guarantee Act 1988*. Within the Alpine National Park a number of areas containing Broad-toothed Rat sites has been included in the Special Protection Zone (DCE 1992a,b).

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 al.* 1990). Restricted to areas where the annual rainfall exceeds 1000mm (Watts and Aslin 1981), this species appears to prefer treeless habitat with few shrubs and a dense cover of sedges and grasses particularly along drainage lines (Green and Osborne 1994, Menkhorst 1995f). Due to its specialised habitat requirements, populations are localised and patchily distributed (Menkhorst 1995f).

Distribution in the North East Region

In the North East the Broad-toothed Rat has been recorded in alpine and subalpine areas from Mt Stirling to Lake Dartmouth. Most records occur in Alpine National Park (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the North East Region

The Broad-toothed Rat is potentially threatened by processes that destroy its habitat such as clearing, timber harvesting and fuel reduction burning (J. Seebeck pers. comm.). Vegetation in alpine areas is particularly sensitive to disturbances, taking a long time to recover from damage (McDougall 1982). Trampling by cattle and recreational activities such as hiking, skiing and associated resort development can cause loss of cover and food (Menkhorst 1995f). As populations of this species are small and disjunct, they are extremely vulnerable to local declines and extinction by stochastic events such as wildfire (Bennett 1990). Another significant threat to the Broad-toothed Rat is predation by Foxes which may selectively prey on this species (Green and Osborne 1981, Mansergh and Marks 1993). Dam construction in gullies, where preferred habitat of this species often occurs, could result in flooding of such areas and therefore lead to habitat loss (J. Seebeck pers. comm.). The bioclimate of the Broad-toothed Rat is predicted to contract to higher altitudes in response to climatic warming (Bennett *et al.* 1991) and is potentially a significant threat to populations.

Spot-tailed Quoll
Dasyurus maculatus

RARITY

a) Geographic Range

- Classification of range size within North East Region: Large
- Distribution of records within North East Region: Scattered widely throughout the Region
- Proportion of North East Region recorded from (%): 7.5
- 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 (1997a)

c) Habitat Specificity

- Classification of habitat specificity: Wide
- Vegetation types inhabited in the Region: Wet forest, dry forest, recorded from the following EVCs: Herb-rich Foothill Forest, Montane Dry Woodland, Montane Damp Forest
- Source: Mansergh (1984), BioMap NRE (Nov 1997)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Declined
- Source: Atlas of Victorian Wildlife, C. Belcher pers. comm.

Population trend since discovery by Europeans

- Increased, stable or declined: Declined
- Source: Mansergh (1984)

SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: Low
- Source: Belcher (1995b)

b) Dispersal

- Classification of powers of dispersal: High
- Average distances dispersed: Unknown
- Maximum distance dispersed: Unknown
- Source: Belcher (1995b)

LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of potential reproductive output: Medium
- Age of sexual maturity (yrs): 1
- Mean clutch/litter/brood size: 5; actual number weaned is unknown
- Mean no of clutches/litters/broods per year: 1
- Time of year young born/hatch: June (in Tasmania)-August
- Source: Fleay (1940), Settle (1978), Green and Scarborough (1990)

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 (1997a)

d) Social organisation

- Colonial or non-colonial: Non-colonial
- Territoriality: Females maintain exclusive female territories, male territories overlap with other male and female territories at least during the breeding season
- Source: Belcher (1995b)

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Diet: Primarily a carnivore, also an insectivore; juveniles primarily insectivores

Source: Belcher (1995a,b)

THREATS

1. **Clearing of Native Vegetation: Ranking (2)** Mansergh and Belcher (1992), P. Menkhorst pers. comm.
2. **Timber Harvesting: Ranking (3)** Mansergh and Belcher (1992), C. Belcher pers. comm.
3. **Fuel Reduction Burning: Ranking (2)** Catling (1991), P. Menkhorst pers. comm.
4. **Firewood Collection: Ranking (2)** C. Belcher pers. comm.
5. **Unplanned Fire: Ranking (2)** C. Belcher pers. comm.
6. **Introduced Species: Ranking (2)** Mansergh (1984), Mansergh and Belcher (1992), C. Belcher and P. Menkhorst pers. comm.
7. **Grazing/Trampling: Ranking (1)** C. Belcher pers. comm.
8. **Pest Control: Ranking (3)** Mansergh and Belcher (1992), Belcher (1995c), 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 pers. comm.
11. **Tree Dieback: Ranking (1)** C. Belcher pers. comm.
12. **Recreation: Ranking (1)** C. Belcher pers. comm.
13. **Illegal Collecting/Harvesting: Ranking (0)** P. Menkhorst pers. comm.
14. **Vandalism: Ranking (2)** C. Belcher pers. comm.

15. Dams/Impoundments: Ranking (1) C. Belcher and P. Menkhorst pers. comm.

Current Management:

The Spot-tailed Quoll is classified as "vulnerable" in Victoria (CNR 1995a) and is listed under the Victorian *Flora and Fauna Guarantee Act* 1988. It is also listed as vulnerable under the Commonwealth *Endangered Species Act* 1992. 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 Quoll within its remaining range, the recording of all sightings in 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. A targeted assessment report on this species has been prepared to assist in the development of a Forest Management Plan and the North East RFA (Belcher 1997b).

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 (Belcher 1995a, Belcher 1997a). Prey are stalked on the ground (e.g. rabbits) and arboreally (e.g. Greater Glider, Ringtail Possum) (Settle 1978, Belcher 1997a). Invertebrates may also be eaten, particularly by young animals (Belcher 1995a). Spot-tailed Quolls are forest dependent and appear 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 Victoria including wet sclerophyll forest, dry sclerophyll forest, woodland and heathland (Mansergh 1984, Edgar and Belcher 1995). 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 1997a). Spot-tailed Quolls, although seemingly solitary creatures, use common defecation sites: 'latrines', which appear to have an important social function such as communication of female reproductive condition (Belcher 1994).

Distribution in the North East Region

Little is known about populations of the Spot-tailed Quoll in this Region as no formal studies have been carried out. Records are scattered widely and are highly disjunct, occurring on private land, State forest and along roadsides and include a number of road-kills. About one third of these are pre-1970 with less than 25 records reported since. The most recent record is a road-kill in 1995 near Wangaratta. Prior to this a female with two young were observed just out of Indigo Upper in 1994 (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the North East 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 of habitat and reduction of suitable foraging habitat and den sites which can be caused by clearing of vegetation, timber harvesting, fuel reduction burning and wildfire (Catling 1991, Mansergh and Belcher 1992, C. Belcher pers. comm.). Firewood collection can also result in a reduction in den sites through the removal of fallen timber. The Spot-tailed Quoll is susceptible to non-target poisoning from 1080-poisoned baits used to control pest animals (Rabbits, wild Dogs and Foxes) which may result in the death of individuals or local populations (Mansergh and Belcher 1992, Belcher 1995c). Secondary poisoning can also occur through ingestion of poisoned Rabbits. Competition for prey items with Cats and Foxes may be a significant threat as there appears to be some dietary overlap (Mansergh 1984, Mansergh and Belcher 1992). Spot-tailed Quolls are known to kill poultry, and illegal shooting of individuals, particularly on private land, is considered a moderate threat (C. Belcher pers. comm.). Road construction and mining or quarrying can involve habitat removal and fragmentation but are considered minor threats to this species in the North East (C. Belcher pers. comm.).

Brush-tailed Phascogale

Phascogale tapoatafa

RARITY

a) Geographic Range

- Classification of range size within North East Region: Medium
- Distribution of records within North East Region: From Seymour to Wodonga
- Proportion of North East Region recorded from (%): 11.3
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: Unknown
- Density: 0.03/ha (Strathbogrie Ranges)
- Home Range (ha): females 20-78 (41); males 68-152 (106)
- Source: Soderquist (1995b), Downes *et al.* (1997), T. Soderquist pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Wide
- Vegetation types inhabited in the Region: Dry sclerophyll forest and woodland. Recorded in the following EVCs: Box Ironbark Forest, Grassy Dry Forest, Herb-rich Foothill

Forest, Heathy Dry Forest, Rocky Outcrop
Shrubland/Herbland Mosaic

• Source: Soderquist (1995b), BioMap NRE (Nov 1997)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Unknown, probably declined
- Source: T. Soderquist pers. comm.

Population trend since discovery by Europeans

- Increased, stable or declined: Declined
- Source: P. Menkhorst pers. comm.

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 2km
- Maximum distance dispersed: Approximately 20km for males, 5km 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): female 1-2; male 1
- Maximum lifespan (yrs): 3 females, 1 males
- Source: Cuttle (1982a), Soderquist (1995a)

c) Morphology

Adult body size

- Weight (g): 106-212 (156) females, 175-311(231) males
- Length (cm): 148-233 (181) females, 160-261 (199) males
- 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), Nectivore, occasionally small vertebrates
- Source: Cuttle (1982b), Traill and Coates (1993)

THREATS

1. **Clearing of Native Vegetation: Ranking (3)** Rhind (1996), Humphries and Seebeck (in prep.), P. Menkhorst and T. Soderquist pers. comm.

2. **Timber Harvesting: Ranking (2)** Rhind (1996), Humphries and Seebeck (in prep.), P. Menkhorst and T. Soderquist pers. comm.

3. **Fuel Reduction Burning: Ranking (1)** T. Soderquist pers. comm.

4. **Firewood Collection: Ranking (2)** Humphries and Seebeck (in prep.), P. Menkhorst and T. Soderquist pers. comm.

5. **Unplanned Fire: Ranking (2)** T. Soderquist pers. comm.

6. **Introduced Species: Ranking (2)** Soderquist (1993), Humphries and Seebeck (in prep.), P. Menkhorst and T. Soderquist pers. comm.

7. **Grazing/Trampling: Ranking (1)** Humphries and Seebeck (in prep.), P. Menkhorst and T. Soderquist pers. comm.

8. **Pest Control: Ranking (1)** T. Soderquist pers. comm.

9. **Road Construction and Maintenance: Ranking (1)** P. Menkhorst and T. Soderquist pers. comm.

10. **Mining/Quarrying: Ranking (1)** Humphries and Seebeck (in prep.), T. Soderquist pers. comm.

11. **Tree Dieback: Ranking (1)** T. Soderquist pers. comm.

12. **Recreation: Ranking (0)** P. Menkhorst and 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 "rare" in Victoria (CNR 1995a) and has been listed under the Victorian *Flora and Fauna Guarantee Act 1988* and an Action Statement is being prepared (Humphries and Seebeck in prep.). A targeted assessment report on this species has been completed to assist in the development of a Forest Management Plan and the North East RFA. (Soderquist 1997).

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 exclusive intrasexual home ranges (average 41 ha) (Soderquist 1995b), hence the species occurs

at very low population densities. 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). Life history of the Brush-tailed Phascogale is characterised 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 lactating adult females can be high (Cuttle 1982a, Soderquist 1993). Brush-tailed Phascogales inhabit dry, sclerophyll forest and woodland particularly where there are box, ironbark and stringybark eucalypt associations (Menkhorst 1995a).

Distribution in the North East Region

Within the North East, Brush-tailed Phascogale records are from Chiltern Box-Ironbark National Park and Beechworth areas, and from Seymour to Benalla including the Strathbogies Ranges (Downes *et al.* 1997, Atlas of Victorian Wildlife). These records occur on private land, in State forest and include a number of road-kills.

Disturbances and potentially threatening processes operating in the North East Region

Fragmentation and reduction of quality of habitat are major threats to the Brush-tailed Phascogale. Removal of both live and dead trees decreases the number of suitable hollows and reduces foraging substrate. These threatening processes can result from activities such as clearing of native vegetation and timber harvesting (Rhind 1996, Humphries and Seebeck in prep.). Fallen timber is also an important foraging resource and their removal for firewood adds to the lessening of habitat quality. Inappropriate fire regimes, grazing and mining are other contributing factors. Remnants linking larger blocks of suitable Brush-tailed Phascogale habitat are very important and degradation of such areas threatens the species viability. Predation by Foxes and feral Cats is also a moderate threat (Humphries and Seebeck in prep.). 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.).

Dingo

Canis familiaris dingo

RARITY

a) Geographic Range

- Classification of range size within North East Region: Unknown, possibly large
- Distribution of records within North East Region: Few records from two widely separated locations (Corryong and Tatong)
- Proportion of North East Region recorded from (%): <1
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: Unknown
- Density: Unknown
- Home Range (ha): 2700 (in mountain forest in NSW), dependent on habitat and prey numbers
- Source: Harden (1985), Menkhorst (1995b)

c) Habitat Specificity

- Classification of habitat specificity: Wide
- Vegetation types inhabited in the Region: Unknown, in general inhabits wet and dry forest and subalpine woodland
- Source: Menkhorst (1995b)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Unknown
- Source: Menkhorst (1995b)

Population trend since discovery by Europeans

- Increased, stable or declined: Unknown, likely to have declined
- Source: J. Seebeck pers. comm.

SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: Unknown, probably low
- Source: Harden (1985)

b) Dispersal

- Classification of powers of dispersal: High
- Average distances dispersed: Unknown
- Maximum distance dispersed: Unknown
- Source: Harden (1985)

LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low, given packs have only one breeding pair, hence a high proportion of non-breeding adults
- Age of sexual maturity (yrs): 1-4 females, 2-3 males
- Mean clutch/litter/brood size: 2-9 (5.5)
- Mean no of clutches/litters/broods per year: 1
- Time of year young born/hatch: March to September, peak between June and August
- Source: Jones and Stevens (1988)

b) Longevity

- Classification of lifespan: Long-lived

- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): 12 - may have been hybrids
- Source: Corbett (1995)

c) Morphology

Adult body size

- Weight (kg): 9.5-22.5 (14.0) females, 10.5-24.0 (16.3) males
- Length (mm): 779-1099 (927) females, 770-1131 (973) males
- Source: Jones (1990)

d) Social organisation

- Colonial or non-colonial: Live singly, in pairs or in packs
- Territoriality: Territorial
- Source: Corbett (1995)

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Diet: Carnivore, medium to large mammals are the major prey item
- Source: Brown and Triggs (1990), Corbett (1995)

THREATS

1. **Clearing of Native Vegetation: Ranking (1)** J. Seebeck pers. comm.
2. **Timber Harvesting: Ranking (2)** J. Seebeck pers. comm.
3. **Fuel Reduction Burning: Ranking (1)** J. Seebeck pers. comm.
4. **Firewood Collection: Ranking (0)** J. Seebeck pers. comm.
5. **Unplanned Fire: Ranking (2)** J. Seebeck pers. comm.
6. **Introduced Species: Ranking (2)** J. Seebeck pers. comm.
7. **Grazing/Trampling: Ranking (1)** J. Seebeck pers. comm.
8. **Pest Control: Ranking (2)** Menkhorst (1995b), J. Seebeck pers. comm.
9. **Road Construction and Maintenance: Ranking (-)**
10. **Mining/Quarrying: Ranking (0)** J. Seebeck pers. comm.
11. **Tree Dieback: Ranking (-)**
12. **Recreation: Ranking (0)** J. Seebeck pers. comm.
13. **Illegal Collecting/Harvesting: Ranking (0)** J. Seebeck pers. comm.
14. **Vandalism: Ranking (1)** J. Seebeck pers. comm.
15. **Dams/Impoundments: Ranking (1)** J. Seebeck pers. comm.
16. **Other - Genetic dilution due to inbreeding with Dogs: Ranking (2)** Corbett (1995)

Current Management:

Dingoes are classified as "insufficiently known" in Victoria (CNR 1995a). Dingoes and their hybrids are declared pests in Victoria under the *Catchment and Lands Protection Act 1994* and are controlled on public land particularly where it borders private land utilised for grazing.

Species characteristics:

Dingoes are the largest terrestrial predator in Australia. They are a social animal commonly living in packs consisting of one dominant breeding pair and other non-breeding animals. They may also live in pairs or singly. The size of the pack, usually 3-12 members, may be related to the availability of resources (Corbett 1995). Dingoes feed mainly on medium to large mammals such as Common and Mountain Brushtail Possums, Black Wallabies and Common Wombats (Newsome *et al.* 1983, Brown and Triggs 1990). Birds, reptiles, insects and plant material are also included in their diet (Brunner *et al.* 1981, Newsome *et al.* 1983). Dingoes inhabit wet and dry forest and subalpine woodlands, using hollow logs, old wombat burrows and occasionally caves under rock ledges as den sites (Corbett 1995, Menkhorst 1995b). Most dens occur close to a water source (Corbett 1995).

Distribution in the North East Region

There are five records of the Dingo within the North East, from State forest and adjacent private land. These are from two widely separated locations: Corryong and Tatong (Atlas of Victorian Wildlife). When Dingo and wild dog records are combined the number of records increases substantially. It is not known what proportion of these records are of pure Dingoes.

Disturbances and potentially threatening processes operating in the North East Region

The status of the Dingo populations in the North East is unclear partly due to the difficulties in distinguishing between Dingoes, feral Dogs and their hybrids (Menkhorst 1995b). This is reflected in the low number of specifically Dingo records in the Atlas of Victorian Wildlife. The extent of hybridisation and therefore its importance as a threatening process is not clear. Interbreeding with Dogs is considered a significant threat to the survival of pure Dingoes via dilution of the gene pool (Corbett 1995). Corbett (1995) believed that hybrids are on the rise although a morphological study concluded that little hybridisation has occurred (Jones 1990). Dingoes are declared vermin in Victoria due to their perceived role in killing stock. Snaring and baiting programs are conducted throughout the North East, mainly on the private land/State forest interface, with no distinction made between Dogs, Dingoes and their hybrids. Although a declared pest, the Dingo is considered an indigenous species within the Alpine National Park which affords it some protection in this area (DCE 1992a,b,c). Competition between Foxes and Dingoes may also be a threat to the species, due to the dietary overlap in prey items (Brown and Triggs 1990). In a study of ground-dwelling mammals in south eastern NSW, Catling and Burt (1995) found the Dingo to be positively correlated with high habitat complexity. Therefore, activities which simplify the vegetation structure such as fuel-reduction

burning, grazing and timber harvesting, may cause population declines (J. Seebeck pers. comm.). Widespread severe wildfire and fuel reduction burnings may result in death of individuals and result in the loss of den sites. Dams may result in a decrease in prey populations through habitat loss although this is considered a minor threat to the species (J. Seebeck pers. comm.).

Smoky Mouse

Pseudomys fumeus

RARITY

a) Geographic Range

- Classification of range size within North East Region: Small
- Distribution of records within North East Region: Scattered within a small area in the vicinity of Barry Mountains
- Proportion of North East Region recorded from (%): 4
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: Unknown
- Density: Unknown
- Home Range (ha): Unknown
- Source: Menkhorst and Seebeck (1981)

c) Habitat Specificity

- Classification of habitat specificity: Narrow
- Vegetation types inhabited in the Region: Habitat usually dry and rocky with an understorey of sclerophyllous shrubs. Recorded in the following EVCs: Subalpine Woodland, Montane Dry Woodland, Heathy Dry Forest, Herb-rich Foothill Forest, Wet Forest, Damp Forest
- Source: Menkhorst and Seebeck (1981), Jurskis *et al.* (1997), BioMap NRE (Nov 1997)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Declined, only a handful of records since 1980
- Source: Atlas of Victorian Wildlife

Population trend since discovery by Europeans

- Increased, stable or declined: Declined
- Source: Menkhorst and Seebeck (1981)

SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: High (especially if in suboptimal habitat)
- Source: Cockburn (1981b)

b) Dispersal

- Classification of powers of dispersal: Unknown, probably low
- Average distances dispersed: Unknown
- Maximum distance dispersed: Unknown
- Source: Cockburn (1981b)

LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Medium
- Age of sexual maturity (yrs): 1
- Mean clutch/litter/brood size: 3
- Mean no of clutches/litters/broods per year: 1-2
- Time of year young born/hatch: December-January
- Source: Cockburn (1981b), P. Menkhorst pers. comm.

b) Longevity

- Classification of lifespan: Short-lived
- Average lifespan (yrs): 1
- Maximum lifespan (yrs): 2
- Source: Cockburn (1981b)

c) Morphology

Adult body size

- Weight (g): 29-40 (37)
- Length (mm): 85-100 (90)
- Source: P. Menkhorst pers. comm.

d) Social organisation

- Colonial or non-colonial: Unknown, probably non-colonial
- Territoriality: Territorial
- Source: Cockburn (1981b), J. Seebeck pers. comm.

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Diet: Omnivore; fungi, seed, insects, flowers
- Source: Cockburn (1981a, b)

THREATS

1. **Clearing of Native Vegetation: Ranking (1)** P. Menkhorst pers. comm.
2. **Timber Harvesting: Ranking (2)** P. Menkhorst and J. Seebeck pers. comm.
3. **Fuel Reduction Burning: Ranking (3)** P. Menkhorst pers. comm.
4. **Firewood Collection: Ranking (1)** P. Menkhorst pers. comm.
5. **Unplanned Fire: Ranking (2)** J. Seebeck pers. comm.
6. **Introduced Species: Ranking (2)** P. Menkhorst pers. comm.
7. **Grazing/Trampling: Ranking (1)** P. Menkhorst and 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 (1) J. Seebeck pers. comm.
 13. Illegal Collecting/Harvesting: Ranking (0) P. Menkhorst and J. Seebeck pers. comm.
 14. Vandalism/Disturbance by Humans: Ranking (0) P. Menkhorst and J. Seebeck pers. comm.
 15. Dams/Impoundments: Ranking (1) P. Menkhorst and J. Seebeck pers. comm.

Current Management:

The Smoky Mouse is classified as "vulnerable" in Victoria (CNR 1995a) and has been recommended for listing under the Victorian *Flora and Fauna Guarantee Act 1988* (SAC 1996d). The Alpine National Park Management Plan (Wonnangatta-Moroka Unit) recommends research into distribution, ecology and threats, particularly fuel reduction burning, of this species. In addition there are a number of known Smoky Mouse sites included within the Special Protection Zone of the Alpine National Park (DCE 1992c).

Species characteristics:

The Smoky Mouse is an omnivorous heath specialist. It utilises the seasonal availability of underground fungi, various seeds and berries and insects, including Bogong Moths in rocky sub-alpine heaths during summer (Cockburn 1981a). Smoky Mouse habitat is usually dry and rocky with a sparse to medium-density understorey of sclerophyllous shrubs. These shrubs are an important food source and in particular include members from the families Epacridaceae and Fabaceae (Cockburn 1981a, Menkhorst and Seebeck 1981, Jurskis *et al.* 1997). There have been very few biological studies carried out on the Smoky Mouse. Most information is from a study carried out on a Grampians population (Cockburn 1981b), which was not located in recent surveys in the area (SAC 1996d).

Distribution in the North East Region

North East records for the Smoky Mouse are low in number and scattered around the vicinity of the Barry Mountains, including the Tea Tree Range, Mt Cobbler, Lake William Hovell to near Kevington. Most of these records are dated from the mid to late 1970s and late 1980s. Most recently the Smoky Mouse was found in 1995 at Mt Cobbler. Many records fall within the Alpine National Park (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the North East Region

Populations of the Smoky Mouse are small and isolated making them particularly vulnerable to disturbances. Loss of habitat due to clearing, fires and road and dam construction could result in local population fragmentation and declines. Much of the Smoky Mouse habitat is said to be fire-generated and the apparent reliance on such vegetation structure may make this species vulnerable to inappropriate fire regimes (SAC 1996d, P. Menkhorst pers. comm.). However, there is a lack of information on the species' ecological requirements, particularly in relation to fire (Lee 1995). The quality of the microhabitat may be an important factor in the life history of the Smoky Mouse. A study in the Grampians found that animals living in optimal microhabitat (supplying a year-round source of high quality food) had a lower mortality rate and higher breeding success than a population living in suboptimal microhabitat which showed a high level of aggression and a large sudden decline in numbers just prior to breeding (Cockburn 1981b). The Smoky Mouse seems prone to local population extinction with the species disappearing from many locations where previously recorded (SAC 1996d, J. Seebeck pers. comm.), which may be related to successional changes in vegetation altering the suitability of habitat (Menkhorst 1995c). Predation by Cats and Foxes is considered a significant threat to this species (Lee 1995, J. Seebeck pers. comm.).

Squirrel Glider

Petaurus norfolcensis

RARITY

a) Geographic Range

- Classification of range size within North East Region: Medium
- Distribution of records within North East Region: Scattered in a narrow band from Seymour to Chiltern Box-Ironbark National Park
- Proportion of North East Region recorded from (%): 7
- Source: 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)
- Classification of habitat specificity: Wide
- Vegetation types inhabited in the Region: Remnants amid farmland and along roadsides. 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 *Eucalyptus camaldulensis* typically containing mature *Acacia dealbata* or *A. mearnsii*. Recorded from the following EVCs: Box Ironbark Forest, Heathy Dry Forest, Alluvial Terraces Herb-rich Woodland/Heathy Dry Forest Mosaic

- Source: Menkhorst *et al.* (1988), BioMap NRE (Nov 1997)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Unknown, probably declined based on clearing of habitat
- Source: R. van der Ree pers. comm.

Population trend since discovery by Europeans

- Increased, 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.

b) Dispersal

- Classification of powers of dispersal: High
- Average distances dispersed: Females observed to disperse 3-5 km
- 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 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. comm.

c) Morphology

Adult body size

- Weight (g): 190-300 (230)
- Length (mm): 180-230 (210)
- Source: Suckling (1995)

d) Social organisation

- Colonial or non-colonial: Colonial
- Territoriality: No
- Source: Quin (1995), Traill (1995)

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Diet: Plant exudates, 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 (2) Weber (in prep.), P. Menkhorst pers. comm., R. van der Ree pers. comm.
3. Fuel Reduction Burning: Ranking (2) Menkhorst *et al.* (1988), R. van der Ree pers. comm.
4. Firewood Collection: Ranking (2) Alexander (1981), Menkhorst *et al.* (1988), R. van der Ree pers. comm.
5. Unplanned Fire: Ranking (2) Menkhorst *et al.* (1988), R. van der Ree pers. comm.
6. Introduced Species: Ranking (1) Alexander (1981), R. van der Ree pers. comm.
7. Grazing/Trampling: Ranking (2) Alexander (1981), Weber (in prep.), 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.* (1988), Weber (in prep.), R. van der Ree pers. comm.

10. Mining/Quarrying: Ranking (-)

11. Tree Dieback: Ranking (2) Weber (in prep.), P. Menkhorst pers. comm., R. van der Ree 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.

16. Other: Loss of Genetic Diversity (1) R. van der Ree pers. comm.

Current Management:

The Squirrel Glider is classified as "vulnerable" in Victoria (CNR 1995a) and is listed under the Victorian *Flora and Fauna Guarantee Act 1988*. An Action Statement is currently being prepared (Weber in prep.). A targeted assessment report on this species has been prepared to assist in the development of a Forest Management Plan and the North East RFA (Rowley 1997).

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 (Bennett 1993) and uses many hollows within each home range (Weber in prep.), requires large areas for foraging and is usually present in low densities (Menkhorst 1995d, Traill 1995). Squirrel Gliders are found in dry woodlands or open forests with mature or mixed aged stands of more than one eucalypt species (including box and ironbark species) or riparian open forests of River Red Gum *Eucalyptus camaldulensis*. These habitats need to be highly productive. An understory of mature *Acacia dealbata* provides an important food source (Menkhorst *et al.* 1988). Density and home range information is based on areas of prime habitat in Chiltern Box-Ironbark National Park, whereas populations in other areas are likely to exhibit lower densities and larger home ranges (P. Menkhorst pers. comm.)

Distribution in the North East Region

Records of the Squirrel Glider in the North East are scattered, ranging from around Seymour, and around the Hume Highway to Swanpool/Benalla area, around Edi and King Valley to Chiltern Box-Ironbark National Park and surrounds. The eastern-most record occurs at Kergunyah (Atlas of Victorian Wildlife). Squirrel Glider records are in roadside or streamside reserves, on private land and within Mt Pilot Multi-Purpose Park and Chiltern Box-Ironbark National Park.

Disturbances and potentially threatening processes operating in the North East Region

Squirrel Gliders are now largely restricted to isolated remnants of habitat amid cleared farmland and along roads or streams (Menkhorst 1995d) although 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.). Squirrel Gliders are under additional pressure from processes that result in loss of remaining habitat or habitat quality such as road maintenance and widening, fuel reduction burning, timber removal and grazing (Menkhorst *et al.* 1988). Although there are no records of this species within State forest boundaries, it has been found very close to areas of State forest containing suitable habitat including near Edi and the Barambogic Ranges. State forest and parts of the Mt Pilot Multi-purpose Park is subject to timber harvesting or firewood collection which can result in the loss of hollow bearing trees thereby degrading present and potential habitat. There are no records of this species within River Red Gum forest in the North East however this forest type is known to support populations in other parts of Victoria and is an example of potential habitat that is being degraded by activities such as firewood collection and camping (P. Menkhorst pers. comm.). Squirrel Glider populations inhabiting remnants could become genetically isolated if unable to interact leading to loss of genetic diversity (R. van der Ree pers. comm.). The use of pesticides may reduce the availability of insect prey (R. van der Ree pers. comm.). The fragmented nature of Squirrel Glider habitat and disjunct distribution of records in the North East means that this species is particularly vulnerable to further disturbances.

Mountain Pygmy-possum *Burramys parvus*

RARITY

a) Geographic Range

- Classification of range size within North East Region: Small
- Distribution of records within North East Region: Most records are concentrated in the Bogong High Plains and surrounding area. Other records are from Mt Buller area.
- Proportion of North East Region recorded from (%): approx. 2
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: 1500 individuals
- Density: Varies from below 4 females/ha to 72 females/ha depending on quality of habitat
- Home Range (ha): females 0.17 ha, males have a less defined "home range" and can range over 15 ha or more
- Source: Mansergh *et al.* (1991), Mansergh and Broome (1994), I. Mansergh pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Narrow
- Vegetation types inhabited in the Region: Sub-alpine heath dominated by Mountain Plum Pine (*Podocarpus lawrencei*). Restricted to boulderfields and related geomorphology. Recorded in the following EVCs: Sub-alpine Woodland, Treeless Sub-alpine Complex, Montane Dry Woodland
- Source: Gullan and Norris (1984), BioMap NRE (Nov 1997), I. Mansergh pers. comm.

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Unknown, probably stable, although marked annual variation in numbers and some habitat destruction has occurred
- Source: I. Mansergh pers. comm.

Population trend since discovery by Europeans

- Increased, stable or declined: Declined, based on known habitat removal
- Source: Mansergh and Broome (1994)

SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: High
- Source: I. Mansergh pers. comm.

b) Dispersal

- Classification of powers of dispersal: Low
- Average distances dispersed: Unknown
- Maximum distance dispersed: Known to move over 7 km in NSW
- Source: L. Broome pers. comm.

LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity (yrs): 1
- Mean clutch/litter/brood size: 2-4
- Mean no of clutches/litters/broods per year: 1
- Time of year young born/hatch: October-November
- Source: Mansergh and Scotts (1990)

b) Longevity

- Classification of lifespan: Long-lived
- Average lifespan (yrs): 5
- Maximum lifespan (yrs): males 4 years, females at least 12 years
- Source: Mansergh and Scotts (1990), I. Mansergh pers. comm.

c) Morphology

Adult body size

- Weight (g): males 30-54 (41), females 30-82 (42)
- Length (mm): males 110, females 111
- Source: Broome 1995

d) Social organisation

- Colonial or non-colonial: Nest communally
- Territoriality: Females permanently occupy breeding habitat, while males reside in non-breeding habitat and visit the females during the breeding season
- Source: Mansergh and Scotts (1990), Mansergh and Broome (1994)

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Diet: Omnivore; mainly Bogong moth as well as other insects, plants, seeds, fruits
- Source: Mansergh *et al.* (1990), Mansergh and Broome (1994)

THREATS

1. Clearing of Native Vegetation: Ranking (3) Mansergh *et al.* (1991), I. Mansergh pers. comm.
2. Timber Harvesting: Ranking (0) I. Mansergh pers. comm.
3. Fuel Reduction Burning: Ranking (0) I. Mansergh pers. comm.
4. Firewood Collection: Ranking (0) I. Mansergh pers. comm.
5. Unplanned Fire: Ranking (2) Mansergh *et al.* (1991), I. Mansergh pers. comm.
6. Introduced Species: Ranking (2) Mansergh *et al.* (1991), I. Mansergh pers. comm.
7. Grazing/Trampling: Ranking (2) I. Mansergh pers. comm.
8. Pest Control: Ranking (1) I. Mansergh pers. comm.
9. Road Construction and Maintenance: Ranking (2) I. Mansergh pers. comm.
10. Mining/Quarrying: Ranking (0) I. Mansergh pers. comm.
11. Tree Dieback: Ranking (0) I. Mansergh pers. comm.
12. Recreation: Ranking (3) Mansergh *et al.* (1991), I. Mansergh pers. comm.
13. Illegal Collecting/Harvesting: Ranking (0) I. Mansergh pers. comm.
14. Vandalism: Ranking (0) I. Mansergh pers. comm.
15. Dams/Impoundments: Ranking (0) I. Mansergh pers. comm.
16. Other: Climate Change: Ranking (3) Bennett *et al.* (1991)

Current Management:

The Mountain Pygmy-possum is classified as "vulnerable" in Victoria (CNR 1995a) and is listed under the Victorian *Flora and Fauna Guarantee Act* 1988. It is also listed as vulnerable under the Commonwealth *Endangered Species Act* 1992. An Action Statement has been prepared (Mansergh *et al.* 1991). Intended management actions relevant to the North East include predator control and ongoing input into the strategic planning for ski resorts.

Species characteristics:

The Mountain Pygmy-possum is unique among Australian mammals in that it is restricted to the alpine-subalpine regions above 1400m (Mansergh *et al.* 1991). It is unable to tolerate even moderate temperatures, eg. 30°C for two hours (Mansergh and Broome 1994). This species is omnivorous, eating invertebrates, seeds, fruit and other plant parts with its main dietary item being the Bogong moth, a summer migrant from New South Wales and Queensland (Mansergh *et al.* 1990). Hibernation occurs from May to September which involves long periods of torpor interspersed with short periods of activity (Mansergh and Broome 1994). The Mountain Pygmy-possum is restricted to habitat consisting of rock scree or boulderfields supporting characteristic communities of sub-alpine heath dominated by Mountain Plum Pine (*Podocarpus lawrencei*) (Gullan and Norris 1984). This habitat type is rare and disjunct in the Victorian Alps with an estimated 3 km² of suitable habitat available (Gullan and Norris 1984, Mansergh *et al.* 1991, I. Mansergh pers. comm.).

Distribution in the North East Region

Most of the known Mountain Pygmy-possum locations in the North East are in the vicinity of the Bogong High Plains. There are three isolated populations: between Mt Loch and Mt Higginbotham; Mt Bogong; and Bogong High Plains (Mansergh *et al.* 1991). The majority of the area used by these populations are within the Alpine National Park (Bogong Unit). The Mt Loch-Mt Higginbotham population is the largest and some 30% of its range is within the Mt Hotham Alpine Resort (Mansergh *et al.* 1991). There are also recent records (1996) from Mt Buller (Atlas of Victorian Wildlife). This latter population appears to be genetically distinct from all others and current preliminary estimates suggest an adult population of about 300 (I. Mansergh pers. comm.).

Disturbances and potentially threatening processes operating in the North East Region

The main threat to the Mountain Pygmy-possum is habitat destruction and fragmentation from human activities associated with skiing and alpine resort activities (Mansergh *et al.* 1991). The Mountain Plum Pine is very slow growing (McDougall 1982) and fire sensitive and thus vulnerable to any disturbances (Mansergh *et al.* 1991). Development of ski resorts, such as ski runs and road and track works can cause total habitat destruction, weed invasion, erosion, soil deposition and interruption of the animal's breeding cycle and hibernation (Mansergh and Scotts 1989, Mansergh *et al.* 1991). Foxes are known to prey on Mountain Pygmy-possums (Mansergh and Marks 1993) and are considered a moderate threat (Mansergh *et al.* 1991). Pest control could be a threat if targeting house mice (I. Mansergh pers. comm.). The bioclimate inhabited by the Mountain Pygmy-possum was predicted to disappear under a 1°C rise in temperature as a result of the enhanced greenhouse effect; this is a major threat to the persistence of the species (Bennett *et al.* 1991).

Long-footed Potoroo *Potorous longipes*

RARITY

a) Geographic Range

- Classification of range size within North East Region: Small
- Distribution of records within North East Region: Mainly concentrated around the Barry Mountains, also near Harrierville
- Proportion of North East Region recorded from (%): 4
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: Unknown
- Density: Probably low
- Home Range (ha): 14-23
- Source: Thomas *et al.* (1994), Green *et al.* (in prep.), N. Jones pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Narrow
- Vegetation types inhabited in the Region: Prefers sheltered sites with moist soils and a dense understorey. Recorded from the following EVCs: Riparian Forest, Damp forest, Montane Damp Forest, Wet Forest, Montane Dry Woodland, Shrubby Dry Forest, Herb-rich Foothill Forest
- Source: Scotts and Seebeck (1989), Jones and Johnson (1997), BioMap NRE (Nov 1997)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Unknown
- Source: N. Jones pers. comm.

Population trend since discovery by Europeans

- Increased, stable or declined: Unknown
- Source: N. Jones pers. comm.

SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: Unknown, probably low
- Source: Scotts and Seebeck (1989)

b) Dispersal

- Classification of powers of dispersal: Low, only males disperse to establish new territories
- Average distances dispersed: Unknown, one male recorded to disperse 3 km away
- Maximum distance dispersed: Unknown
- Source: Green and Mitchell (in press)

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: 1-2
- Time of year young born/hatch: Through-out year with a peak in July-Sept
- Source: Scotts and Seebeck (1989), Seebeck (1992), Green and Mitchell (in press)

b) Longevity

- Classification of lifespan: Long-lived
- Average lifespan (yrs): Unknown, possibly 5 based on similar species *P. tridactylus*
- Maximum lifespan (yrs): Unknown, in captivity have lived for over 14 years

- Source: J. Seebeck pers. comm., D. McDonald pers. comm. in Nunan *et al.* (in prep.)

c) Morphology

Adult body size

- Weight (g): males 2000-2200 (2100), females 1600-1800 (1700)
- Length (mm): 380-415 (400)
- Source: Seebeck (1995b)

d) Social organisation

- Colonial or non-colonial: Non-colonial, solitary
- Territoriality: Territorial monogamy: a monogamous pair share a common territory but only nest together to breed
- Source: Scotts and Seebeck (1989), Seebeck (1995a)

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Diet: Primarily mycophagous (fungi feeding), also a small amount of plant material and invertebrates
- Source: Scotts and Seebeck (1989)

THREATS

1. **Clearing of Native Vegetation: Ranking (1)** Thomas *et al.* (1994), J. Seebeck pers. comm.

2. **Timber Harvesting: Ranking (3)** Saxon *et al.* (1994), Nunan *et al.* (in prep.), J. Seebeck pers. comm.

3. **Fuel Reduction Burning: Ranking (2)** Catling (1991), Thomas *et al.* (1994), J. Seebeck pers. comm.

4. **Firewood Collection: Ranking (-)**

5. **Unplanned Fire: Ranking (2)** Scotts and Seebeck (1989), J. Seebeck pers. comm.

6. **Introduced Species: Ranking (2)** Saxon *et al.* (1994), Scotts and Seebeck (1989), J. Seebeck pers. comm.

7. **Grazing/Trampling: Ranking (1)** J. Seebeck pers. comm.

8. **Pest Control: Ranking (1)** J. Seebeck pers. comm.

9. **Road Construction and Maintenance: Ranking (2)** Thomas *et al.* (1994), J. Seebeck pers. comm.

10. **Mining/Quarrying: Ranking (-)**

11. **Tree Dieback: Ranking (-)**

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 (1)** J. Seebeck pers. comm.

Current Management:

The Long-footed Potoroo is classified as "endangered" in Victoria (CNR 1995a) and is listed under the Victorian *Flora and Fauna Guarantee Act* 1988. It is also listed as endangered under the Commonwealth *Endangered Species Act* 1992. An Action Statement (Thomas *et al.* 1994) and Management Strategy (Saxon *et al.* 1994) have been prepared and a Recovery Plan is currently being finalised (Nunan *et al.* in prep.). At present there is a moratorium on timber harvesting, new roading and other new development activities at all Long-footed Potoroo sites within the North East. Fuel-reduction burning is also strictly limited. These prescriptions are interim, pending research on distribution and habitat disturbance (Nunan *et al.* in prep.). Such research is being conducted as part of the RFA process.

Species characteristics:

The Long-footed Potoroo is a ground-dwelling species that appears to be heavily mycophagous (fungi-feeding), feeding on the sporocarps (fruiting bodies) of hypogaeal (underground fruiting) and sub-hypogaeal fungi. A small amount of invertebrates and plant material are also eaten (Scotts and Seebeck 1989). Potoroos characteristically forage by digging conical pits in litter and surface soil with their forefeet (Seebeck 1995a). The Long-footed Potoroo occurs in a variety of vegetation classes but seems to prefer sheltered sites with moist soils (which appear to be favourable for fungi growth) and a dense understorey interspersed with bare patches (Scotts and Seebeck 1989, Saxon *et al.* 1994, Jones and Johnson 1997).

Distribution in the North East Region

The Long-footed Potoroo was discovered in the North East in 1995. Since then, surveys have recorded animals in areas mainly concentrated around the Barry Mountains, specifically West Buffalo, East Riley and Tea Tree Ranges. There are also records near Harrierville (Pascoe 1995, Jones and Johnson 1997, Atlas of Victorian Wildlife). It is estimated that the range of the population in this area is approximately 51,000 ha, about 60% of which falls within the Alpine National Park, the remainder being in State forest (Jones and Johnson 1997). Previously the Long-footed Potoroo had only been recorded in East Gippsland and south-eastern New South Wales.

Disturbances and potentially threatening processes operating in the North East Region

The Long-footed Potoroo has a limited distribution in the North East and any loss of habitat due to clearing, timber harvesting, roading, fires and dam construction could result in fragmentation and declines of sub-populations (Saxon *et al.* 1994, Thomas *et al.* 1994). Dense understorey appears to be important shelter sites for the Long-footed Potoroo, particularly as protection from the Fox and wild Dog (Scotts and Seebeck 1989). A reduction in this shelter may increase predation on this species, which is regarded as a major threat (J. Seebeck pers. comm.). Compaction and disturbance of

soil and reduction of litter as a result of timber harvesting, burning and grazing may also affect hypogeal fungi availability (Thomas *et al.* 1994); further research is required in regard to this. Pest control is considered a minor threat as Long-footed Potoroos may be caught in traps meant for pest animals and subsequently destroyed (J. Seebeck pers. comm.).

Yellow-bellied Glider
Petaurus australis

RARITY

a) Geographic Range

- Classification of range size within North East Region: Large
- Distribution of records within North East Region: Patchy distribution concentrated along the south-eastern border of the Region
- Proportion of North East Region recorded from (%): 17
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: Unknown
- 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)

c) Habitat Specificity

- Classification of habitat specificity: Wide
- Vegetation types inhabited in the Region: Prefer wet mixed species eucalypt forest with a predominance of smooth-barked trees.
- Source: Kavanagh (1987), Henry (1995)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Unknown, there is a lack of research on this species in the North East. Recent surveys in the area recorded individuals from a number of previously unidentified sites.
- Source: Atlas of Victorian Wildlife

Population trend since discovery by Europeans

- Increased, stable or declined: Most likely declined due to widespread loss of habitat resulting from clearing for agriculture and past forest management practices.
- Source: Newman (1961), Recher *et al.* (1975), Norris *et al.* (1979)

SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: Low
- Source: Goldingay and Kavanagh (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 exclusive home ranges
- 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), J. Seebeck pers. comm.
- 2. Timber Harvesting: Ranking (3)** Goldingay and Kavanagh (1991), Henry (1995), J. Seebeck pers. comm.
- 3. Fuel Reduction Burning: Ranking (1)** J. Seebeck pers. comm.
- 4. Firewood Collection: Ranking (1)** J. Seebeck pers. comm.
- 5. Unplanned Fire: Ranking (2)** Goldingay and Kavanagh (1991), J. Seebeck pers. comm.
- 6. Introduced Species: Ranking (1)** J. Seebeck pers. comm.

7. Grazing/Trampling: Ranking (1) J. Seebeck pers. comm.

8. Pest Control: Ranking (0)

9. Road Construction and Maintenance: Ranking (1) J. Seebeck pers. comm.

10. Mining/Quarrying: Ranking (1) J. Seebeck pers. comm.

11. Tree Dieback: Ranking (-) 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 (1) J. Seebeck pers. comm.

Current Management:

The Yellow-bellied Glider is not considered threatened in Victoria (CNR 1995a). There are no specific management prescriptions for this species in the North East.

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 (Kavanagh 1987). This species uses a wide variety of eucalypt species for foraging, utilising different feeding substrates (such as shedding bark) 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). Preferred species include Messmate (*Eucalyptus obliqua*), Manna Gum (*E. viminalis*), Apple Box (*E. bridgesiana*) and Mountain Gum (*E. dalrympleana*). Large hollows are used as dens and many are used within a home area (Craig 1985). Yellow-bellied Gliders maintain large exclusive family home ranges (30-65 ha) (Goldingay and Kavanagh 1991).

Distribution in the North East Region

Yellow-bellied Glider records in the North East are patchily spread mainly along the south-eastern border of the Region. This is the northern edge of the distribution of this species in Victoria. Locations of records include Howqua, Strathbogie Ranges, Bogong High Plains, Cravensville and Corryong (Atlas of Victorian Wildlife). A number of records are from the Alpine National Park.

Disturbances and potentially threatening processes operating in the North East Region

The major threat to the Yellow-bellied Glider in the North East is habitat loss and alteration which can occur through clearing and timber harvesting and associated habitat fragmentation (Goldingay and Kavanagh 1991, J. Seebeck pers. comm.); both these processes are known to result in population declines (Henry 1995). Following such a disturbance to their habitat, Yellow-bellied Gliders may be impacted by a loss of critical food resources and den trees, a rise in the time spent foraging and an increase in the exposure to predation (Goldingay and Kavanagh 1991). Timber harvesting converts older age classes of forest to young regrowth stands resulting in loss of foraging habitat and den sites. Other processes that can degrade habitat include fuel reduction burning, wildfire and grazing (Goldingay and Kavanagh 1991, J. Seebeck pers. comm.). This species requires large hollows (which only occur in large old trees), large foraging ranges and habitat consisting of a wide mixture of eucalypt species; long-term survival depends on maintaining the integrity of large areas of forest (Russell 1995). Fragmentation of habitat is an important threat and can be caused by the clearing of vegetation, timber harvesting and the construction of roads, mines/quarries and dams. 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 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 North East.

Yellow-footed Antechinus
Antechinus flavipes

RARITY

a) Geographic Range

- Classification of range size within North East Region: Medium
- Distribution of records within North East Region: Mainly from areas around and between Benalla, Beechworth and Rutherglen
- Proportion of North East Region recorded from (%): 8
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: Unknown
- Density: Probably low
- Home Range (ha): Unknown
- Source: Dickmann (1980), Menkhurst (1995e)

c) Habitat Specificity

- Classification of habitat specificity: Wide
- Vegetation types inhabited in the Region: Dry forest and woodlands
- Source: Menkhorst (1995e)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Declined
- Source: J. Seebeck pers. comm.

Population trend since discovery by Europeans

- Increased, stable or declined: Declined
- Source: J. Seebeck pers. comm.

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 (1995e)

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 (1995e)

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, nectivore
- Source: Smith (1984), Fleay (1949)

THREATS

1. **Clearing of Native Vegetation: Ranking (2)** J. Seebeck pers. comm.
2. **Timber Harvesting: Ranking (2)** Menkhorst (1995e), J. Seebeck pers. comm.
3. **Fuel Reduction Burning: Ranking (2)** Catling (1991), J. Seebeck pers. comm.
4. **Firewood Collection: Ranking (2)** Menkhorst (1995e), J. Seebeck pers. comm.
5. **Unplanned Fire: Ranking (2)** J. Seebeck pers. comm.
6. **Introduced Species: Ranking (2)** J. Seebeck pers. comm.
7. **Grazing/Trampling: Ranking (2)** Menkhorst (1995e), J. Seebeck pers. comm.
8. **Pest Control: Ranking (1)** J. Seebeck pers. comm.
9. **Road Construction and Maintenance: Ranking (-)**
10. **Mining/Quarrying: Ranking (1)** J. Seebeck pers. comm.
11. **Tree Dieback: Ranking (-)**
12. **Recreation: Ranking (1)** 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 (1)** J. Seebeck pers. comm.

Current Management:

The Yellow-footed Antechinus is not considered threatened in Victoria (CNR 1995a). There are no current management prescriptions for this species in the North East.

Species characteristics:

The Yellow-footed Antechinus is found in dry forest and woodland communities including River Red Gum (*E. camaldulensis*) and box-ironbark species. Specific habitat requirements are not known (Menkhorst 1995e). 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 crevices (Menkhorst 1995e). Its diet consists of insects, nectar and small vertebrates including lizards and mice (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 1995e). Continued existence of populations is therefore dependent on successful breeding each year.

Distribution in the North East Region

In the North East the Yellow-footed Antechinus has been recorded mainly between Rutherglen and Beechworth, including Chiltern Box-Ironbark National Park, and from areas near Benalla. There are old (1973) isolated records from

Burrowa-Pine Mountain National Park in the north-east of the Region (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the North East Region

The forests and woodlands which the Yellow-footed Antechinus inhabits have been subjected to widespread clearing. Remaining habitat is subject to practices such as timber harvesting, firewood collection, mining/quarrying and stock grazing (Menkhorst 1995e) which may result in habitat modification. The loss of hollows is of particular concern as older trees are replaced by coppiced stands. Inappropriate fire regimes can reduce and eventually eliminate undergrowth, degrading foraging habitat and potentially increase the risk of predation by Foxes and Cats (Catling 1991). Predation by introduced carnivores on this species is considered a significant threat (J. Seebeck pers. comm.). Wildfire has the potential to eliminate isolated populations and can significantly alter habitat. The life history strategy of the Yellow-footed Antechinus makes this species vulnerable to local extinction and so exacerbates the effects of any disturbances, especially if they occur during breeding.

Long-nosed Bandicoot

Perameles nasuta

RARITY

a) Geographic Range

- Classification of range size within North East Region: Large
- Distribution of records within North East Region: Widespread throughout Region
- Proportion of North East Region recorded from (%): 23.5
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Medium
- Population Estimate: Unknown
- Density: Probably low
- Home Range (ha): Unknown
- Source: Menkhorst and Seebeck (1995), J. Seebeck pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Wide
- Vegetation types inhabited in the Region: Wet open-forest, heathy woodlands, grasslands
- Source: Menkhorst and Seebeck (1995)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Unknown, most likely some decline due to habitat reduction
- Source: J. Seebeck pers. comm.

Population trend since discovery by Europeans

- Increased, stable or declined: Unknown, most likely some decline due to habitat reduction
- 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: Unknown
- Average distances dispersed: Unknown
- Maximum distance dispersed: Unknown
- Source: J. Seebeck pers. comm.

LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: High
- Age of sexual maturity (yrs): Males 5 months, Females 4 months
- Mean clutch/litter/brood size: 1-4
- Mean no of clutches/litters/broods per year: Potentially several
- Time of year young born/hatch: all year/ pouch young recorded during September - December
- Source: Lyne (1964), Menkhorst and Seebeck (1995)

b) Longevity

- Classification of lifespan: Unknown, probably short-lived
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): Unknown
- Source: Stodart (1977)

c) Morphology

Adult body size

- Weight (g): 500-1900
- Length (mm): 310-425
- Source: Stodart (1995)

d) Social organisation

- Colonial or non-colonial: Solitary
- Territoriality: Adults aggressively territorial
- Source: Menkhorst and Seebeck (1995)

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Diet: Omnivore
- Source: Stodart (1977), Claridge (1993)

THREATS

1. **Clearing of Native Vegetation: Ranking (2)** J. Seebeck pers. comm.
2. **Timber Harvesting: Ranking (2)** J. Seebeck pers. comm.

3. **Fuel Reduction Burning: Ranking (2)** Catling (1991), J. Seebeck pers. comm.
4. **Firewood Collection: Ranking (0)** J. Seebeck pers. comm.
5. **Unplanned Fire: Ranking (2)** J. Seebeck pers. comm.
6. **Introduced Species: Ranking (2)** Claridge *et al.* (1991), J. Seebeck pers. comm.
7. **Grazing/Trampling: Ranking (1)** J. Seebeck pers. comm.
8. **Pest Control: Ranking (1)** McIlroy (1983), J. Seebeck pers. comm.
9. **Road Construction and Maintenance: Ranking (-)**
10. **Mining/Quarrying: Ranking (1)** J. Seebeck pers. comm.
11. **Tree Dieback: Ranking (-)**
12. **Recreation: Ranking (1)** 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 (1)** J. Seebeck pers. comm.

Current Management:

The Long-nosed Bandicoot is not considered threatened in Victoria (CNR 1995a). There are no current management prescriptions for this species in the North East.

Species characteristics:

The Long-nosed Bandicoot is widely distributed in the eastern half of Victoria. There are also isolated populations in the Otway Ranges and westwards to the Naringal district (Menkhorst and Seebeck 1995, Atlas of Victorian Wildlife). This species is usually found in areas associated with watercourses or where soils are frequently moist (Opie *et al.* 1990). Habitat includes wet open-forest with dense riparian vegetation (Menkhorst *et al.* 1984). The Long-nosed Bandicoot forages among the ground litter and digs conical holes searching for invertebrates, fungi (mostly underground-fruited mycorrhizal types), seeds and plant material (Claridge 1993, Menkhorst and Seebeck 1995). It also nests on the ground, placing dry grass and plant material in well camouflaged depressions (Menkhorst and Seebeck 1995). A number of different nests may be used over several nights (C. Dickmann pers. comm. in Menkhorst and Seebeck 1995). A high reproductive output is offset by high juvenile mortality (Stodart 1977). The Long-nosed Bandicoot is a difficult animal to study in the wild and consequently its ecology is poorly known (J. Seebeck pers. comm.).

Distribution in the North East Region

Long-nosed Bandicoot records are scattered throughout most of the North East including sites in the Alpine National Park. Locations of records include the Strathbogie and Tolmie Ranges, Edi, Mt Stirling, Bogong, Chiltern, Dartmouth, and Corryong (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the North East Region

The Long-nosed Bandicoot is very sensitive to disturbance (J. Seebeck pers. comm.). This species is most threatened by processes relating to alteration of habitat, especially those that simplify the understorey and disturb the ground litter layer. Clearing, quarrying and dam construction involves direct loss of sheltering, nesting and foraging sites. Inappropriate fire regimes and wildfire can reduce and eliminate understorey resulting in loss of habitat and may lead to increased predation (Catling 1991). Recent research suggests that the effect of fire on hypogean (underground-fruited) fungi availability may be detrimental (Thomas *et al.* 1994). However there has been limited research in this area; further investigation is required. Predation is considered a significant threat; high incidences of predator scats with Long-nosed Bandicoot have been reported (Claridge *et al.* 1991, J. Seebeck pers. comm.). Pest control is potentially a threat with the risk of this species getting caught in traps meant for Foxes and wild Dogs (J. Seebeck pers. comm.). Non-target poisoning is also possible via ingestion of 1080 poison used to control Rabbits, Foxes and wild Dogs (McIlroy 1983).

Common Bent-wing Bat

Miniopterus schreibersii blepotis

RARITY

a) Geographic Range

- Classification of range size within Region: Small
- Distribution of records within Region: Small number of records from four different areas.
- Proportion of Region recorded from (%): Approximately 2
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: Probably greater than 1000 animals
- Density: Unknown
- Home Range (ha): Unknown
- Source: L. Lumsden pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Narrow; depends on mine shafts for roosting.
- Vegetation types inhabited in the Region: EVCs recorded from in the study area include: Herb-rich Foothill Forest, Montane Dry Woodland, Grassy Dry Forest, Heathy Dry Forest and Damp Forest

- Source: NRE BioMap (November 1997), L. Lumsden pers. comm.

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Possibly declined due to destruction, closing and natural collapse of mine shafts within the Region.

- Source: L. Lumsden pers. comm.

Population trend since discovery by Europeans

- Increased, stable or declined: Increased, the construction of mine shafts has resulted in an increase in suitable roost sites.

- Source: L. Lumsden 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 and probably travel a similar distance to the North East.
- Maximum distance dispersed: Hundreds of kilometres.
- 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 (1966a)

e) Other

- Nomadic, migratory, sedentary: Adult females are migratory, migrate seasonally to Nargun's maternity cave in East Gippsland, 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)** Hamilton-Smith (1979), L. Lumsden pers. comm.

2. **Timber harvesting: Ranking (-)** Law (1996), L. Lumsden pers. comm.

3. **Fuel Reduction Burning: Ranking (-)**

4. **Firewood Collection: Ranking (-)**

5. **Unplanned Fire: Ranking (-)**

6. **Introduced Species: Ranking (2)** Dwyer (1964), Dwyer (1966b), Hall (1982), 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 (1995), L. Lumsden pers. comm.

9. **Road Construction and Maintenance: Ranking (0)** L. Lumsden pers. comm.

10. **Mining/Quarrying: Ranking (2)** Lumsden *et al.* (1991), L. Lumsden pers. comm.

11. **Tree Dieback: Ranking (-)**

12. **Recreation: Ranking (0)** L. Lumsden pers. comm.

13. **Illegal Collection/Harvesting: Ranking (0)**

14. **Vandalism/Disturbance by Humans: Ranking (3)** Seebeck and Hamilton-Smith (1967), Hall (1982), Lumsden *et al.* (1991), Menkhorst and Lumsden (1995), L. Lumsden pers. comm.

15. **Dams/Impoundments: Ranking (0)**

16. **Other: Collapse of mine shafts and overgrown entrances: Ranking (3)** L. Lumsden pers. comm.

Current Management:

The Common Bent-wing Bat is a restricted colonial roosting and breeding species (CNR 1995a), and is listed under the Victorian *Flora and Fauna Guarantee Act* 1988. There are no threat ameliorating management prescriptions for this species in the North East Region.

Species characteristics:

The Common Bent-wing Bat is a fast flying, highly mobile aerial insectivore. Female Common 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 Warrnambool (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 1995). 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, Common 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 North East Region:

There are currently only limited records of the Common Bent-wing Bat from the North East Region. The species has been recorded from the Strathbogie Ranges, from State forest near Jamieson and Kevington, from the Alpine National Park (Bogong Unit), and from State forest near Granite Flat and Mitta Mitta North where a roost site has been found in a disused mine. Disused mines are scattered throughout the Region, and although no other roost sites have been located, there are likely to be more (L. Lumsden pers. comm.).

Disturbances and potentially threatening processes operating in the North East Region:

Common Bent-wing Bats go into torpor over winter. The species is particularly vulnerable to disturbances which rouse them during torpor; human disturbance of 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 mine shaft entrances near areas of human habitation, can also cause losses. Collapse of mine shafts, 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 1995) 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 composition and abundance of insects. The effects of timber harvesting and fuel reduction burning on this species and its prey, are unknown (Law 1996, L. Lumsden pers. comm.).

Large-footed Myotis *Myotis macropus*

RARITY

a) Geographic Range

- Classification of range size within Region: Small
- Distribution of records within Region: Three widely separated records.
- Proportion of Region recorded from (%): <1
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: Unknown; probably less than 1000 individuals
- Density: Unknown
- Home Range (ha): Unknown; individuals are known to regularly forage 10-15 km from roosts.
- Source: L. Lumsden pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Narrow; always associated with permanent water bodies.
- Vegetation types inhabited in the Region: Generally recorded from a wide range of vegetation communities associated with water; has been recorded from the Riparian Forest EVC in the North East Region.
- Source: L. Lumsden pers. comm., NRE BioMap (Nov 1997)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Unknown
- Source: L. Lumsden pers. comm.

Population trend since discovery by Europeans

- Increased, stable or declined: Unknown
- 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: 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 2
- 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 unsynchronous birthing season or if there are two distinct periods when births occur.

- Source: Lumsden and Menkhorst (1995a), 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

Adult body size

- Weight (g): 10-14
- Length (mm): 52-56 (54)
- Source: Richards (1995), L. Lumsden pers. comm.

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
- Diet: Insectivore, Piscivore
- 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 (-)**
4. **Firewood Collection: Ranking (-)**
5. **Unplanned Fire: Ranking (-)** Campbell and Doeg (1989)
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 (2)** L. Lumsden pers. comm.
10. **Mining/Quarrying: Ranking (2)** L. Lumsden pers. comm.
11. **Tree Dieback: Ranking (-)**
12. **Recreation: Ranking (1)** L. Lumsden pers. comm.
13. **Illegal Collection/Harvesting: Ranking (0)** L. Lumsden pers. comm.
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:

The Large-footed Myotis is classified as "rare" in Victoria (CNR 1995a). Under the Code of Forest Practices for Timber Production (NRE 1997) 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. 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 Large-footed Myotis.

Species characteristics:

The Large-footed Myotis *Myotis macropus*, formerly known as *Myotis adversus macropus*, is a newly recognised species (Kitchener *et al.* 1995). 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 1995a). The Large-footed Myotis feeds close to 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 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 1995a).

Distribution in the North East Region:

There are currently three records of the Large-footed Myotis in the North East Region; near Bandiana on the Murray River (1992), near Kevington on the Goulburn River (1997) and from the vicinity of Mount Pilot (1997) (Atlas of Victorian Wildlife). The Large-footed Myotis is usually only trapped when traps or mist nets are placed directly over water (Lumsden and Menkhorst 1995a). A broad-scale survey of the Region is currently being undertaken. However, as not all sites are located near water (G. Newell pers. comm.), its presence may be underestimated by this survey. Targeted surveys are required to ascertain its distribution and status within the North East Region.

Disturbances and potentially threatening processes operating within the North East Region:

Disturbances which affect water quality may secondarily impact on the Large-footed 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 that may occur

as a result of poor road construction and maintenance, and timber harvesting within stream catchments, may affect the species' prey. Although the relative dependence of the Large-footed Myotis on roost sites in caves versus tree hollows is unknown (Lumsden and Menkhorst 1995a), timber harvesting may also have some impact on the species through loss of roosting habitat. Grazing of streamside reserves may impact on the Large-footed Myotis in the long-term by limiting habitat regeneration and in the short-term 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 through loss of prey (L. Lumsden pers. comm.).

Eastern Horseshoe Bat *Rhinolophus megaphyllus*

RARITY

a) Geographic Range

- Classification of range size within Region: Small
- Distribution of records within Region: Several records within approximately 25 km of each other.
- Proportion of Region occupied (%): <1
- Source: Atlas of Victorian Wildlife, L. Lumsden pers. comm.

b) Abundance

- Classification of abundance: Low
- Population Estimate: Less than 500 individuals
- Density: Unknown
- Home Range (ha): Unknown
- Source: L. Lumsden pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Narrow; depends on given roosting requirements (dependence on mine shafts)
- Vegetation types inhabited in the Region: Shrubby Dry Forest and Herb-rich Foothill Forest EVCS
- Source: NRE BioMap (November 1997)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Unknown
- Source: L. Lumsden pers. comm.

Population trend since discovery by Europeans

- Increased, stable or declined: Increased; probably did not occur in the Region prior to the construction of mine shafts.
- Source: Kerle (1979), 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: Low, individuals rarely move far from their roosts however the species is thought to be capable of long distance movements.
- Average distances dispersed: Unknown
- Maximum distance dispersed: Longest recorded movement of a banded individual is 22 km
- Source: Lumsden and Menkhorst (1995b), Dwyer (1966c)

LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity (yrs): 2-3 females, 2 males
- Mean clutch/litter/brood size: 1
- Mean no of clutches/litters/broods per year: 1
- Time of year young born/hatch: November, December
- Source: Purchase and Hiscox (1960), Dwyer (1966c), Young (1975)

b) Longevity

- Classification of lifespan: Long-lived
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): Unknown, closely related European species of the same genus can live up to 30 years.
- Source: L. Lumsden pers. comm.

c) Morphology

Adult body size

- Weight (g): 7-14
- Length (mm): 42-58
- Source: Pavey and Young (1995)

d) Social organisation

- Colonial or non-colonial: Colonial
- Territoriality: Unknown, but unlikely
- Source: Dwyer (1966c), L. Lumsden pers. comm.

e) Other

- Nomadic, migratory, sedentary: Probably sedentary
- Diet: Insectivore
- Source: Vestjens and Hall (1977), Lumsden and Menkhorst (1995b), L. Lumsden pers. comm.

THREATS

1. Clearing of Native Vegetation: Ranking (-)
2. Timber harvesting: Ranking (-) Law (1996), L. Lumsden pers. comm.
3. Fuel Reduction Burning: Ranking (-)
4. Firewood Collection: Ranking (-) L. Lumsden pers. comm.
5. Unplanned Fire: Ranking (-)
6. Introduced Species: Ranking (2) L. Lumsden pers. comm.
7. Grazing/Trampling: Ranking (0) L. Lumsden pers. comm.

8. Pest Control: Ranking (2) Dunsmore *et al.* (1974), L. Lumsden pers. comm.

9. Road Construction and Maintenance: Ranking (0) L. Lumsden pers. comm.

10. Mining/Quarrying: Ranking (2) Lumsden *et al.* (1991), L. Lumsden pers. comm.

11. Tree Dieback: Ranking (-)

12. Recreation: Ranking (0) L. Lumsden pers. comm.

13. Illegal Collection/Harvesting: Ranking (0) L. Lumsden pers. comm.

14. Vandalism/Disturbance by Humans: Ranking (3) Lumsden and Menkhorst (1995b), L. Lumsden pers. comm.

15. Dams/Impoundments: Ranking (0) L. Lumsden pers. comm.

16. Other: Mine shaft collapse and entrances overgrown. Ranking (3) L. Lumsden pers. comm.

Current Management:

The Eastern Horseshoe Bat is classified as a "Restricted Colonial or Roosting Species" (CNR 1995a) and is listed under the Victorian *Flora and Fauna Guarantee Act 1988*. No Action Statement has been prepared for this species and there are currently no threat ameliorating management prescriptions within the North East Region. A broad-scale survey of the bat fauna of the Region has been undertaken.

Species characteristics:

Like the Common Bent-wing Bat, the Eastern Horseshoe Bat is dependent on caves and mine shafts for roosting and breeding. The species selects warm and humid roost sites which are usually in enclosed chambers with little air circulation (Hall *et al.* 1975). Only three maternity sites have been located, all are in caves: near Nowa Nowa, Murrindal and on the Snowy River near Buchan (Lumsden and Menkhorst 1995b). Recent records of lactating and heavily pregnant females from the Strathbogie Ranges indicate the presence of a maternity site, most likely in a mine in the area, which is yet to be located (L. Lumsden pers. comm.). The majority of records of the species are from East Gippsland and it is likely that the construction of mines has allowed a western range expansion (L. Lumsden pers. comm.). Eastern Horseshoe Bats mainly forage for relatively large, slow-flying insects amongst low vegetation, often close to the ground (Lumsden and Menkhorst 1995b).

Distribution within the North East Region:

There are currently three records from two localities of the Eastern Horseshoe Bat within the North East Region; one is from State forest in the Strathbogie Ranges and the other is from State forest near Wrightley (Atlas of Victorian Wildlife). Both these records are approximately 50 kms from the nearest known roost site in a disused mine near Eildon in the Central Highlands. Eastern Horseshoe Bats are sedentary and rarely move far from their roosts and it is likely there are yet to be discovered roosts in the North East Region. Recent surveys within the Region have recorded the species from a further six sites, all within the Strathbogie Ranges. Some of these records were of lactating and heavily pregnant females, indicating the presence of a maternity site in the area (L. Lumsden pers. comm.).

Disturbances and potentially threatening processes operating within the North East Region:

Although no Eastern Horseshoe Bat roost sites have been located to date, potential threats relate mostly to disturbance at the roost and include human disturbance, loss of habitat through mine shaft collapse, overgrown entrances and reworking of old mines, and predation by feral animals, particularly Cats (Lumsden *et al.* 1991, L. Lumsden pers. comm.). Poisoning through accumulation of pesticides (Dunsmore *et al.* 1974) may adversely impact on the species (L. Lumsden pers. comm.). The Eastern Horseshoe Bat may also be susceptible to fluctuations in insect availability and loss of foraging substrates as a result of disturbances such as timber harvesting, wildfire and fuel reduction burning although the affect of these disturbances on the species and its prey are unknown (Law 1996, L. Lumsden pers. comm.).

Eastern Broad-nosed Bat

Scotorepens orion

RARITY

a) Geographic Range

- Classification of range size within Region: Small
- Distribution of records within Region: Small number of records from the North East of the Region and a small cluster of records near Mount Beauty and Bogong.
- Proportion of Region occupied (%): 2
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: Unknown
- Density: Unknown, but capture rates of the species are usually low.
- Home Range (ha): Unknown
- Source: Lumsden and Bennett (1995), L. Lumsden pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Wide
- Vegetation types inhabited in the Region: Generally recorded from mixed-species forests in which the stringybark eucalypts *Eucalyptus baxteri*, *E. sieberi* or *E.*

obliqua are characteristically present. In the Region records are from Herb-rich Foothill Forest, Heathy Dry Forest, Grassy Dry Forest, Shrubby Dry Forest and Montane Dry Woodland EVCs.

- Source: Lumsden and Bennett (1995), NRE BioMap (November 1997)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Unknown
- Source: L. Lumsden pers. comm.

Population trend since discovery by Europeans

- Increased, stable or declined: Unknown, probably declined as a result of loss of habitat from past clearing.
- 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: Unknown
- Average distances dispersed: Unknown
- Maximum distance dispersed: Unknown
- Source: Lumsden and Bennett (1995)

LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity (yrs): Unknown; likely to be 1 or 2
- Mean clutch/litter/brood size: Unknown, probably 1
- Mean no of clutches/litters/broods per year: Unknown, probably 1
- Time of year young born/hatch: late Spring/early Summer
- Source: Lumsden and Bennett (1995), Tidemann (1995), McKean and Hamilton-Smith (1967)

b) Longevity

- Classification of lifespan: Unknown, possibly long-lived
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): Unknown
- Source: McKean and Hamilton-Smith (1967), L. Lumsden pers. comm.

c) Morphology

Adult body size

- Weight (g): 7-15 (11)
- Length (mm): 43-59 (49)
- Source: Tidemann (1995)

d) Social organisation

- Colonial or non-colonial: Unknown
- Territoriality: Unknown
- Source: Lumsden and Bennett (1995), Tidemann (1995), L. Lumsden pers. comm.

e) Other

- Nomadic, migratory, sedentary: Unknown; most likely sedentary
- Diet: Insectivore
- Source: Lumsden and Bennett (1995), 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 (-)
4. Firewood Collection: Ranking (-)
5. Unplanned Fire: Ranking (-)
6. Introduced Species: Ranking (1) L. Lumsden pers. comm.
7. Grazing/Trampling: Ranking (0) L. Lumsden pers. comm.
8. Pest Control: Ranking (2) Dunsmore *et al.* (1974) L. Lumsden pers. comm.
9. Road Construction and Maintenance: Ranking (-)
10. Mining/Quarrying: Ranking (-)
11. Tree Dieback: Ranking (-)
12. Recreation: Ranking (0) L. Lumsden pers. comm.
13. Illegal Collection/Harvesting: Ranking (0) L. Lumsden pers. comm.
14. Vandalism/Disturbance by Humans: Ranking (1) L. Lumsden pers. comm.
15. Dams/Impoundments: Ranking (0) L. Lumsden pers. comm.

Current Management:

The Eastern Broad-nosed Bat is not considered "threatened" in Victoria (CNR 1995a). There are currently no threat-ameliorating management prescriptions for the species in the North East Region. A broad-scale survey of the bat fauna of the Region has been undertaken.

Species characteristics:

The Eastern Broad-nosed Bat is a poorly known species which has mostly been recorded from East Gippsland. The species has undergone relatively recent taxonomic revision which established its specific status (Kitchner and Caputi 1985, Baverstock *et al.* 1987). The majority of records are from mixed-species forests characterised by the stringybark eucalypts *E. baxteri*, *E. sieberi* or *E. obliqua* (Lumsden and Bennett 1995). The species is known to roost in tree hollows and buildings (Hall and Richards 1979). Eastern Broad-nosed Bats are rarely recorded and there is no published information on breeding, social organisation or diet (Lumsden and Bennett 1995).

Distribution within the North East Region:

There are thirteen records of the Eastern Broad-nosed Bat from three areas in the North East Region: from Koetong State Forest near Cudgewa, from State forest near Granya and from near Mount Beauty and Bogong in the Alpine National Park. With the exception of the record from Granya which was recorded in 1996, all other records are from 1987/88 (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating within the North East Region:

Disturbances such as clearing, timber harvesting, wildfire and firewood collection which can result in a loss of hollow trees may adversely affect the Eastern Broad-nosed Bat. The species may also be susceptible to fluctuations in insect availability and loss of foraging substrates as a result of disturbances such as timber harvesting, wildfire and fuel reduction burning although the affect of these disturbances on the species and its prey are unknown (Law 1996, L. Lumsden pers. comm.).

BIRDS

Regent Honeyeater

Xanthomyza phrygia

RARITY

a) Geographic Range

- Classification of range size within Region: Large
- Distribution of records within Region: Scattered, patchy distribution
- Proportion of Region recorded from (%): Approximately 11%, although the species has been recorded throughout the North East, the majority of records are concentrated in only a few areas.
- 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
- Source: Franklin *et al.* (1987), Webster and Menkhurst (1992), Menkhurst (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 areas. EVCs species recorded from within Region include: Herb-rich Foothill Forest, Shrubby Dry Forest, Grassy Dry Forest, Box Ironbark Forest, Heathy Dry Forest, Granitic Hills Woodland, Alluvial Terraces Herb-rich Woodland, Alluvial Terraces Herb-rich Woodland/Heathy Dry Forest Mosaic
- Source: Franklin *et al.* (1989), Menkhurst (1997), NRE BioMap (November 1997)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Declined
- Source: Franklin *et al.* (1987), Webster and Menkhurst (1992)

Population trend since discovery by Europeans

- Increased, stable or declined: Declined
- Source: Webster and Menkhurst (1992), Garnett (1992a), Menkhurst (1997)

SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: High
- Source: Menkhurst (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: Menkhurst (1997), P. Menkhurst 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: Menkhurst (1993), Ley *et al.* (1996), Menkhurst (1997)

b) Longevity

- Classification of lifespan: Unknown
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): 7 years
- Source: P. Menkhurst 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 Menkhurst (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)

THREATS

1. **Clearing of Native Vegetation: Ranking (3)** Menkhurst (1997), P. Menkhurst pers. comm.
2. **Timber harvesting: Ranking (2)** Garnett (1992b), Robinson (1994), Menkhurst (1997), P. Menkhurst pers. comm.
3. Fuel Reduction Burning: Ranking (-)
4. **Firewood Collection: Ranking (2)** Ley and Williams (1992), Garnett (1992b), Menkhurst (1993)
5. **Unplanned Fire: Ranking (2)** P. Menkhurst pers. comm.
6. **Introduced Species: Ranking (1)** Menkhurst (1997), P. Menkhurst pers. comm.
7. **Grazing/Trampling: Ranking (2)** Landsberg *et al.* (1990), Ford (1993), Grey (1995), P. Menkhurst pers. comm.
8. Pest Control: Ranking (-)
9. **Road Construction and Maintenance: Ranking (1)** P. Menkhurst pers. comm.
10. Mining/Quarrying: Ranking (-)
11. **Tree Dieback: Ranking (3)** P. Menkhurst pers. comm.
12. Recreation: Ranking (-)
13. Illegal Collection/Harvesting: Ranking (0) P. Menkhurst pers. comm.
14. Vandalism/Disturbance by Humans: Ranking (-)
15. Dams/Impoundments: (0) P. Menkhurst pers. comm.
16. **Other: Interspecific competition: Ranking (1)** Franklin and Robinson (1989), Ford *et al.* (1993), Menkhurst (1993), Grey *et al.* (1997), P. Menkhurst pers. comm.

Current Management:

The Regent Honeyeater is classified as "endangered" in Victoria (CNR 1995a), and is listed under the Victorian *Flora and Fauna Guarantee Act 1988* and the Commonwealth *Endangered Species Protection Act 1992*. An Action Statement (Menkhurst 1993) and Recovery Plan have been prepared for this species (Menkhurst 1997). 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. Within the North East Region, exclusion areas identified to date include parts of Chiltern Box-Ironbark National Park and Reef Hills Park. Management of all public land containing the key eucalypt species will aim to at least maintain and preferably increase the number of mature trees. Disused road reserves currently being grazed under licence within the species' distribution will be reassessed and where one or more of the key eucalypt species are locally indigenous licensees will be assisted in the protection of the vegetation. Protection of roadside vegetation and the development of roadside management plans by local shires should be encouraged (Menkhurst 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 (Menkhurst 1997).

Species characteristics:

The Regent Honeyeater is a highly mobile species which 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 and 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 (Menkhurst 1997).

Distribution within the North East Region:

Within the North East records of the Regent Honeyeater are widely distributed but are extremely patchy which is typical of the distribution of the species throughout its range (Atlas of Victorian Wildlife, Webster and Menkhurst 1992). A large proportion of the Victorian records of the species are from Chiltern Box-Ironbark National Park and Reef Hills Park (Webster and Menkhurst 1992). Other important areas for the species within the North East include freehold land in the Lurg district where aggregations of birds have been recorded over several winters (Menkhurst 1997), and to a lesser extent the Eildon district (Atlas of Victorian Wildlife, Franklin *et al.* 1989).

Disturbances and potentially threatening processes within the North East 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 harvested for timber (Menkhurst 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, Menkhurst 1997). Larger trees appear to be selected for nectar feeding (Webster and Menkhurst 1992) and birds are often recorded in small remnants which 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 contribute 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: Small
- Distribution of records within Region: All records are from the north west of the study area.
- Proportion of Region recorded from (%): Approximately 5%, the majority of records are from one area.
- 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. Robinson pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Narrow
- Vegetation types inhabited in the Region: Dry sclerophyll open-forest and woodland. EVCs recorded from within study area include Box Ironbark Forest, Herb-rich Foothill Forest, Grassy Dry Forest and Heathy Dry Forest, Granitic Hills Woodland, Shrubby Granitic outwash Grassy Woodland.
- Source: Robinson (1991), NRE BioMap (November 1997), D. Robinson pers. comm.

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Unknown, possibly declined
- Source: Garnett (1992a), Robinson (1994)

Population trend since discovery by Europeans

- Increased, stable or declined: Unknown, probably declined commensurate with broad-scale habitat clearance earlier this century
- 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 kilometres 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)

e) Other

- 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 1992a
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 pers. comm.

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.

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)

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)** Robinson (1994), Grey *et al.* (1997), M. Clarke pers. comm.

Current Management:

The Painted Honeyeater is classified as "rare" in Victoria (CNR 1995a) and is listed under the Victorian *Flora and Fauna Guarantee Act* 1988. There are no current management prescriptions for the species in the North East. 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 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. miquelii*, 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 North East, eucalypt species typically parasitised by these mistletoes, and hence 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 North East Region:

The majority of records of the Painted Honeyeater (approximately 70%) are from the Chiltern Box-Ironbark National Park where its current status is rare-uncommon (ie. 0-10 - 11-100 individuals) (Traill *et al.* 1996, Atlas of Victorian Wildlife). Other concentrations of records are from Reef Hills and Eildon State Park. Approximately 10% of the records are from private land (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes within the North East Region:

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 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 which 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.). Timber harvesting can result in degradation of habitat where silviculture practices involve loss of large trees, and is considered a moderate threat. Inappropriate fire regimes may contribute to habitat degradation. Other possible reasons for the species' apparent decline include exclusion from areas of suitable habitat by Noisy Miners *Manorina melanocephala* which is particularly significant in fragmented woodland remnants (Grey *et al.* 1997, M. Clarke pers. comm.).

Swift Parrot
Lathamia discolor

RARITY

a) Geographic Range

- Classification of range size within Region: Medium
- Distribution of records within Region: The majority of records are from the north west of the Region, there are two records from the late 1970s from the south east of the Region.
- Proportion of Region occupied (%): 6-7%
- 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.
- 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. EVCs recorded from in the Region: Box Ironbark Forest, Heathy Dry Forest, Alluvial Terraces Herb-rich Woodland and Alluvial Terraces Herb-rich Woodland/Heathy Dry Forest Mosaic and Cleared/Severely Disturbed.
- Source: Emison *et al.* (1987), NRE BioMap (November 1997), Webster (in prep), C. Tzaros pers. comm.

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Declined
- Australia wide population census 1320 pairs (1989), 940 pairs (1995)
- Source: Brereton (1996)

Population trend since discovery by Europeans

- Increased, stable or declined: Declined
- Source: Garnett (1992b), Lumsden *et al.* (1991)

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 at Tasmanian breeding sites
- 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): Unknown
- Maximum lifespan (yrs): Unknown
- Source:

c) Morphology

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 sources.
- Territoriality: No
- Source: Brereton (1996), 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 (3)** Brown (1989), Garnett (1992b), C. Tzaros pers. comm.
2. **Timber harvesting: Ranking (2)** Garnett (1992b), C. Tzaros pers. comm.
3. **Fuel Reduction Burning: Ranking (-)**
4. **Firewood Collection: Ranking (2)** Robinson (1994), Garnett (1992b), C. Tzaros pers. comm.
5. **Unplanned Fire: Ranking (-)**
6. **Introduced Species: Ranking (1)** C. Tzaros pers. comm.
7. **Grazing/Trampling: Ranking (2)** Landsberg *et al.* (1990), Robinson (1994), C. Tzaros pers. comm.
8. **Pest Control: Ranking (-)**
9. **Road Construction and Maintenance: Ranking (1)** C. Tzaros pers. comm.
10. **Mining/Quarrying: Ranking (-)** Webster (in prep)
11. **Tree Dieback: Ranking (2)** Landsberg *et al.* (1990), Webster (in prep), C. Tzaros 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.
16. **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 (CNR 1995a), and is listed under the Victorian *Flora and Fauna Guarantee Act* 1988. An Action Statement is currently being prepared (Webster in prep). The species is also listed under the Commonwealth *Endangered Species Protection Act* 1992 and an Australia wide Recovery Plan has been published (Brereton 1996). Recovery objectives for the overwintering population include the identification, mapping and management of foraging habitat, and population monitoring. In Victoria, overwinter surveys commenced in 1995 and will run for at least 2 more years (Tzaros and Davidson 1996, Tzaros 1997). This survey concentrated on sites where Swift Parrots had been regularly recorded as well as sites which contained the preferred winter flowering eucalypts and included several areas in the North East (mainly Reef Hills and Chiltern). A project to identify and collect habitat information on winter foraging habitat and investigate interaction with other nectar feeding birds has been funded as part of the North East Region Comprehensive Regional Assessment (Tzaros in prep).

Species characteristics:

The Swift Parrot is a gregarious arboreal nectivore which 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).

Distribution within the North East Region:

The movements and presence of birds in an area is variable and appears related to the flowering of these key eucalypt species. Within the North East areas of public land identified as important for Swift Parrot by the most recent survey include Chiltern Box-Ironbark National Park and Reef Hills Regional Park. The species was also recorded from remnant stands of Box Ironbark woodlands and open forests on private land (Tzaros and Davidson 1996).

Disturbances and potentially threatening processes within the North East Region:

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 where post cutting and firewood collection result in loss of large old trees, 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). Illegal harvesting and displacement by aggressive nectar feeding birds may also constitute threats to the species although the significance of these disturbance are unknown (C. Tzaros pers. comm.).

Turquoise Parrot

Neophema pulchella

RARITY

a) Geographic Range

- Classification of range size within Region: Small
- Distribution of records within Region: The majority of records are from the north west of the Region.
- Proportion of Region occupied (%): 6%
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Medium (uncommon throughout range but locally common in favoured habitats; patchily distributed)
- Population Estimate: Unknown, the population estimate for Chiltern Box-Ironbark National Park in Spring 1987 (pre-breeding) averaged 448 individuals (range 373-523). Autumn 1988 (post-breeding) mean of 738 individuals (Range 597-878). The total population of the Barambogie Ranges during Winter is approximately 1000 individuals. The total population of the Reef Hills Park is approximately 200 individuals.
- Density: Pre-breeding density estimate for Chiltern Box-Ironbark National Park and adjacent properties 0.1045 ± 0.0252 individuals/ha, density for the park only 0.1059 ± 0.0177 individuals/ha, post breeding density of 0.1849 ± 0.0440 individuals/ha for the park and adjacent properties and for the park only 0.1743 ± 0.0332 individuals/ha. In other areas in the north-east, Turquoise Parrots are said to occur in small numbers widely spread.
- Home Range (ha): Unknown
- Source: Jarman (1973), Quin (1990), Quin and Baker-Gabb (1993), B. Quin pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Wide
- Vegetation types inhabited in the Region: Open forests and woodlands, native grassland and adjacent cleared

farmland and vegetation associated with water courses. EVCs recorded from in the Region: Box Ironbark Forest, Heathy Dry Forest, Grassy Dry Forest, Shrubby Dry Forest, Granitic Hills Woodland, Alluvial Terraces Herb-rich Woodland/Heathy Dry Forest Mosaic and areas mapped as Cleared/Severely Disturbed.

- Source: Emison *et al.* (1987), Forshaw and Cooper (1981), Quin (1990), NRE BioMap (November 1997)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Increased
- Source: Quin (1990), Quin and Baker-Gabb (1993)

Population trend since discovery by Europeans

- Increased, stable or declined: Initially declined, began re-establishing itself in many areas in the 1930s. In the North East populations continued to increase through the 1960s, 1970s and especially the 1980s.
- Source: Jarman (1973), Quin (1990), Quin and Baker-Gabb (1993)

SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: High; seasonal and annual variation.
- Source: Forshaw and Cooper (1981), Quin and Baker-Gabb (1993), B. Quin pers. comm.

b) Dispersal

- Classification of powers of dispersal: High
- Average distances dispersed: Unknown, there is a local post-breeding dispersal of birds from woodlands to more open country.
- Source: Jarman (1973), Forshaw and Cooper (1981), Quin and Baker-Gabb (1993)

LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: High
- Age of sexual maturity (yrs): Unknown, possibly 1 year
- Mean clutch/litter/brood size: 4-5 eggs
- Mean no of clutches/litters/broods per year: Usually 1, sometimes 2
- Time of year young born/hatch: August-December; hatchlings mainly recorded between late October-late January, less typically active nests have been recorded in early March and from near Chiltern in April-May)
- Source: Quin (1990), Quin and Baker-Gabb (1993), B. Quin pers. comm.

b) Longevity

- Classification of lifespan: Unknown
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): Unknown
- Source: B. Quin pers. comm.

c) Morphology

Adult body size

- Weight (g): 37-44
- Length (mm): 200
- Source: Forshaw and Cooper (1981)

d) Social organisation

- Colonial or non-colonial: Non-colonial; mainly nesting pairs although can have clumps of nests, form feeding flocks
- Territoriality: No
- Source: Quin (1990), B. Quin pers. comm.

e) Other

- Nomadic, migratory, sedentary: Sedentary, local seasonal movements although broader scale movements occur in some years (eg. from Barambogie Ranges to Chiltern Box-Ironbark National Park).
- Diet: Granivorous; Food comprises seeds of colonising native plants, introduced grasses, herbaceous plants (including weeds), shrubs, trees and the scales of Coccid insects. Mainly feeds on or near the ground.
- Source: Forshaw and Cooper (1981), Quin (1990)

THREATS

1. **Clearing of Native Vegetation: Ranking (2)** Quin (1990), B. Quin pers. comm.
2. **Timber harvesting: Ranking (2)** Quin (1990), Quin and Baker-Gabb (1993), B. Quin pers. comm.
3. **Fuel Reduction Burning: Ranking (2)** Quin (1990), Quin and Baker-Gabb (1993), B. Quin pers. comm.
4. **Firewood Collection: Ranking (2)** Quin (1990), Quin and Baker-Gabb (1993), B. Quin pers. comm.
5. **Unplanned Fire: Ranking (2)** Quin (1990), B. Quin pers. comm.
6. **Introduced Species: Ranking (3)** Quin (1990), Quin and Baker-Gabb (1993), B. Quin pers. comm.
7. **Grazing/Trampling: Ranking (2)** Quin (1990), B. Quin pers. comm.
8. **Pest Control: Ranking (0)** B. Quin pers. comm.
9. **Road Construction and Maintenance: Ranking (1)** Quin (1990), B. Quin pers. comm.
10. **Mining/Quarrying: Ranking (1)** Quin (1990), B. Quin pers. comm.
11. **Tree Dieback: Ranking (2)** Landsberg *et al.* (1990), Webster (in prep), B. Quin pers. comm.
12. **Recreation: Ranking (0)** B. Quin pers. comm.
13. **Illegal Collection/Harvesting: Ranking (1)** Quin (1990), B. Quin pers. comm.
14. **Vandalism/Disturbance by Humans: Ranking (0)** B. Quin pers. comm.

15. Dams/Impoundments: Ranking (0) B. Quin pers. comm.

16. **Other: Pasture Improvement: Ranking (3)** Quin (1990), B. Quin pers. comm.

Current Management:

The Turquoise Parrot is classified as "rare" in Victoria (CNR 1995a) and is listed under the Victorian *Flora and Fauna Guarantee Act* 1988. There is currently no Action Statement for this species. There are no threat ameliorating management prescriptions for the species within the North East Region.

Species characteristics:

Turquoise Parrots appear to favour ecotone habitats especially grassland with or without a sparse tree covering, bordering woodland or forest (Quin and Baker-Gabb 1993). The species also uses timbered ridges and tree-lined creeks that traverse farmland (Forshaw and Cooper 1981). Turquoise Parrots nest in hollows in living or dead trees, as well as hollows in stumps, fence posts and fallen limbs (Jarman 1973, Quin 1990). Forest ecotones are favoured as nest sites, most are within 100m of cleared land. Also recorded nesting in unimproved, semi-cleared land and improved, cleared pasture containing stumps. All these nest sites were within 75m of the forest edge (Quin 1990). Turquoise Parrots have a generalised diet; the seeds of colonising native plants, herbaceous plants (including weeds) and some pasture grasses are important components of the diet. Crop species and many of the improved pasture species appear not to be used. Nocturnal roosting habitat is characterised by a dense foliage layer in the understorey which presumably protects birds from predators and weather (Quin 1990, Quin and Baker-Gabb 1993).

Distribution in the North East Region:

Turquoise Parrot populations declined dramatically after European settlement when much of the Box Ironbark Forests were cleared but began to recover around the 1930s. Within the North East Region populations increased substantially during the late 1970s and throughout the 1980s in the Chiltern-Pilot Range area. The stronghold of the species within the Region includes much of the granite country of the Pilot Range, from Byawatha and Eldorado, north-east to Mount Pilot and Little Pilot and extends north through Sugarloaf Hill and the Barambogie Ranges to Chiltern and Barnawatha. Turquoise Parrots have also been recorded from Glenrowan north east to Wangaratta. The range of the species appears to be expanding as more recent records have come from Bobinawarrah, Bonegilla, Molyullah and the foothills of Mount Buffalo (Quin 1990, Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes in the North East Region:

Disturbances which are likely to cause declines in Turquoise Parrot populations are those which affect nest sites, food availability and roost sites. Clearing results in a loss of habitat, particularly of nest sites. Although some species of introduced grasses and weeds are important components of the diet, many of the improved pasture species appear not to be eaten. Clearing in conjunction with pasture improvement activities results in a loss of food, nest sites and nocturnal roost sites. Although birds will nest in stumps and remnant trees in open paddocks, such nest sites are usually within 100m of the forest edge. Clearing results in fragmentation of habitat with habitat remnants becoming increasingly isolated from forest stands and unsuitable for use as Turquoise Parrot nest sites (Quin 1990, B. Quin pers. comm.).

Although wildfire stimulates growth of food, high intensity fire is known to destroy Turquoise Parrot nesting habitat (Quin 1990). Unlike wildfires, low intensity fuel reduction burns promote growth of Turquoise Parrot foods and cause far less damage to nest sites than wildfire. However, some plant species do not flower the first season following burning and too frequent burning (i.e. burning in several consecutive years) could result in an absence of seed for feeding in future years. Burning in certain habitats will result in a decrease in the amount of Autumn, Winter and Spring feeding habitats (Quin 1990). Fuel reduction burning may simplify the structure of the understorey making it less suitable as roosting habitat. Timber harvesting and firewood collection can result in the loss of nest sites and feeding and roosting habitat and are significant threats to the species, where they result in the loss of large old trees. Turquoise Parrots have a tendency for nesting low to the ground making females particularly vulnerable to predation; Foxes are known to take adult females and nestlings at nest sites. Predation of females at nest sites most likely led to a male sex bias at Chiltern. Domestic Cats are known to prey on feeding parrots on farmland bordering Chiltern Box-Ironbark National Park and predation by introduced species is a significant threat to Turquoise Parrot populations (Quin 1990, Quin and Baker-Gabb 1993, B. Quin pers. comm.). The cessation of long-term intensive grazing in reserves (in conjunction with on-going rabbit control) is likely to have contributed to the increase in Turquoise Parrot numbers, particularly in the Barambogie Ranges and Chiltern Box-Ironbark National Park. Grazing causes long-term changes to the floristic composition and understorey structure, contributes to tree dieback (Landsberg *et al.* 1990, Webster in prep) and prevents habitat regeneration and may contribute to declines in Turquoise Parrot populations. Illegal trapping and poaching at nest sites

are known to occur, but are unlikely to be a significant threats to the population within the North East (Quin 1990).

Bush Stone-curlew ***Burhinus grallarius***

RARITY

a) Geographic Range

- Classification of range size within Region: Small
- Distribution of records within Region: (ha): Restricted distribution; most records are from the north west of the study area.
- Proportion of Region recorded from (%): Approximately 8%
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: North East Region - unknown; scattered pairs known through the Lurg, Greta, Chiltern and Glenrowan areas although total number of birds unknown. Victorian estimate 500-1000 breeding pairs, Northern Plains estimate (species stronghold which includes part of the North East Region) 300-330 breeding birds on private land.
- Density: The Northern Plains survey area a density of approximately one bird per 34 km² was recorded.
- Home Range (ha): 250-600 ha, breeding territory of 10-25 ha
- Source: Shodde and Mason (1980), Wilson (1989), Robinson (1994), Johnson and Baker-Gabb (1994), Webster and Baker-Gabb (1994), D. Robinson pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Narrow
- Vegetation types inhabited in the Region: Lowland grassy woodland and open forest. 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 1997), D. Robinson pers. comm.

DYNAMICS

Population Trend in Last Decade

- Increased, 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

- Increased, stable or declined: Declined. A decline in numbers has been noted from the Chiltern area since the 1970s
- Source: Emison *et al.* (1987), Marchant and Higgins (1993), Johnson and Baker-Gabb (1994), Traill *et al.* (1996)

SPATIAL DYNAMICS

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
- 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): 10-25
- Maximum lifespan (yrs): At least 25 years
- Source: Johnson and Baker-Gabb (1994), Robinson (in prep.)

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 (in prep)

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. Robinson pers. comm.

4. Firewood Collection: Ranking (3) Johnson and Baker-Gabb (1994), Robinson and Johnson (in prep), 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 (in prep), D. Robinson pers. comm.

9. Road Construction and Maintenance: Ranking (2) D. Robinson pers. comm.

10. Mining/Quarrying: Ranking (-)

11. Tree Dieback: Ranking (1) Landsberg *et al.* (1990), Johnson and Baker-Gabb (1994), Robinson and Johnson (in prep), D. Robinson pers. comm.

12. Recreation: Ranking (0) D. Robinson pers. comm.

13. 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 pers. comm.

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 "vulnerable" in Victoria (CNR 1995a), is listed under the Victorian *Flora and Fauna Guarantee Act* 1988 and an Action Statement is currently being prepared (Robinson and Johnson in prep). There are no current management prescriptions for the species in the North East Region.

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 amongst 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 kilometres 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 in prep.).

Distribution in the North East Region:

The north west of the North East Region is part of the Victorian stronghold of the Bush Stone-curlew. Within the North East the majority of records are from either private land where the birds occur in wooded farmland or from roadside reserves and farm tracks. Bush Stones-curlews have also been recorded from Chiltern Box-Ironbark National Park and Reef Hills Regional Park (Traill *et al.* 1996, Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes in the North East Region:

Statewide the species has undergone a significant decline as a result of habitat clearance and fragmentation (Johnson and Baker-Gabb 1994). Within the North East current threats relate to further loss and degradation of habitat, particularly from disturbances such as clearing for agriculture and associated pasture improvement activities. Bush Stone-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 north eastern Victoria between 1985 and 1991 (Webster and Baker-Gabb 1994). Scattered woodlots and patches of 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 and which will reduce their habitat value. Invasion of roadside remnants, important Stone-curlew habitat in the North East, 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 licence (Robinson and Johnson in prep). Trampling by stock while being moved is known to have resulted in the loss of eggs and young and nesting birds. Grazing limits 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 contribute 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 fallen timber, an important component of day shelters, and is a significant threat to the species in the North East.

Grey-crowned Babbler
Pomatostomus temporalis

RARITY

a) Geographic Range

- Classification of range size within Region: Small
- Distribution of records within Region: All records confined to the north west of the Region
- Proportion of Region recorded from (%): 6%
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: Seven known populations, 60-65 groups of approximately 250 individuals. Approximately 12% of the Victorian population is found within the North East Region.
- Density: 60-65 groups are known from the study area
- Home Range (ha): 2-53
- Source: Blakers *et al.* (1984), Robinson *et al.* (in prep), D. Robinson pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Wide
- 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 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

- Increased, stable or declined: Declined
- Source: Davidson and Robinson (1992), Traill *et al.* (1996)

Population trend since discovery by Europeans

- Increased, stable or declined: Declined
- Source: Emison *et al.* (1987), Davidson and Robinson (1992)

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: 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.

3. Fuel Reduction Burning: Ranking (2) Adam and Robinson (1996), D. Robinson pers. comm.

4. Firewood Collection: Ranking (2) Johnson and Baker-Gabb (1994), Robinson *et al.* (in prep), D. Robinson pers. comm.

5. Unplanned Fire: Ranking (-)

6. Introduced Species: Ranking (2) Davidson and Robinson (1992), Robinson *et al.* (in prep), D. Robinson pers. comm.

7. Grazing/Trampling: Ranking (3) Davidson and Robinson (1992), D. Robinson pers. comm.

8. Pest Control: Ranking (1) Robinson *et al.* (in prep), Davidson and Robinson (1992), D. Robinson pers. comm.

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 (CNR 1995a). The species is listed 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 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 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. Grey-crowned Babblers forage for insects on the ground as well as on the trunks and amongst 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 North East Region:

Within the North East Region Grey-crowned Babbler records are mostly from the Violet Town-Baddaginnie, Lurg, Chiltern and Norong districts; the largest populations are found at Lurg (18 groups, 65 individuals), Rutherglen-Norong (27+ groups, 109+ individuals) and Chiltern (10 groups, 30-35 individuals). Remnant woodland vegetation along roadsides and adjacent private land provides habitat for the majority of Babbler groups in the Region. Three groups occurs in reserves and three groups occur on the edge of private land and public land (Robinson *et al.* in prep, D. Robinson pers. comm., Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes within the North East Region:

Grey-crowned Babblers sites are characterised by 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.).

The majority of Babbler groups in the North East depend upon roadside vegetation for habitat. Road works such as road-widening, upgrading and installation of utilities, degrade and reduce habitat by removing and damaging mature trees and saplings and shrubs, and result in weed invasion causing a deterioration of ground-layer habitat and are a significant threat to the species. Road works also contribute to tree dieback as a result of altered drainage patterns, nutrient run-off or introduced plant pathogens (Heartwale 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 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 degradation 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 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. Roadside droving and grazing is a particularly significant threat to Babbler habitat in the Rutherglen-Norong area (D. Robinson pers. comm.).

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 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 al.* in prep.).

Apostlebird
Struthidea cinerea

RARITY

a) Geographic Range

- Classification of range size within Region: Small
- Distribution of records within Region: There is a cluster of records in the north west corner of the study area and two other more scattered records.
- Proportion of Region recorded from (%): 1
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: Unknown, less than 20 groups are found east in the area east of the Owens River, north of the Hume Freeway, close to the Murray Valley Highway
- Density: Unknown
- Home Range (ha): 10-15 ha
- Source: Baldwin (1974), Schodde and Tidemann (1986)

c) Habitat Specificity

- Classification of habitat specificity: Narrow
- Vegetation types inhabited in the Region: Occurs in remnant Callitris Pine woodlands and Yellow Box and Grey Box woodlands along the Murray Floodplain. Within the North East Region, found only in Callitris Pine remnants.
- Source: Emison *et al.* (1987), D. Robinson pers. comm.

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Unknown, probably declined
- Source: D. Robinson pers. comm.

Population trend since discovery by Europeans

- Increased, stable or declined: Declined
- Source: Emison *et al.* (1987)

SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: Low
- Source: Blakers *et al.* 1984, Emison *et al.* 1987

b) Dispersal

- Classification of powers of dispersal: Low
- Average distances dispersed: Young from previous years stay in family home range and clans usually don't wander greater than 1 km from family home range.
- Maximum distance dispersed: During hard winters or severe drought may move several kilometres
- Source: Chapman (1969), Schodde and Tidemann (1986)

LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity (yrs): Unknown
- Mean clutch/litter/brood size: 2-5, usually 4
- Mean no of clutches/litters/broods per year: 2
- Time of year young born/hatch: August-December
- Source: Chapman (1969), Baldwin (1974)

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): No information
- Length (mm): 290-330
- Source: Chapman (1969), Baldwin (1974), Schodde and Tidemann (1986)

d) Social organisation

- Colonial or non-colonial: Non-colonial but communal breeders and live in clans of 4-18 individuals.
- Territoriality: Defend territories during the breeding season.
- Source: Chapman (1969), Baldwin (1974), Dow (1980), D. Robinson pers. comm.

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Diet: Granivore and insectivore, also recorded eating mice and eggs
- Source: Chapman (1969), Baldwin (1974), Hobbs (1976), Whitemore (1981), Blakers *et al.* (1984)

THREATS

1. **Clearing of Native Vegetation: Ranking (3)** Emison *et al.* (1987), Robinson (1991)
2. Timber harvesting: Ranking (0)
3. Fuel Reduction Burning: Ranking (0) D. Robinson pers. comm.
4. Firewood Collection: Ranking (-)
5. **Unplanned Fire: Ranking (1)** D. Robinson pers. comm.
6. **Introduced Species: Ranking (1)** D. Robinson pers. comm.
7. **Grazing/Trampling: Ranking (3)** D. Robinson pers. comm.
8. **Pest Control: Ranking (1)** D. Robinson pers. comm.
9. **Road Construction and Maintenance: Ranking (2)** D. Robinson pers. comm.
10. Mining/Quarrying: Ranking (-)
11. **Tree Dieback: Ranking (3)** 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)
16. **Other: Pasture Improvement: Ranking (2)** D. Robinson pers. comm.

Current Management:

The Apostlebird is classified as "rare" in Victoria (CNR 1995a). There are no threat ameliorating management prescriptions for the species within the North East Region.

Species Characteristics:

Apostlebirds are woodland birds which inhabit Yellow and Grey Box eucalypt woodlands, and Callitris Pine woodlands and are now mainly recorded along the Murray Floodplain (Emison *et al.* 1987). Within the North East Region the Apostlebird has only been recorded from Callitris Pine remnants (D. Robinson pers. comm.). The species has disappeared from parts of Northern Plains that were cleared of box-buloke and Callitris Pine woodlands earlier this century (Emison *et al.* 1987). The Apostlebird is a communal species which lives in family groups consisting of a dominant adult pair and the young of several previous years (Chapman 1969). All members of the group participate in building the mud nest which they fix to a sloping branch or fork of a tree or tall shrub (Chapman 1969, Emison *et al.* 1987). The species is territorial during the breeding season and all territories have a watering point which is needed for both drinking and nest building (Schodde and Tidemann 1986). Roosting habitat consists of thick foliage which may be quite close to the nesting area (Chapman 1969). Apostlebirds forage on the ground for mainly insects during summer and seeds during winter (Blakers *et al.* 1984). It is an opportunistic feeder and has also been recorded catching mice and taking eggs from nests (Hobbs 1976, Whitemore 1981).

Distribution in the North East Region:

The majority of Apostlebird records from the North East Region are from between Peechelba East and Norong Central and the vicinity of Rutherglen. There is one 1984 record from near Barnawartha and a 1987 record from near Euroa. There are 16 post 1985 records (14 separate localities) of the species; with the exception of one creek side record, all are from woodland remnants on private land and roadside reserves (Atlas of Victorian Wildlife).

Disturbances and potentially threatening process operating in the North East Region:

Within the North East Region, Apostlebirds have only been recorded from Callitris Pine remnants; most records are from remnants on private land and roadside reserves in a predominantly agricultural landscape. As a result, the most significant disturbances include loss of habitat through further clearing and disturbances which contribute to degradation of existing habitat such as tree dieback and roadside maintenance activities such as ploughing of firebreaks (D. Robinson pers. comm.). Ploughing of firebreaks by private landholders along fence lines also contributes to habitat degradation and loss. Practices associated with intensified land use including increased clearing, higher stocking rates and use of chemicals cause habitat loss and contribute to tree dieback and habitat degradation. Rising water tables and salinity also contribute to tree dieback; evidence of raised water tables is becoming apparent in areas where Apostlebirds are recorded. The currently high levels of roadside grazing in areas where Apostlebirds are recorded prevents extension of habitat and

regeneration and is considered a major threat. Introduced pasture species and weeds such as Canary Grass (*Phalaris* spp) may reduce foraging habitat (D. Robinson pers. comm.).

Square-tailed Kite
Lophoictinia isura

RARITY

a) Geographic Range

- Classification of range size within Region: Small
- Distribution of records within Region: Scattered records from the west and north west of the Region
- Proportion of Region recorded from (%): 3
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: Estimated 20-50 pairs in Victoria, probably less than 10 pairs in the North East
- 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 pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Wide
- Vegetation types used in the Region: Tall open-forest, open-forest and woodland across a range of EVCs, sometimes in riparian situations. Elsewhere in Victoria, not recorded from extensively cleared areas, extensive naturally treeless areas, alpine areas, nor from small southerly remnant forests isolated by extensive treeless areas. Nested in Manna Gum *Eucalyptus viminalis* and Blue Gum *E. bicostata* in Victoria.
- Source: : LCC (1984), Debus and Silveira (1989), Traill *et al.* (1996), Borella and Borella (1997)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Unknown
- Source: C. Silveira pers. comm.

Population trend since discovery by Europeans

- Increased, stable or declined: Likely decline in southern Australia commensurate with large-scale habitat clearance there.
- 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 kilometres.
- 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 nesting 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. comm.

6. **Introduced Species: Ranking (0)** C. Silveira pers. comm.

7. **Grazing/Trampling: Ranking (1)** C. Silveira pers. comm.

8. **Pest Control: Ranking (-)** Olsen *et al.* (1993b)

9. **Road Construction and Maintenance: Ranking (1)** C. Silveira pers. comm.

10. **Mining/Quarrying: Ranking (-)**

11. **Tree Dieback: Ranking (1)** C. Silveira pers. comm.

12. **Recreation: Ranking (-)**

13. **Illegal Collection/Harvesting: Ranking (2)** Jolly (1989), Garnett (1992a), Marchant and Higgins (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 "vulnerable" in Victoria (CNR 1995a). There are no threat-ameliorating management prescriptions for this species within the North East Region.

Species characteristics:

The Square-tailed Kite is a medium-sized, long-winged 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 open-forest, 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 North East Region:

The Square-tailed Kite has been recorded from fewer than 20 localities. Most of the records are from Chiltern Box-Ironbark National Park, the Strathbogie Ranges and the Baramobgie Ranges; one record is from near Mt Firebrace, north east of Tallangatta (Atlas of Victorian Wildlife, C. Silveira pers. comm.). It is likely that breeding occurs within the North East Region as high-soaring by a pair (a nesting behaviour) has been observed there in spring (C. Silveira pers. comm.).

Disturbances and potentially threatening processes operating in the North East 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, if it significantly 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), egg-collection is potentially a significant threat (Garnett 1992a, Marchant and Higgins 1993) as is illegal shooting (Jolly 1989).

Grey Goshawk

Accipiter novaehollandiae

RARITY

a) Geographic Range

- Classification of range size within Region: Medium
- Distribution of records within Region: Scattered records mainly from the north and north-west of the Region
- Proportion of Region recorded from (%): 5
- Source: Atlas of Victorian Wildlife, Trail *et al.* (1996)

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 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 occasionally disperse great distances. In Victoria, breeding is largely limited to gullies in southern tall-open forest (eg. Otway Ranges and Gippsland Plains).
- Vegetation types inhabited in the Region: Vegetation types used in the North East Region: Box Ironbark forest and woodland at Chiltern and Shrubby Dry Forest EVC. Elsewhere in Victoria, 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), Traill *et al.* (1996), NRE BioMap (November 1997)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Unknown
- Source: R. Loyn pers. comm.

Population trend since discovery by Europeans

- Increased, stable or declined: Likely decline in southern Australia commensurate with large-scale 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 (eg. 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 Marples (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. Silveira 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 (1)** Mooney and Hunt (1983), Mooney (1988).
10. **Mining/Quarrying: Ranking (-)**
11. **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 "rare" in Victoria (CNR 1995a). There are no threat-ameliorating management prescriptions for this species within the North East Region.

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 mixed-age 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 North East Region:

Misidentifications of the adult Brown Goshawk as the grey form of the Grey Goshawk make regional assessments of abundance and distribution difficult especially where the form (i.e. white or grey) seen has not been reported with the submitted record (Blakers *et al.* 1984, C. Silveira). Nevertheless, if all records from the North East Region were of white individuals, then records of the Grey Goshawk are scattered mainly in the north and the north-west. The records are either from public land, mostly State forest, or from private land close to State forest (Atlas of Victorian Wildlife). During the 1970s, the Grey Goshawk was a breeding resident of the Chiltern Box-Ironbark National Park, but has not been recorded there since (Traill *et al.* 1996).

Disturbances and potentially threatening processes operating in the North East Region:

The Grey Goshawk predominantly utilises older age-classes 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 can convert older age-classes of forest to young regrowth stands and may therefore result in the loss of both nesting and foraging habitat (Mooney 1987, Mooney 1988, Mooney and Holdsworth 1988). Wildfire can also result in a loss of nesting and foraging habitat. Given that the Grey 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 North East 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: Medium
- Distribution of records within Region: The majority of records are clustered around several large, permanent bodies of water.
- Proportion of Region recorded from (%): 6
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: Unknown, likely to be less than 30 pairs
- Possibly 100 breeding pairs or less in Victoria
- Density: Unknown. Estimates for other areas of Victoria vary greatly
- Home Range (ha): Unknown in Victoria, in Tasmania adult home range approximately 100 km², defends a smaller nesting territory of approximately 5 km².
- Source: Mooney (1986), R. Bilney pers. comm. in Clunie (1994), P. Clunie pers. comm.

c) Habitat Specificity

- 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

- Increased, stable or declined: Unknown
- Source: P. Clunie pers. comm.

Population trend since discovery by Europeans

- Increased, stable or declined: Declined
- Source: Mooney (1986), Marchant and Higgins (1993)

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 2000-2420g
- 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)** Strahan (1994), Marchant and Higgins (1993), P. Clunie pers. comm.
3. **Fuel Reduction Burning: Ranking (-)**
4. **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 (-)**
8. **Pest Control: Ranking (1)** Mooney and Hunt (1982), 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. comm
11. **Tree Dieback: Ranking (1)** P. Clunie pers. comm.
12. **Recreation: Ranking (2)** Mooney (1986), P. Clunie, pers. comm.
13. **Illegal Collection/Harvesting: Ranking (-)**
14. **Vandalism/Disturbance by Humans: Ranking (1)** Mooney and Hunt (1982), Bilney and Emison (1983), Mooney (1986), Hunt and Mooney (1993), Nermut *et al.* (1995), Dennis and Lashmar (1996), P. Clunie pers. comm.
15. **Dams/Impoundments: Ranking (0)** P. Clunie pers. comm.
16. **Other: Interspecific Competition: Ranking (-)** Clunie (1994), Wiersma (1996)

Current Management:

The White-bellied Sea-Eagle is classified as "rare" in Victoria (CNR 1995a) 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, Strahan 1994). Nests are usually found near water, in tall live or dead trees. White-bellied 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 North East Region:

Within the North East most White-bellied Sea-Eagle records are from major rivers and some large freshwater lakes including Lake Nillahcootie, Lake William Hovell, Lake Dartmouth, Lake Hume and the Mitta Mitta River, Lake Moodemere, Lake Buffalo and the Buffalo River and Lake Eildon (Atlas of Victorian Wildlife). Active nest sites are known from Lake Hume with possible sites on the Mitta Mitta River and Lake Eildon (P. Clunie pers. comm.).

Disturbances and potentially threatening process operating in the North East 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). As a result, disturbances such as recreation, mining, timber harvesting and road construction and maintenance in the vicinity of nest sites, represent threats to the species (P. Clunie pers. comm.). Breeding pairs are sedentary and are sensitive to disturbances including timber harvesting and clearing if they reduce important habitat components such as nest trees (Mooney 1986). 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.* 1993a), it is an issue to be considered. Deliberate shooting has been recorded (Mooney 1986) although is unlikely to be a significant threat within the North East (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 (Clunie 1994, Wiersma 1996).

Barking Owl

Ninox connivens

RARITY

a) Geographic Range

- Classification of range size within the Region: Medium
- Distribution of records within Region: The majority of records are from the north west of the Region although there are also scattered records from the North East.
- Proportion of Region recorded from (%): 8
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: Unknown, possibly < 50 pairs in Victoria and < 20 pairs in the North East Region.
- Density: Unknown, sparsely distributed and possibly < 1 pair/100 km²
- Home Range (ha): Approximately 100ha estimated for Chiltern Box-Ironbark National Park, 200 ha estimated for other woodland areas. 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.
- Source: Schodde and Mason (1980), P. Peake pers. comm. in Robinson (1994), E. McNabb pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Narrow
- Vegetation types inhabited in the Region: Drier Box Ironbark habitats as well as riparian River Red Gum habitats and woodlands, open forest and wooded farmlands. Rarely recorded from wet forest and then usually only near clearings. Most records from a recent survey of the North East 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 (1980), Emison *et al.* (1987), Kavanagh *et al.* (1995), Loyn *et al.* (in prep)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Unknown, possibly stable
- Source: Traill *et al.* (1996), E. McNabb pers. comm.

Population trend since discovery by Europeans

- Increased, 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: Probably 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 (1980), 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 (1980)

d) Social organisation

- Colonial or non-colonial: Breeding pairs
- Territoriality: Yes
- Source: Schodde and Mason (1980)

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Diet: Carnivore, insectivore
- Source: Schodde and Mason (1980)

THREATS

1. **Clearing of Native Vegetation: Ranking (3)** Schodde and Mason (1980), Robinson (1994), E. McNabb pers. comm.
2. **Timber harvesting: Ranking (2)** E. McNabb pers. comm.
3. **Fuel Reduction Burning: Ranking (2)** Adams and Robinson (1996), E. McNabb pers. comm.
4. **Firewood Collection: Ranking (2)** Robinson (1994), E. McNabb pers. comm.
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. comm.
11. **Tree Dieback: Ranking (2)** E. McNabb pers. comm.
12. Recreation: Ranking (0) E. McNabb pers. comm.
13. 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 "rare" in Victoria (CNR 1995a) and has received a final recommendation for listing under the Victorian *Flora and Fauna Guarantee Act 1988*. There is currently no Action Statement or prescriptions for the forest management areas incorporated in the North East Region for this species. An assessment of the status of the Barking Owl within the North East Region has been completed (Silveira 1997) and systematic surveys have been conducted. Site data collected from survey sites was to be used in conjunction with mapped variables to develop predictive models for the species. However, due to the paucity of Barking Owl records produced by the survey, no predictive model will be produced for this species (E. McNabb pers. comm.).

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 medium-sized 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 1980).

Distribution in the North East Region:

Within the North East the majority of records of Barking Owl are from the Chiltern and Beechworth areas and the Barambogic Ranges. There are also scattered records through the north east of the Region; the species was recently recorded from State forest east of Thowgla Upper. The majority of records of the species recorded by a recent survey of the North East Region were from the vicinity of Chiltern and Beechworth. The species was only recorded from the drier more open forest formations and most records were close to cleared farmland (Loyn *et al.* in prep).

Disturbances and potentially threatening process operating in the North East Region:

Loss and fragmentation of habitat through clearing is a significant threat to Barking Owls in the North East 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 timber harvesting and firewood collection are also significant threats to the species (Robinson 1994). Grazing can limit the regeneration of trees and shrubs and will limit future habitat availability. Grazing also contributes to rural tree dieback which 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, Kavanagh *et al.* (1995) suggest the species has a wide dietary flexibility. Barking Owls prefer sites with some dense understorey shrubs for roosting (Schodde and Mason 1980). Fire prevention activities can prevent habitat regeneration and cause the death of young trees and shrubs resulting in habitat loss (Adam and Robinson 1996). Fire prevention activities can also result in loss of habitat of the owl's 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: There are two main concentrations of records as well as more widely distributed records from other areas.
- Proportion of Region recorded from (%): 16
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: (Central Highlands estimate 40-120 pairs)
- Density: Unknown, widespread but rare within the North East Region
- Home Range (ha): 300 - >1000, dependent on habitat and availability of prey
- Source: Seebeck (1976), McNabb (1996)

c) Habitat Specificity

- Classification of habitat specificity: Wide
- Vegetation types inhabited in the Region: Been recorded from tall open-forests, open-forests and woodlands including drier Box Ironbark habitats and riparian River Red Gum habitat. A recent survey of the North East mainly recorded Powerful Owls from the following EVCs: Shrubby Dry Forest, Swamp Riparian Woodland, Riparian Forest. Other records were from Montane Dry Woodland, Montane Damp Forest/Montane Riparian Thicket, Damp Forest, Herb-rich Foothill Forest, Grassy Dry Forest and Heathy Dry Forest.
- Source: Traill (1993), Loyn *et al.* (in prep)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Stable
- Source: R. Loyn and E. McNabb pers. comm.

Population trend since discovery by Europeans

- Increased, 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 (1980)

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
- Time of year young born/hatch: July-September
- Source: Fleay (1968), Schodde and Mason (1980), Debus and Chafer (1994), McNabb (1996), E. McNabb 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): 1050-1600 females, 1130-1700 males
- Length (mm): 450-540 females, 480-650 males
- Source: Schodde and Mason (1980)

d) Social organisation

- Colonial or non-colonial: Non-colonial
- Territoriality: Territorial
- Source: Schodde and Mason (1980)

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 (1980), 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 pers. comm.
3. **Fuel Reduction Burning: Ranking (2)** Debus and Chafer (1994), E. McNabb pers. comm.
4. **Firewood Collection: Ranking (1)** Robinson (1994)
5. **Unplanned Fire: Ranking (3)** E. McNabb pers. comm.
6. **Introduced Species: Ranking (0)** E. McNabb pers. comm.
7. **Grazing/Trampling: Ranking (-)**
8. **Pest Control: Ranking (1)** R. Loyn pers. comm.
9. **Road Construction and Maintenance: Ranking (1)** E. McNabb pers. comm.
10. **Mining/Quarrying: Ranking (1)** E. McNabb pers. comm.
11. **Tree Dieback: Ranking (1)** Landsberg *et al.* (1990), E. McNabb pers. comm.
12. **Recreation: Ranking (0)** E. McNabb pers. comm.
13. **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 Powerful Owl is classified as "rare" in Victoria (CNR 1995a) 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). An assessment of the status of the Powerful Owl has been completed (Silveira 1997) and systematic surveys have been conducted in the North East Region. Site data collected from survey sites will be used in conjunction with mapped variables to develop predictive models for the species (Loyn *et al.* in prep). These studies will facilitate the development of appropriate management prescriptions for abating forestry-related threatening processes.

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 form part of the diet (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 (300-1000ha) that contain a number of roost sites and nest trees (McNabb 1996).

Distribution in the North East Region:

The majority of Powerful Owl records from the North East Region are from the Barambogie Ranges, in the vicinity of Chiltern, in State forest west of Whitlands and Mount Samaria State Park. Other records are scattered throughout the Region and although some are from National Parks, the majority are from large blocks of State forest.

Disturbances and potentially threatening process operating in the North East Region:

Significant threats to this species include disturbances that reduce the availability of nest sites or the number of prey. Timber harvesting and wildfire can 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 can also result 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 (Cating 1991, E. McNabb pers. comm.).

Masked Owl

Tyto novaehollandiae

RARITY

a) Geographic Range

- Classification of range size within Region: Small
- Distribution of records within Region: (ha): Very few records from two widely separated localities; near Rutherglen and Lake Eildon.
- Proportion of Region recorded from (%): 1
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low

- Population Estimate: Victorian estimate 300-400 breeding pairs, North East estimate possibly < 50 pairs.
- Density: Unknown, but territories most likely well spaced, 5-10 km² per pair been postulated.
- Home Range (ha): 1017-1178, from radio-tracking one female
- Source: Peake *et al.* (1993), Kavanagh and Murray (1996), Schodde and Mason (1996), 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 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. EVCs recorded from within the North East Region include Herb-rich Foothill Forest and Grassy Dry Forest.
- Source: Peake *et al.* (1993), NRE BioMap (November 1997), E. McNabb pers. comm.

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Unknown, probably declined
- Source: Peake *et al.* (1993), E. McNabb pers. comm.

Population trend since discovery by Europeans

- Increased, 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 (1980)

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 (1980), 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* has 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 (1980)

d) Social organisation

- Colonial or non-colonial: Non-colonial
- Territoriality: Territorial
- Source: Schodde and Mason (1980), Hollands (1991)

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Diet: Carnivore (terrestrial prey dominant)
- Source: Schodde and Mason (1980), 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 Rose (1994), E. McNabb pers. comm.
4. **Firewood Collection: Ranking (2)** E. McNabb pers. comm.
5. **Unplanned Fire: Ranking (2)** E. McNabb pers. comm.
6. **Introduced Species: Ranking (1)** R. Loyn pers. comm.
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 (1)** E. McNabb pers. comm.
10. **Mining/Quarrying: Ranking (-)**
11. **Tree Dieback: Ranking (2)** Landsberg *et al.* (1990), Debus and Rose (1994), E. McNabb pers. comm.
12. **Recreation: Ranking (0)** E. McNabb pers. comm.
13. **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 "rare" in Victoria (CNR 1995a) and is listed under the Victorian *Flora and Fauna Guarantee Act* 1988 although there is currently no Action Statement for this species. An assessment of the status of the Masked Owl within

the North East Region has been completed (Lampman 1997) and systematic surveys have been conducted in the forest in the Region. Data collected at survey sites will be used in conjunction with mapped data to develop predictive models for the species (Loyn *et al.* in prep). There are currently no management prescriptions for this species in the Forest Management Areas which are incorporated in the North East Region and these studies will facilitate the development of appropriate management prescriptions for abating forestry-related threatening processes.

Species Characteristics:

The Masked Owl is a rarely recorded species which 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 woodland for hunting (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 agricultural and pastoral areas (Schodde and Mason 1980, Peake *et al.* 1993).

Distribution in the North East Region:

There are only three records of Masked Owl within the North East Region. One of these records is from the Rutherglen area where birds were recorded over several years; the most recent record from this area was 1976. The other record was also from the Rutherglen area but was in 1914. The most recent record (1986) is from near Kevington in Eildon State forest (Atlas of Victorian Wildlife). Recent surveys by the Department of Natural Resources and Environment did not detect Masked Owl within the North East Region. Although Masked Owls are cryptic and do not readily respond to playback (Debus 1995), the results of this survey indicate the species is rare in the North East Region.

Disturbances and potentially threatening process operating in the North East Region:

Loss of habitat through clearance of native vegetation is a significant threat to the Masked Owl in the North East. The species is known to nest in disturbed areas such as isolated stands of trees in paddocks (Hollands 1991). However, habitat is being lost through continued clearing and tree dieback and is not being replaced by natural regeneration as a result of grazing (Debus and Rose 1994). Masked Owls are known to hunt along roads and road widening and maintenance activities may result in a loss of habitat.

Introduced species, particularly Foxes, may be competing for prey with the Masked Owl affecting 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 this species from pesticide residues found in prey species is unknown and requires investigation.

Loss of nest and roost sites is a threat in forests managed for timber production and because Masked Owls require open forest for foraging, dense logging regeneration may not be suitable foraging habitat (Peake *et al.* 1993). Wildfires also result in a loss of habitat and prey and are a threat to the species. Frequent fuel reduction burns are known to cause the death of young trees and shrubs (Adams and Robinson 1996) and may result in the loss of roosting habitat and prey (E. McNabb pers. comm.).

Sooty Owl

Tyto tenebricosa

RARITY

a) Geographic Range

- Classification of range size within Region: Medium
- Distribution of records within Region: The majority of records are from the south of the Region on the adjacent slopes of the Great Dividing Range.
- Proportion of Region recorded from (%): 6
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: 50-150 pairs
- Density: East Gippsland estimate for public land of between 1 pair/50km² (McIntyre and Bramwell in prep) and 1 pair/96 km² (McIntyre and Henry in prep). Using data from across Victoria 1-9 individuals/ 100 km² in most of the forested land east of Melbourne (Silveira 1997).
- Home Range (ha): 200-800+. Estimates have varied from 200 ha to 3000 ha and appears to vary depending on habitat quality (ie. prey density).
- Source: Schodde and Mason (1980), Kavanagh (1996), Silveira (1997), E. McNabb pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Narrow
- Vegetation types inhabited in the Region: Generally recorded from closed forests (rainforests), tall open-forests

and open-forests, across a range of EVCs. During a recent survey of the North East Region, most records of Sooty Owl were from the Damp Forest EVC followed by Herb-rich Foothill Forest, Shrubby Dry Forest and Montane Dry Forest.

- Source: C. Silveira pers. comm., Loyn *et al.* (in prep)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Unknown, possibly declined
- Source: Ed McNabb pers. comm.

Population trend since discovery by Europeans

- Increased, stable or declined: Declined
- Source: Garnett (1992a), Debus (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
- Source: Schodde and Mason (1980)

LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity (yrs): Probably 2
- Mean clutch/litter/brood size: 2
- Mean no of clutches/litters/broods per year: 1
- Time of year young born/hatch: all year round although there appear to be peaks in detections of young birds in autumn and spring
- Source: Schodde and Mason (1980), R. Loyn and E. McNabb pers. comm.

b) Longevity

- Classification of lifespan: Long-lived
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): Unknown
- Source: R. Loyn and Ed McNabb pers. comm.

c) Morphology

Adult body size

- Weight (g): 750-1000 females, 500-700 males
- Length (mm): 440-510 females, 370-430 males
- Source: Schodde and Mason (1980)

d) Social organisation

- Colonial or non-colonial: Non-colonial
- Territoriality: Territorial
- Source: Schodde and Mason (1980)

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Diet: Carnivore (terrestrial and arboreal mammals)
- Source: Schodde and Mason (1980), Lundie-Jenkins (1992), Milledge (1996)

THREATS

1. **Clearing of Native Vegetation: Ranking (2)** E. McNabb pers. comm.
2. **Timber harvesting: Ranking (3)** Milledge *et al.* (1991), Garnett (1992a), Davey (1993), Debus (1994), E. McNabb pers. comm.
3. **Fuel Reduction Burning: Ranking (2)** E. McNabb pers. comm.
4. **Firewood Collection: Ranking (1)** E. McNabb pers. comm.
5. **Unplanned Fire: Ranking (3)** E. McNabb pers. comm.
6. **Introduced Species: Ranking (0)** E. McNabb pers. comm.
7. **Grazing/Trampling: Ranking (-)**
8. **Pest Control: Ranking (1)** E. McNabb pers. comm.
9. **Road Construction and Maintenance: Ranking (1)** E. McNabb pers. comm.
10. **Mining/Quarrying: Ranking (1)** E. McNabb pers. comm.
11. **Tree Dieback: Ranking (1)** E. McNabb pers. comm.
12. **Recreation: Ranking (0)** E. McNabb pers. comm.
13. **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.
16. **Other: Climate Change Ranking: (2)** Bennett *et al.* (1991)

Current Management:

The Sooty Owl is classified as "rare" in Victoria (CNR 1995a) and is listed under the Victorian *Flora and Fauna Guarantee Act* 1988 although there is currently no Action Statement for the species. An assessment of the status of the Sooty Owl within the North East Region has been completed (Silveira 1997) and systematic surveys have been conducted. Data collected during the survey will be used in conjunction with mapped variables to develop predictive models for the species (Loyn *et al.* in prep). There are currently no management prescriptions for the Sooty Owl in the Forest Management Areas which are incorporated in the North East Region and these studies will facilitate the development of appropriate management prescriptions for abating forestry-related threatening processes.

Species characteristics:

The Sooty Owl is a specialist inhabitant of nutrient rich, wet forests (Lumsden *et al.* 1991, Milledge *et al.* 1991). Large trees with hollows are required for roosting and breeding; caves may also be used if available. Sooty Owls feed on both arboreal and terrestrial mammals although in some areas

terrestrial mammals make up the bulk of the prey (Schodde and Mason 1980, E. McNabb pers. comm.).

Distribution in the North East Region:

A recent survey of the North East Region found the Sooty Owl to be widespread but rare throughout the moister forests of the Region. It has not been recorded from the drier Box Ironbark forest types, or from the River Red Gum *Eucalyptus camaldulensis* riparian habitats. Within the North East Sooty Owls were recorded from a range of altitudes, and appeared to favour gullies and midslopes and sites with easterly or southerly aspects reflecting their preference for wetter environments. The species was most frequently recorded from the more senescent age-classes of forest at sites with many dead hollow-bearing trees and a dense middle storey containing Silver Wattles *Acacia dealbata* or Blackwood *Acacia melanoxylon*, Blanketleaf *Bedfordia arborescens* and treeferns. Sooty Owls appeared to favour sites with a greater abundance of the Greater Glider *Petauroides volans* and from sites of Greater Gliders and Sugar Gliders (Loyn *et al.* in prep).

Disturbances and potentially threatening processes within the North East Region:

Because the Sooty Owl is mainly dependent on large tree hollows for nesting and are partially dependent on prey which also require tree hollows, major disturbances in the North East are those which result in a reduction in the availability of tree hollows and consequently the abundance of prey (Milledge *et al.* 1991, Garnett 1992a, Debus 1994, R. Loyn pers. comm.). These disturbances include timber harvesting, commercial firewood collection and extensive wildfire. These disturbances in addition to fuel reduction burning can also result in a reduction in the availability of ground dwelling and scansorial prey (E. McNabb pers. comm.). Road construction and maintenance associated with timber harvesting may also result in habitat loss. Sooty Owls are known to prey upon rats, and secondary poisoning following rat baiting near towns may have a detrimental impact on the species. Habitat alteration as a consequence of climate change associated with the Enhanced Greenhouse Effect is also a threat to the species. (Bennet *et al.* 1991, R. Loyn pers. comm.).

Glossy Black-Cockatoo *Calyptorhynchus lathami*

RARITY

a) Geographic Range

- Classification of range size within Region: Small
- Distribution of records within Region: There are only 3 records in the study area; near Wangaratta, near Chiltern and near Myrtleford
- Proportion of Region recorded from (%): <1
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: Total Victorian population probably less than a few hundred birds
- Density: Unknown, very sparsely distributed.
- Home Range (ha): Large; has been recorded travelling 40 km to feed
- Source: S. Henry pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Narrow
- Vegetation types inhabited in the Region: Eucalypt forest and woodland containing stands of casuarinas *Allocasuarina* spp. Recorded from Shrubby Dry Forest EVC in the study area
- Source: Clout (1989), Joseph in Brouwer and Garnett (1990), NRE BioMap (November 1997)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Unknown, difficult to assess due to longevity and time-lag of effects but numbers are possibly stable in Victoria
- Source: Clout (1989), Brouwer and Garnett (1990)

Population trend since discovery by Europeans

- Increased, stable or declined: Declined
- Source: Clout (1989), Garnett (1992a)

SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: Unknown, probably low
- Source: Emison *et al.* (1987)

b) Dispersal

- Classification of powers of dispersal: High
- Average distances dispersed: Unknown, variable.
- Maximum distance dispersed: Species moves up to several 100's of kms in East Gippsland and South East NSW especially over autumn and winter, Kangaroo Island individuals known to disperse 14 km across the Backstairs Passage to the southern Mount Lofty Ranges.
- Source: Forshaw and Cooper (1981), S. Henry pers. comm.

LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity (yrs): Unknown, possibly 2
- Mean clutch/litter/brood size: 1

- Mean no of clutches/litters/broods per year: 1
- Time of year young born/hatch: April-August
- Source: Forshaw and Cooper (1981), Joseph (1982)

b) Longevity

- Classification of lifespan: Long-lived
- Average lifespan (yrs): No information for wild birds
- Maximum lifespan (yrs): Greater than 30 years
- Source: Forshaw and Cooper (1981)

c) Morphology

Adult body size

- Weight (g): Female 422, male 430
- Length (mm): 480
- Source: Forshaw and Cooper (1981)

d) Social organisation

- Colonial or non-colonial: Non-colonial, usually seen in threes comprising a pair and their young, sometimes pairs and small groups. Pairs or family parties generally roost alone but join other groups at food or water.
- Territoriality: Possibly territorial while breeding, displacement of individuals from favoured feeding trees has also been observed.
- Source: Forshaw and Cooper (1981), Emison *et al.* (1987), Clout (1989)

e) Other

- Nomadic, migratory, sedentary: Sedentary in some areas, pronounced local movements within defined areas of suitable habitat in other areas or can be unpredictable visitors turning up in areas where they are virtually unknown.
- Diet: Granivore, almost totally dependent upon the seeds of casuarinas *Allocasuarina* spp.
- Source: Forshaw and Cooper (1981)

THREATS

1. **Clearing of Native Vegetation: Ranking (1)** Emison *et al.* (1987), R. Loyn pers. comm.

2. **Timber harvesting: Ranking (-)**

3. **Fuel Reduction Burning: Ranking (1)** Clout (1989), R. Loyn pers. comm.

4. **Firewood Collection: Ranking (-)**

5. **Unplanned Fire: Ranking (-)**

6. **Introduced Species: Ranking (-)**

7. **Grazing/Trampling: Ranking (1)** Pepper (1997), R. Loyn pers. comm.

8. **Pest Control: Ranking (0)**

9. **Road Construction and Maintenance: Ranking (0)**

10. **Mining/Quarrying: Ranking (-)**

11. **Tree Dieback: Ranking (-)**

12. **Recreation: Ranking (0)**

13. **Illegal Collection/Harvesting: Ranking (-)**

14. **Vandalism/Disturbance by Humans: Ranking (0)**

15. **Dams/Impoundments: Ranking (0)**

Current Management:

The Glossy Black-Cockatoo is classified as "vulnerable" (CNR 1995a) and is listed under the Victorian *Flora and Fauna Guarantee Act* 1988. There are no threat-ameliorating management prescriptions for the species within the North East Region.

Species characteristics:

The Glossy Black-Cockatoo is rare throughout its range. It feeds almost exclusively on the seeds of casuarinas (*Allocasuarina* spp.), mostly Black She-oak *A. littoralis*, Drooping She-oak *A. verticillata* and Forest Oak *A. torulosa* (Joseph in Brouwer and Garnett 1990). The Victoria stronghold of the Glossy Black-Cockatoo is East Gippsland where these species of casuarina are most abundant (Emison *et al.* 1987). It has also been recorded in the Upper Murray Valley particularly where Murray Pine woodlands occur near rivers and in nearby uplands (Emison *et al.* 1987). Glossy Black-Cockatoos nest in large tree hollows and suitable breeding habitat includes areas where large hollow-bearing eucalypts are close to stands of *Allocasuarina* (Clout 1989, Joseph 1982).

Distribution in the North East Region:

There are only three records of the Glossy Black-Cockatoo within the North East Region: one near Wangaratta, one near Chiltern and the third in the vicinity of Myrtleford (Atlas of Victorian Wildlife). The status of the species within the Region requires clarification as it is unknown whether sightings are of rare vagrants, migrants or a members of a breeding population (Silveira *et al.* 1997). However, it is most likely records of the species within the North East Region are of nomadic birds from other areas (D. Robinson and R. Loyn pers. comm.); records from the Upper Murray Valley near Wangaratta for example are possibly of birds from the northern population near Griffith in New South Wales (Emison *et al.* 1987).

Disturbances and potentially threatening process operating in the North East Region:

Because Glossy Black-Cockatoos are most likely only occasional visitors to the Region, disturbances are unlikely to impact significantly on the population. However, loss of feeding habitat in the Upper Murray Valley through clearing may result in a lack of food for nomadic birds. Although *Allocasuarina* can regenerate successfully after fire, frequent successive fuel reduction burns within a 10 year period could prevent the species from producing seed (Clout 1989). Grazing may prevent regeneration of suitable habitat; grazing by sheep is

known to reduce regeneration of Drooping Sheoak on Kangaroo Island (Pepper 1997).

Gang-gang Cockatoo
Callocephalon fimbriatum

RARITY

a) Geographic Range

- Classification of range size within North East Region: Large
- Distribution of records within North East Region: Widespread
- Proportion of North East Region from which recorded: 50%
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Medium
- Population estimate: Unknown
- Density: 0.14-0.44 birds/ha at Boola Boola, Victoria.
- Home range: Unknown
- Source: Loyn (1980), C. Silveira pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Wide, but requires tree-hollows in which to nest.
- Vegetation types inhabited in the North East Region: Tall open-forest, open-forest and woodland across a range of EVCs.
- Source: LCC (1984)

DYNAMICS

Population Trend in Last Decade

- Increasing, stable or declining: Unknown, possibly declining
- Source: Chambers (1995)

Population trend since discovery by Europeans

- Increasing, stable or declining: Likely decline commensurate with large-scale habitat clearance and the progressive conversion of remaining forests and woodlands on unreserved public land to younger-aged stands with fewer or no hollows in which to nest. Known to have declined in some parts of its range.
- Source: Crome (1992), Blakers *et al.* (1984), Chambers (1995), C. Silveira pers. comm.

SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: Unknown
- Source: C. Silveira

b) Dispersal

- Classification of powers of dispersal: High
- Average distance dispersed: Unknown
- Maximum distance dispersed: Hundreds of kilometres.
- Source: Blakers *et al.* (1984), Schodde and Mason (1997)

LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity: Probably 2-3 years.
- Mean clutch/litter/brood size: 2
- Mean no. of clutches/litters/broods per year: 1
- Time of year young born/hatch: Spring to summer.
- Source: Beruldsen (1980)

b) Longevity

- Classification of lifespan: Probably long-lived.
- Average lifespan: Unknown
- Maximum lifespan: At least 60 in captivity; captive birds often continue to breed at 20-25 years.
- Source: G. Dosser pers. comm. in Chambers (1995)

c) Morphology

Adult body size

- Weight (g): 219
- Length (mm): 340
- Source: Simpson and Day (1996)

d) Social organisation

- Colonial or non-colonial: Non-colonial; pairs or family groups during breeding season; large flocks of up to 100 at other times, although smaller flocks of up to six more common.
- Territoriality: Territorial when breeding.
- Source: Forshaw and Cooper (1981), Blakers *et al.* (1984), Schodde and Tidemann (1986), Chambers (1995)

e) Other

- Nomadic, migratory, sedentary: Partial altitudinal migrant which occurs in coastal and lower altitudes of the Great Dividing Range in autumn and winter and higher, cooler mountain forests in which it breeds in spring and summer.
- Mode of feeding: Granivorous and occasionally insectivorous.
- Source: Forshaw and Cooper (1981), Blakers *et al.* (1984), Schodde and Mason (1997)

THREATS

1. **Clearing of Native Vegetation: Ranking (2)** Emison *et al.* (1987)
2. **Timber-harvesting: Ranking (2)** Emison *et al.* (1987)
3. **Fuel Reduction Burning: Ranking (1)** C. Silveira pers. comm.
4. **Firewood Collection: Ranking (-)**
5. **Unplanned Fire: Ranking (2)** C. Silveira pers. comm.
6. **Introduced Species: Ranking (0)** C. Silveira pers. comm.
7. **Grazing/Trampling: Ranking (-)**

8. **Pest Control Measures: Ranking (0)** C. Silveira pers. comm.
9. **Road Construction and Maintenance: Ranking (-)**
10. **Mining/Quarrying: Ranking (-)**
11. **Tree Dieback: Ranking (-)**
12. **Recreation: Ranking (0)**
13. **Illegal Collection/Harvesting: Ranking (-)** 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 Gang-gang Cockatoo is not considered "threatened" in Victoria (CNR 1995a). There are no threat-ameliorating management prescriptions for the Gang-gang Cockatoo within the North East Region.

Species characteristics:

The Gang-gang Cockatoo is a widely distributed species which is most frequently recorded from forests and woodlands where rainfall exceeds 700 mm (Emison *et al.* 1987). There is a seasonal shift in the bulk of the population; during the winter Gang-gangs are more common in lowland habitats but return to the mountain forests in spring where the majority of birds nest (Forshaw and Cooper 1981, Blakers *et al.* 1984). Gang-gangs nests in tree hollows placed high up in eucalypts, mainly in mature forest (Schodde and Tidemann 1986, Emison *et al.* 1987, Crome 1992). Mature forests also provide important foraging habitat; birds generally forage amongst the canopy, sub-canopy and shrub layers for the seeds of eucalypts and acacias. Berries, nuts, fruits, vegetable matter and insects and their larvae are also eaten (Forshaw and Cooper 1981, Blakers *et al.* 1984, Recher and Holmes 1985).

Distribution in the North East Region:

Widespread, but more common in habitats where rainfall exceeds 700 mm (Emison *et al.* 1987, Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the North East Region:

Habitat clearance, timber harvesting and wildfire can result in the loss of hollow-rich old eucalypts and foraging habitat and are the most significant threats to the Gang-gang Cockatoo in the North East Region. Consequently, the retention of mature forest for nesting is considered essential for maintaining numbers at present levels (Emison *et al.* 1987).

Azure Kingfisher

Alcedo azurea

RARITY

a) Geographic Range

- Classification of range size within Region: Medium
- Distribution of records within North East Region: Widespread
- Proportion of North East Region from which recorded: 12%
- 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 North East Region: Riparian EVCs
- Source: Emison *et al.* (1987), C. Silveira pers. comm.

DYNAMICS

Population Trend in Last Decade

- Increasing, stable or declining: Unknown
- Source: C. Silveira pers. comm.

Population trend since discovery by Europeans

- Increasing, stable or declining: Declined at southern end of its Australian range.
- Source: Blakers *et al.* (1984)

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.
- Maximum 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.
- Mode of feeding: Carnivorous (fish, frogs, insects and crustaceans).
- Source: McEvey (1965), Blakers *et al.* (1984), Emison *et al.* (1987)

THREATS

1. **Clearing of Native Vegetation: Ranking (1)** 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 (-)
5. Unplanned Fire: Ranking (-)
6. **Introduced Species: Ranking (2)** Shields (1994), S. Saddler 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 (-)
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 (3)** Shields (1994), Koehn *et al.* (1996), R. Loyn pers. comm.

Current management:

The Azure Kingfisher is not considered "threatened" in Victoria (CNR 1995a). There are no threat-ameliorating management prescriptions for the Azure Kingfisher within the North East 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 which it excavates in the bank of the stream beside the water (Blakers *et al.* 1984, Shields 1994).

Distribution in the North East Region:

Most records are from the sheltered creeks and rivers running off the Great Dividing Range and feeding into the Murray River system. Other scattered records are from the south and south-east of the Region. Major rivers the species has been recorded from include: the Murray, Ovens, Mitta Mitta, Kiewa and Goulburn Rivers. It has also been recorded from dams, lakes and impoundments including: Lesters Lagoon, Loombah Weir, Chiltern Valley Dam, Lake Kerford and Lake William Hovell. The majority of records are pre-1980 (66%) (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the North East Region:

Disturbances that result in the pollution of streams, alterations to stream flow or that remove adjacent riparian vegetation such as clearing, are likely to threaten the Azure Kingfisher. Stream frontages are commonly grazed under licence 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. Saddler 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.).

Dollarbird

Eurystomus orientalis

RARITY

a) Geographic Range

- Classification of range size within Region: Medium
- Distribution of records within North East Region: Widespread, mainly north of the Great Dividing Range.
- Proportion of North East Region from which recorded: 22%
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Medium
- Population estimate: Unknown
- Density: 0.14 birds/ha at Armidale, NSW; 0.05-0.10 birds/ha at Moruya, NSW.
- Home range: Nests were about 0.75 km apart along streams and creeks on the Ord River, WA.
- Source: Blakers *et al.* (1984)

c) Habitat Specificity

- Classification of habitat specificity: Narrow
- Vegetation types inhabited in the North East Region: Woodland and Riverine EVCs.
- Source: LCC (1984), R. Loyn pers. comm.

DYNAMICS

Population Trend in Last Decade

- Increasing, stable or declining: Unknown
- Source: C. Silveira pers. comm.

Population trend since discovery by Europeans

- Increasing, stable or declining: Unknown
- Source: C. Silveira pers. comm.

SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: Unknown
- Source: C. Silveira pers. comm.

b) Dispersal

- Classification of powers of dispersal: High
- Average distance dispersed: Unknown, but in the order of thousands of kilometres given absence from most of Australia during winter.
- Maximum distance dispersed: 108 km by a banded individual.
- Source: Baker *et al.* (1997), Schodde and Mason (1997)

LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity: Probably 1-2 years.
- Mean clutch/litter/brood size: 4 eggs
- Mean no. of clutches/litters/broods per year: 1
- Time of year young born/hatch: Late spring to summer.
- Source: Beruldsen (1980)

b) Longevity

- Classification of lifespan: Probably long-lived.
- Average lifespan: Unknown
- Maximum lifespan: Unknown
- Source: C. Silveira pers. comm.

c) Morphology

Adult body size

- Weight (g): 140
- Length (mm): 270-310
- Source: Keast (1985), Simpson and Day (1996)

d) Social organisation

- Colonial or non-colonial: Non-colonial; solitary, in pairs when breeding and family groups after breeding.
- Territoriality: Territorial when breeding.
- Source: Blakers *et al.* (1984), Schodde and Tidemann (1986).

e) Other

- Nomadic, migratory, sedentary: Migratory in Victoria
- Mode of feeding: Insectivorous
- Source: Blakers *et al.* (1984), Schodde and Mason (1997)

THREATS

1. **Clearing of Native Vegetation: Ranking (2)** C. Silveira pers. comm.
2. **Timber harvesting: Ranking (1)** C. Silveira pers. comm.
3. **Fuel Reduction Burning: Ranking (1)** C. Silveira pers. comm.
4. **Firewood Collection: Ranking (2)** C. Silveira pers. comm.
5. **Unplanned Fire: Ranking (2)** C. Silveira pers. comm.
6. Introduced Species: Ranking (-)
7. **Grazing/Trampling: Ranking (1)** Landsberg *et al.* (1990), Davidson and Robinson (1992), C. Silveira pers. comm.
8. **Pest Control Measures: Ranking (1)** C. Silveira pers. comm.
9. Road Construction and Maintenance: Ranking (-)
10. Mining/Quarrying: Ranking (-)
11. **Tree Dieback: Ranking (1)** C. Silveira 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 (0) C. Silveira pers. comm.

Current management:

The Dollarbird is not considered "threatened" in Victoria (CNR 1995a). There are no threat-ameliorating management prescriptions for the Dollarbird within the North East Region.

Species characteristics:

The Dollarbird is a summer migrant to Australia, where it breeds. In Victoria it favours River Red Gum woodlands along rivers and streams in the lowlands and foothills of the north east of the State. It also inhabits wooded farmland, and eucalypt forests including areas of regrowth. Dollarbirds utilise exposed tree branches and twigs, usually near small clearings, as vantage points to catch their aerial insect prey, which is taken in flight. Dollarbirds actively defend the area around their nest which is placed in a tree hollow, usually high above the ground. Individuals appear to return to the same territory and nest trees in successive years (Blakers *et al.* 1984, Emison *et al.* 1987, Thompson 1994).

Distribution in the North East Region:

Records of the Dollarbird are widespread within the Region, mainly north of the Great Dividing Range. The species has been recorded in the north east corner of the Region from the vicinity of Cudgewa to the south west of the Region east of Trawool. Records from conservation reserves include: the Dartmouth Area and Wabonga Plateau areas of the Alpine National Park, Mount Buffalo, and Chiltern Box-Ironbark National Park and Reef Hills Park. It has also been recorded from the Murray and Ovens Rivers and from the Lake Hume area. Other records are from private land and State forest blocks including Strathbogie, Ovens River, Barambogie State forests as well as State forest in the vicinity of Carboor East, Granite Flat, Tawonga Gap and Hurdle Flat south east of Beechworth (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the North East Region:

The Dollarbird depends on tree hollows for nesting and disturbances including clearing and timber harvesting may result in some loss of habitat. In the North East Region, timber harvesting is not conducted in Red Gum Woodland, the preferred habitat of the Dollarbird, although in this habitat firewood collection may result in loss of habitat. Dollarbirds are known to use cleared areas providing some old trees are present including wooded farmland, (Blakers *et al.* 1984, Emison *et al.* 1987) and loss of large trees from paddocks where there is little or no regeneration due to continued grazing by cattle and sheep is a threat to habitat quality (Davidson and Robinson 1992). Tree dieback may also result in loss of habitat. Grazing contributes to tree dieback due to increased nutrient input, root damage and soil compaction (Landsberg *et al.* 1990). High rates of clearing and an increased use of pesticides are associated with intensified land use and result in loss of habitat on private land and may reduce insect availability (Robinson *et al.* in prep).

Chestnut-rumped Heathwren

Hylacola pyrrhopygia

RARITY

a) Geographic Range

- Classification of range size within Region: Small
- Distribution of records within North East Region: Concentrations in the north-west and the south-east; solitary records in the north and the south.
- Proportion of North East Region from which recorded: 3%
- 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 North East Region: Open-forest and woodland, especially those with a heathy understorey; also low shrubs among rocky outcrops. Has been recorded from the Shrubby Dry Forest, Heathy Dry Forest and Box Ironbark Forest EVCs within the North East.
- Source: LCC (1984), NRE BioMap (November 1997)

DYNAMICS

Population Trend in Last Decade

- Increasing, stable or declining: Unknown
- Source: C. Silveira pers. comm.

Population trend since discovery by Europeans

- Increasing, stable or declining: Likely decline in Australia commensurate with clearance of favoured woodland habitat
- Source: Blakers *et al.* (1984)

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 Measures: Ranking (0) C. Silveira pers. comm.
9. Road Construction and Maintenance: Ranking (0) C. Silveira pers. comm.
10. Mining/Quarrying: Ranking (0) C. Silveira pers. comm.
11. Tree Dieback: Ranking (0) 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 currently not considered "threatened" in Victoria (CNR 1995a). There are no threat-ameliorating management prescriptions for the Chestnut-rumped Heathwren within the North East 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. 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 built close to the ground in low shrubs or grass tussocks (Blakers *et al.* 1984, Emison *et al.* 1987).

Distribution in the North East Region:

There are two small concentrations of records of the Chestnut-rumped Heathwren; in the south east of the Region from the Dartmouth Area of the Alpine National Park and in the north west of the Region from the Chiltern Box-Ironbark National Park, private land west of Chiltern, near Mt Barambogie and Mt Pilot in the Barambogie Ranges and from Beechworth Historic Park. There are also isolated records from private land near Wyeebo and from State forest near Jamieson (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the North East 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. In addition, the isolated and restricted nature of populations in the North East Region make them particularly vulnerable to disturbances. 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, particularly as the Barambogie Range and forest near Beechworth are major firewood collection areas and support Chestnut-rumped Heathwren populations (NRE unpublished data, Atlas of Victorian Wildlife). 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.).

Speckled Warbler
Chthonicola sagittata

RARITY

a) Geographic Range

- Classification of range size within Region: Small
- Distribution of records within North East Region: Predominantly in drier forests, and woodlands, below about 600 m on the western and northern slopes of the Great Dividing Range.
- Proportion of North East Region from which recorded: 14%
- 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 (1984), Blakers *et al.* (1984), Tzaros (1996)

c) Habitat Specificity

- Classification of habitat specificity: Wide
- Vegetation types inhabited in the North East Region: Woodlands and open-forests with a grassy understorey; also recorded on pine plantation/farmland margin near Chiltern. Has been recorded from Grassy Dry Forest, Heathy Dry Forest and Box Ironbark EVCs.
- Source: LCC (1984), NRE BioMap (November 1997), C. Silveira pers. comm.

DYNAMICS

Population Trend in Last Decade

- Increasing, stable or declining: Declining; declined at Chiltern and known to have declined in other parts of its range.
- Source: C. Tzaros pers. comm.

Population trend since discovery by Europeans

- Increasing, stable or declining: Likely decline in southern Australia commensurate with large-scale habitat clearance.
- Source: C. Silveira pers. comm.

SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: High
- Source: Bell (1984)

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 (1984), Tzaros (1996)

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Mode of feeding: Granivorous and insectivorous.
- Source: Bell (1984), Blakers *et al.* (1984), Tzaros (1996)

THREATS

1. **Clearing of Native Vegetation: Ranking (2)** C. Tzaros pers. comm.
2. **Timber-harvesting: Ranking (2)** McEvey (1965), C. Tzaros pers. comm.
3. **Fuel Reduction Burning: Ranking (1)** Tzaros (1996)
4. **Firewood Collection: Ranking (2)** C. Tzaros pers. comm.
5. **Unplanned Fire: Ranking (1)** Tzaros (1996)
6. **Introduced Species: Ranking (1)** Tzaros (1996)
7. **Grazing/Trampling: Ranking (2)** C. Tzaros pers. comm.
8. **Pest Control Measures: Ranking (0)** C. Tzaros pers. comm.
9. **Road Construction and Maintenance: Ranking (0)** C. Tzaros pers. comm.
10. **Mining/Quarrying: Ranking (-)**
11. **Tree Dieback: Ranking (1)** C. Tzaros pers. comm.
12. **Recreation: Ranking (0)** C. Tzaros pers. comm.
13. **Illegal Collection/Harvesting: Ranking (0)** C. Tzaros pers. comm.
14. **Vandalism/Disturbance by Humans: Ranking (0)** C. Tzaros pers. comm.
15. **Dams/Impoundments: Ranking (0)** C. Tzaros pers. comm.

Current management:

The Speckled Warbler is currently not considered "threatened" in Victoria (CNR 1995a). There are no threat-ameliorating management prescriptions for the Speckled Warbler within the North East Region.

Species characteristics:

The Speckled Warbler is a ground nester and ground foraging species which inhabits the drier forests and woodlands of the northern foothills of the Great Dividing Range (Emison *et al.* 1987). The species 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 1984, 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).

Distribution in the North East Region:

Records of the Speckled Warbler are predominantly from drier forests and woodlands, below about 600 m on the western and northern slopes of the Great Dividing Range (Atlas of Victorian Wildlife). The species has been recorded from private land, State forest and conservation reserves. The majority of records are from Chiltern Box-Ironbark National Park where it is a common breeding resident (Traill *et al.* 1996) and surrounding areas, the Barambogie Ranges and from near Beechworth (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the North East Region:

The Speckled Warbler has been recorded from wooded farmland within the North East and further clearing associated with intensified land use would result in loss of habitat on private land (Robinson *et al.* in prep). Timber harvesting may also result in loss of habitat. In addition, dense young regrowth forests are unlikely to provide suitable foraging habitat for the Speckled Warbler. Being a ground nesting species, Speckled Warblers are vulnerable to trampling by grazing cattle and predation by introduced species. Firewood collection results in disturbance to the ground layer, and removal of debris and fallen timber and is considered a moderate threat to the species (C. Tzaros 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).

Pink Robin

Petroica rodinogaster

RARITY

a) Geographic Range

- Classification of range size within Region: Large
- Distribution of records within North East Region: Widespread
- Proportion of North East Region from which recorded: 11%
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Medium
- Population estimate: Unknown
- Density: On average about 5 pairs bred each year along about 300 m of creek at Ferntree, Tasmania.
- Home range: Probably < 10 ha
- Source: Blakers *et al.* (1984), C. Silveira pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Wide, although more restricted during the breeding season
- Vegetation types inhabited in the North East Region: Tall open-forest, especially gullies therein; but most other vegetation types when individuals disperse. Recorded from the Wet Forest, Sub-alpine Woodland and Montane Dry Woodland EVCs.
- Source: LCC (1984), Loyn (1985), NRE BioMap (November 1997)

DYNAMICS

Population Trend in Last Decade

- Increasing, stable or declining: Stable
- Source: R. Loyn pers. comm.

Population trend since discovery by Europeans

- Increasing, stable or declining: Unknown
- Source: C. Silveira pers. comm.

SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: Low
- Source: R. Loyn pers. comm.

b) Dispersal

- Classification of powers of dispersal: High
- Average distance dispersed: Unknown
- Maximum distance dispersed: Many hundreds of kilometres.
- Source: Blakers *et al.* (1984)

LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity: Probably 1-2 years.
- Mean clutch/litter/brood size: 3 eggs
- Mean no. of clutches/litters/broods per year: 1-2
- Time of year young born/hatch: Spring to early summer

- Source: Beruldsen (1980)
- b) Longevity**
 - Classification of lifespan: Short-lived
 - Average lifespan: Unknown
 - Maximum lifespan: Three years for a banded individual.
 - Source: Baker *et al.* (1997)
- c) Morphology**
 - Adult body size
 - Weight (g): 9.4 (n=2)
 - Length (mm): 120
 - Source: Simpson and Day (1996), Baker *et al.* (1997)
- d) Social organisation**
 - Colonial or non-colonial: Non-colonial; solitary especially when dispersing, or in pairs.
 - Territoriality: Territorial when breeding.
 - Source: Schodde and Tidemann (1986)
- e) Other**
 - Nomadic, migratory, sedentary: Adult males are sedentary, but other individuals disperse widely.
 - Mode of feeding: Insectivorous
 - Source: Blakers *et al.* (1984), Schodde and Tidemann (1986)

THREATS

- 1. Clearing of Native Vegetation: Ranking (1)** R. Loyn pers. comm.
- 2. Timber-harvesting: Ranking (1)** Blakers *et al.* (1984)
- 3. Fuel Reduction Burning: Ranking (1)** R. Loyn pers. comm.
4. Firewood Collection: Ranking (0)
- 5. Unplanned Fire: Ranking (1)** R. Loyn pers. comm.
6. Introduced Species: Ranking (-)
- 7. Grazing/Trampling: Ranking (1)** R. Loyn pers. comm.
8. Pest Control Measures: Ranking (0) R. Loyn pers. comm.
9. Road Construction and Maintenance: Ranking (-)
10. Mining/Quarrying: Ranking (0) R. Loyn pers. comm.
11. Tree Dieback: Ranking (-)
12. Recreation: Ranking (0) R. Loyn pers. comm.
13. Illegal Collection/Harvesting: Ranking (0) R. Loyn pers. comm.
14. Vandalism/Disturbance by Humans: Ranking (0) R. Loyn pers. comm.
15. Dams/Impoundments: Ranking (0) R. Loyn pers. comm.
- 16. Climate Change: Ranking (2)** Bennett *et al.* (1991)

Current management:

The Pink Robin is not considered "threatened" in Victoria (CNR 1995a). Under the Code of Forest Practices for Timber Production (NRE 1996), cool temperate rainforest, important breeding habitat of the Pink Robin, is excluded from harvesting and must be surrounded by an appropriate buffer. For rainforest stands of lesser significance, buffers of 40 m are to be retained, or 20 m exclusion plus a 40 m modified harvesting strip. For stands where *Nothofagus* makes up greater than 20% of the canopy, a 60 m buffer is to be retained, or 40 m buffer with 40 m modified harvesting zone. Stands containing nationally significant rainforest are generally protected at the sub-catchment level (NRE 1996).

Species characteristics:

The Pink Robin breeds exclusively in mountain forests, usually in gullies. In Wet Forest highest densities are recorded from gullies containing cool temperate rainforest of Myrtle Beech *Nothofagus cunninghamii* (Blakers *et al.* 1984, Loyn 1985). During the non-breeding season, females and juveniles disperse into drier and lower elevation forests while adult males tend to stay in the vicinity of the breeding territory but forage over a wider area (Blakers *et al.* 1984). Pink Robins feed exclusively on insects and other invertebrates taken from the ground, the air and the foliage of low understorey shrubs; the majority of food is taken on the ground by diving on to it from a low perch (Blakers *et al.* 1984, Schodde and Tidemann 1986).

Distribution in the North East Region:

Records of the Pink Robin are fairly widespread although sparsely distributed throughout the Region. The species has mostly been recorded from State forest and conservation reserves including the Bogong Area, Barry Mountains and Dargo High Plains in the Alpine National Park, and Mount Buffalo National Park. It has also been recorded from State forest between Myrree and Wrightley, the Strathbogie Ranges, and from State forest near Howqua and Mount Stirling (Atlas of Victorian Wildlife).

Disturbances and threatening processes operating in the North East Region:

The ground layer and understorey shrub layers are important habitat components for the Pink Robin; disturbances which affect these layers are potential threats to the species. Grazing and fuel reduction burning simplifies understorey structure which may affect its habitat quality for the Pink Robin. Timber harvesting, clearing and wildfire may also result in habitat loss. Invasion of stream-side gullies, by Blackberry may constitute loss of breeding habitat although the significance of this disturbance is unknown (R. Loyn and C. Silveira pers. comm.). Habitat alteration as a consequence of climate change associated with the Enhanced Greenhouse Effect is also a threat to the species. (Bennet *et al.* 1991).

Cicadabird *Coracina tenuirostris*

RARITY

a) Geographic Range

- Classification of range size within Region: Medium
- Distribution of records within North East Region: Records are widespread although patchily distributed; there is a concentration of records in the south-west which is a reflection of surveys conducted in the area in the early to mid 1980s and it is likely the actual distribution is less patchy than is suggested by the records.
- Proportion of North East Region from which recorded: 12 %
- Source: Atlas of Victorian Wildlife, C. Silveira pers. comm.

b) Abundance

- Classification of abundance: Medium
- Population estimate: Unknown
- Density: 0.3-0.5 birds/ha at Wollomombi, NSW; 0.08-0.11 birds/ha at Moruya, NSW; and 0.1 birds/ha at Boola Boola, Victoria.
- Home range: Unknown
- Source: Blakers *et al.* (1984), C. Silveira pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Wide
- Vegetation types inhabited in the North East Region: Tall open-forest and open-forest across a range of EVCs; rarely in woodland in Victoria. Generally found in mature forest. The majority of North East records are from the Herb-rich Foothill Forest EVC; also recorded from the Heathy Dry Forest, Shrubby Dry Forest, Grassy Dry Forest, Wet Forest and Damp Forest EVCs.
- Source: LCC (1984), Trill *et al.* (1996), NRE BioMap (November 1997), R. Loyn and C. Silveira pers. comm.

DYNAMICS

Population Trend in Last Decade

- Increasing, stable or declining: Unknown
- Source: C. Silveira pers. comm.

Population trend since discovery by Europeans

- Increasing, stable or declining: Unknown
- Source: C. Silveira pers. comm.

SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: Unknown
- Source: C. Silveira pers. comm.

b) Dispersal

- Classification of powers of dispersal: High
- Average distance dispersed: Unknown, but absence from southern Australia during winter suggests thousands of kilometres.
- Maximum distance dispersed: Unknown
- Source: Blakers *et al.* (1984), Schodde and Tidemann (1986), 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: 1 egg
- Mean no. of clutches/litters/broods per year: Probably one.
- Time of year young born/hatch: Late spring to early summer in southern Australia.
- Source: Beruldsen (1980), Shields (1994), C. Silveira pers. comm.

b) Longevity

- Classification of lifespan: Long-lived
- Average lifespan: Unknown
- Maximum lifespan: Six years for a banded individual.
- Source: Baker *et al.* (1997), R. Loyn pers. comm.

c) Morphology

- Adult body size
 - Weight (g): 64-73
 - Length (mm): 240-260
 - Source: Rowland (1984), Simpson and Day (1996), Baker *et al.* (1997)

d) Social organisation

- Colonial or non-colonial: Non-colonial; solitary or in pairs; occasionally clusters of adults.
- Territoriality: Territorial when breeding.
- Source: Shields (1994), Schodde and Tidemann (1986)

e) Other

- Nomadic, migratory, sedentary: Migratory in Victoria.
- Mode of feeding: Insectivorous
- Source: Rowland (1984), Emison *et al.* (1987)

THREATS

- 1. Clearing of Native Vegetation: Ranking (2)** C. Silveira pers. comm.
- 2. Timber-harvesting: Ranking (2)** C. Silveira pers. comm.
3. Fuel Reduction Burning: Ranking (-)
4. Firewood Collection: Ranking (0) C. Silveira pers. comm.
- 5. Unplanned Fire: Ranking (1)** C. Silveira pers. comm.
6. Introduced Species: Ranking (0) C. Silveira pers. comm.
7. Grazing/Trampling: Ranking (0) C. Silveira pers. comm.
8. Pest Control Measures: Ranking (0) C. Silveira pers. comm.
9. Road Construction and Maintenance: Ranking (0) C. Silveira pers. comm.
10. Mining/Quarrying: Ranking (0) C. Silveira pers. comm.
- 11. Tree Dieback: Ranking (1)** 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 Cicadabird is not considered "threatened" in Victoria (CNR 1995a). There are no threat-ameliorating management prescriptions for the Cicadabird within the North East Region.

Species characteristics:

The Cicadabird is a summer breeding migrant to Victoria; most individuals arrive from about October, breed, then depart by March. Cicadabirds mainly occur in wet forests and rainforests in the Eastern Uplands although, in the foothills, they also inhabit drier forest types (Emison *et al.* 1987). Mature forest is preferred (Loyn 1980, 1985). Cicadabirds forage in the canopy or sub-canopy for insects and their larvae which are taken mainly from leaves or twigs. Fruit and seeds are also eaten. Nests are built in trees, and are often placed in a horizontal fork on a small branch. Males actively defend the well defined territory; individual birds or pairs may return to the same site in successive seasons (Schodde and Tidemann 1986, Shields 1994).

Distribution in the North East Region:

Records of the Cicadabird are widespread although patchily distributed within the North East Region (Atlas of Victorian Wildlife). However, this is most likely a reflection of a lack of survey effort during the spring and summer when males are calling (C. Silveira pers. comm.). Surveys for diurnal birds have been conducted across the study area as part of the North East RFA. Current records of the Cicadabird are from State forest, conservation reserves and habitat remnants on private land. The species has been recorded from the Dartmouth, Bogong and Wabonga Plateau Areas of the Alpine National Park, Chiltern Box-Ironbark National Park, Beechworth Historic Park and Mount Buffalo National Park. The majority of records from public land are from the Strathbogrie Range and from State forest near Mount Samaria. Cicadabirds have also been recorded from near Lake Eildon and from State forest near Koetong and Darbyshire (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the North East Region:

Habitat clearance, timber-harvesting, unplanned intense fires and tree dieback all remove the canopy layer that is essential for the Cicadabird. Habitat clearance also results in fragmentation of habitat and creation of small remnants that are not then utilised by this "interior" species which requires continuous eucalypt forest (C. Silveira pers. comm.).

REPTILES

Alpine Bog Skink

Pseudemoia cryodroma

RARITY

a) Geographic Range

- Classification of range size within North East Region: Small
- Distribution of records within North East Region: Recorded from two locations in the Bogong High Plains: Mt Nelse and near Mt Cope
- Proportion of North East Region recorded from (%): < 1
- 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: Narrow
- Vegetation types inhabited in the Region: Sub-alpine to alpine wet heathland and boggy creeks. Recorded in the EVC Treeless Sub-alpine Complex
- Source: Hutchinson and Donnellan (1992), BioMap NRE (Nov 1997), P. Robertson pers. comm.

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Unknown
- Source: P. Robertson pers. comm.

Population trend since discovery by Europeans

- Increased, stable or declined: Declined
- Source: P. Robertson pers. comm.

SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: Probably low
- 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 for males, 3 for females
- Mean clutch/litter/brood size: 2-5 (3)
- Mean no of clutches/litters/broods per year: 1
- Time of year young born/hatch: February
- Source: Hutchinson and Donnellan (1992), P. Robertson pers. comm.

b) Longevity

- Classification of lifespan: Short-lived
- Average lifespan (yrs): Unknown, possibly 4
- Maximum lifespan (yrs): Unknown, probably less than 10
- Source: P. Robertson pers. comm.

c) Morphology

Adult body size

- Weight (g): Approximately 2
- Length (mm): 44-60 mm females, 40-55 mm males
- Source: Hutchinson and Donnellan (1992), G. Brown pers. comm.

d) Social organisation

- Colonial or non-colonial: Non-colonial
- Territoriality: No
- Source: P. Robertson pers. comm.

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Diet: Primarily an opportunistic insectivore
- Source: Brown (1988), P. Robertson pers. comm.

THREATS

1. **Clearing of Native Vegetation: Ranking (3)** SAC (1996c), G. Brown pers. comm.
2. Timber Harvesting: Ranking (0) P. Robertson pers. comm.
3. Fuel Reduction Burning: Ranking (0) P. Robertson pers. comm.
4. Firewood Collection: Ranking (0) G. Brown pers. comm.
5. **Unplanned Fire: Ranking (1)** SAC (1996c), P. Robertson pers. comm.
6. **Introduced Species: Ranking (1)** P. Robertson pers. comm.
7. **Grazing/Trampling: Ranking (3)** SAC (1991a, 1996c), P. Robertson pers. comm.
8. Pest Control: Ranking (0) P. Robertson pers. comm.
9. **Road Construction and Maintenance: Ranking (1)** SAC (1991a, 1996c), G. Brown and P. Robertson pers. comm.
10. **Mining/Quarrying: Ranking (1)** P. Robertson pers. comm.
11. Tree Dieback: Ranking (0) P. Robertson pers. comm.
12. **Recreation: Ranking (2)** SAC (1991a, 1996c), G. Brown and 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 (2)** P. Robertson pers. comm.

16. Other: Climate Change: Ranking (3) Bennett *et al.* (1991)

Current Management:

The Alpine Bog Skink is classified as "vulnerable" in Victoria (CNR 1995a) and has received a final recommendation for listing under the Victorian *Flora and Fauna Guarantee Act 1988* (SAC 1996c). An important habitat of this species; the Alpine Bog Community, has been listed under the *Flora and Fauna Guarantee Act 1988* as a threatened community and an action statement is being prepared (McDougall and Papst in prep.).

Species Characteristics:

The Alpine Bog Skink only occurs above 1000m on mountain plateaux from central to north eastern Victoria (SAC 1996c). It is found in wet subalpine and alpine heathlands and boggy creeks, including the vegetation type defined as the Alpine Bog Community (Hutchinson and Donnellan 1992, SAC 1996c). There is limited life history information on this species.

Distribution in the North East Region

In the North East there are only 10 confirmed records since 1970; on Mt Nelse, near Falls Creek and near Mt Cope (Bogong High Plains) (Atlas of Victorian Wildlife). These sites are within Alpine National Park (Bogong Unit).

Disturbances and potentially threatening processes operating in the North East Region

The Alpine Bog Skink has a very restricted distribution so any damage to existing habitat is significant. The vegetation of the treeless alpine zone, which includes the Alpine Bog Community, is extremely sensitive to processes that cause damage because they can lead to erosion (LCC 1982). This vegetation is very slow growing, thus recovery from damage takes a long time (McDougall 1982). In addition, the soil of this zone is prone to erosion if exposed to the harsh environment, due to its light and friable nature (LCC 1982). Repeated trampling by stock and people inhibits revegetation, exposes the soil and can also lead to a diversion of water and lowering of the water table, resulting in a contraction of the bog community (McDougall and Papst in prep.). Grazing can also contribute to erosion (LCC 1982). Cattle grazing has been removed from the section of the Alpine National Park which supports the Alpine Bog Skink. Recreational activities such as hiking, four-wheel driving, skiing and associated development are significant threats to the Alpine Bog Skink because of the potential damage to its habitat (SAC 1991a, 1996c). Earthworks such as road construction, quarrying and dam construction involves habitat destruction and can lead to alteration of hydrology and the introduction of weeds (McDougall and Papst in prep.). Construction of the Rocky Valley Storage Dam inundated a proportion of Alpine Bog Skink habitat and there would be a risk of further habitat degradation if the dam were to be raised (P. Robertson pers. comm.). Even though wildfire would have lasting detrimental effects on alpine vegetation (McDougall 1982), it is considered that the likelihood of this event is low and therefore the threat to this species is minor (P. Robertson pers. comm.). Predation by Cats and Foxes is also considered a minor threat to the Alpine Bog Skink (P. Robertson pers. comm.). Climate change associated with the enhanced greenhouse effect is predicted to reduce the amount of sub-alpine and alpine habitat (Bennett *et al.* 1991) which is a potentially a significant threat to populations.

**Alpine She-oak Skink
*Cyclodomorphus praealtus***

RARITY

a) Geographic Range

- Classification of range size within North East Region: Small
- Distribution of records within North East Region: Bogong High Plains from Mt Hotham to Falls Creek
- Proportion of North East Region recorded from (%): <1
- 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: Narrow
- Vegetation types inhabited in the Region: Montane shrublands or herbfields with thick ground covering of snow grasses. Recorded in the following EVCs: Sub-alpine Woodland, Treeless Sub-alpine Complex
- Source: SAC (1996a), BioMap NRE (Nov 1997)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Declined
- Source: P. Robertson pers. comm.

Population trend since discovery by Europeans

- Increased, stable or declined: Declined
- 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: 2-19
- Mean no of clutches/litters/broods per year: 1
- Time of year young born/hatch: February
- Source: Greer (1989), Shea (1995), P. Robertson pers. comm.

b) Longevity

- Classification of lifespan: Probably short-lived
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): Unknown
- Source: P. Robertson pers. comm.

c) Morphology

Adult body size

- Weight (g): Around 21g
- Length (mm): Male 89-98, Female 81-119
- Source: Shea (1995), Schulz and Mansergh (1997)

d) Social organisation

- Colonial or non-colonial: Non-colonial
- Territoriality: Unknown
- Source: P. Robertson pers. comm.

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Diet: Invertebrates, possibly mainly molluscs and arthropods
- Source: Shea (1988), P. Robertson pers. comm.

THREATS

1. **Clearing of Native Vegetation: Ranking (3)** G. Brown and P. Robertson pers. comm.
2. **Timber Harvesting: Ranking (0)** P. Robertson pers. comm.
3. **Fuel Reduction Burning: Ranking (2)** G. Brown and P. Robertson pers. comm.
4. **Firewood Collection: Ranking (1)** P. Robertson pers. comm.
5. **Unplanned Fire: Ranking (2)** G. Brown pers. comm.
6. **Introduced Species: Ranking (1)** P. Robertson pers. comm.
7. **Grazing/Trampling: Ranking (3)** SAC (1996b), P. Robertson pers. comm.
8. **Pest Control: Ranking (0)** P. Robertson pers. comm.
9. **Road Construction and Maintenance: Ranking (1)** P. Robertson pers. comm.
10. **Mining/Quarrying: Ranking (1)** P. Robertson pers. comm.
11. **Tree Dieback: Ranking (0)** P. Robertson pers. comm.
12. **Recreation: Ranking (3)** SAC (1996b), G. Brown pers. comm.
13. **Illegal Collecting/Harvesting: Ranking (1)** P. Robertson pers. comm.
14. **Vandalism: Ranking (0)** P. Robertson pers. comm.
15. **Dams/Impoundments: Ranking (1)** P. Robertson pers. comm.
16. **Other: Climate Change: Ranking (3)** Bennett *et al.* (1991), SAC (1996b)

Current Management:

The Alpine She-oak Skink is classified as "vulnerable" in Victoria (CNR 1995a) and has received a final recommendation for listing under the Victorian *Flora and Fauna Guarantee Act 1988*. Part of its habitat, the Alpine Bog Community, has been listed under the *Flora and Fauna Guarantee Act 1988* as a threatened community and an action statement is currently being prepared (McDougall and Papst in prep.).

Species characteristics

The Alpine She-oak Skink is an uncommonly recorded inhabitant of the Australian Alps, occurring only above the treeline (Green and Osborne 1994). It occurs in heathlands and grasslands that have a thick ground cover of snow grasses (*Poa* spp) (Green and Osborne 1994, SAC 1996b). There is limited information regarding life history, population characteristics and habits of this species.

Distribution in the North East Region

In Victoria the Alpine She-oak Skink has been recorded from the Bogong High Plains and the Dargo High Plains. In the North East it has been found in the Bogong High Plains from Mt Hotham to Falls Creek with just over 30 individuals recorded (Atlas of Victorian Wildlife). These sites are within the Mt Hotham Alpine Resort and Alpine National Park.

Disturbances and potentially threatening processes operating in the North East Region

Vegetation characteristic of the Bogong High Plains, which includes the Alpine Bog Community, is very sensitive to physical disturbances as much of it is slow growing, the soils are particularly liable to erosion if exposed and establishment of seedlings is rare (LCC 1982, McDougall 1982). Therefore significant threats to the Alpine She-oak Skink involve processes that damage vegetation and expose and lead the soil to erosion. As a portion of this species' range falls within and adjacent to the Mt Hotham Alpine Resort, a major threat to populations is habitat clearing and degradation due to activities such as skiing, slope grooming and ski-lift construction. Other recreational activities such as hiking and four wheel driving that occur throughout the Alpine National

Park also contribute to habitat degradation and loss (Schulz *et al.* 1995, SAC 1996b). Grazing and trampling by stock and other introduced animals such as brumbies can damage vegetation, leading to erosion and is considered a major threat to the Alpine She-oak Skink (LCC 1982, P. Robertson pers. comm.). Cattle grazing has been removed from the Bogong high plains section of the Alpine National Park. Fire has the potential to cause severe damage to alpine habitat (McDougall 1982). Although fuel reduction burning within areas where the Alpine She-oak Skink occurs is strictly controlled and is generally avoided (DCE 1992a), potential damage as a result of this practice, and the risk of wildfire, is regarded as an important threat to this species (G. Brown and P. Robertson pers. comm.). Road works and quarrying (gravel and stone extraction) involve direct habitat destruction, contributes to erosion and can alter the drainage characteristics of the soil (LCC 1982, McDougall and Papst in prep.). There are plans to expand the extraction area of the Basalt Hill Quarry situated in the Alpine National Park which will take into account results of a current survey for presence of the Alpine She-oak Skink (E. McDowell pers. comm.). The Rocky Valley Storage Dam is surrounded by suitable Alpine She-oak Skink habitat which is potentially at risk if it were to be decided to raise the existing level (P. Robertson pers. comm.). Firewood collection may result in alteration of habitat though the potential threat to this species is small (P. Robertson pers. comm.). It is possible that the Alpine She-oak Skink is taken for private collections, although this is considered to be a minor threat (P. Robertson pers. comm.). Climate change associated with the enhanced greenhouse effect is predicted to reduce the amount of sub-alpine and alpine habitat (Bennett *et al.* 1991) which is a potentially a significant threat to populations (SAC 1996b).

Alpine Water Skink *Eulamprus kosciuskoi*

RARITY

a) Geographic Range

- Classification of range size within North East Region: Small
- Distribution of records within North East Region: Bogong High Plains around Mt Cope and Falls Creek
- Proportion of North East Region recorded from (%): <1
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: Unknown
- Density: Unknown
- Home Range (ha): Unknown
- Source: SAC (1992c), P. Robertson pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Narrow
- Vegetation types inhabited in the Region: Sphagnum mossbeds and wet heathlands along drainage lines. Recorded in the following EVCs: Sub-alpine Woodland, Treeless Sub-alpine Complex
- Source: Coventry and Robertson (1980), BioMap NRE (Nov 1997)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Declined
- Source: P. Robertson pers. comm.

Population trend since discovery by Europeans

- Increased, stable or declined: Declined
- 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, possibly 3
- Mean clutch/litter/brood size: 1-6 (3.1)
- Mean no of clutches/litters/broods per year: 1
- Time of year young born/hatch: End of January
- Source: Jenkins and Bartell (1980), Greer (1989), Green and Osborne (1994), Hutchinson and Rawlinson (1995), P. Robertson pers. comm.

b) Longevity

- Classification of lifespan: Probably short-lived
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): Unknown
- Source: P. Robertson pers. comm.

c) Morphology

Adult body size

- Weight (g): Around 11
- Length (mm): 58-76 (70)
- Source: Greer (1989), Hutchinson and Rawlinson (1995), G. Brown pers. comm.

d) Social organisation

- Colonial or non-colonial: Non-colonial

- Territoriality: Unknown, possibly territorial
 - Source: P. Robertson pers. comm.
- e) Other**
- Nomadic, migratory, sedentary: Sedentary
 - Diet: Insectivore
 - Source: Jenkins and Bartell (1980), P. Robertson pers. comm.

THREATS

1. **Clearing of Native Vegetation: Ranking (2)** P. Robertson pers. comm.
2. Timber Harvesting: Ranking (0) P. Robertson pers. comm.
3. Fuel Reduction Burning: Ranking (0) P. Robertson pers. comm.
4. Firewood Collection: Ranking (0) P. Robertson pers. comm.
5. **Unplanned Fire: Ranking (1)** G. Brown pers. comm.
6. **Introduced Species: Ranking (1)** P. Robertson pers. comm.
7. **Grazing/Trampling: Ranking (3)** SAC (1992c), Meredith (in prep.), G. Brown and P. Robertson pers. comm.
8. Pest Control: Ranking (0) P. Robertson pers. comm.
9. **Road Construction and Maintenance: Ranking (1)** P. Robertson pers. comm.
10. **Mining/Quarrying: Ranking (1)** P. Robertson pers. comm.
11. Tree Dieback: Ranking (0) P. Robertson pers. comm.
12. **Recreation: Ranking (3)** SAC (1992c), Meredith (in prep.), G. Brown pers. comm.
13. Illegal Collecting/Harvesting: Ranking (0) P. Robertson pers. comm.
14. Vandalism: Ranking (0) P. Robertson pers. comm.
15. **Dams/Impoundments: Ranking (2)** Meredith (in prep.), P. Robertson pers. comm.
16. **Other: Climate Change: Ranking (3)** Bennett *et al.* (1991)

Current Management:

The Alpine Water Skink is classified as "vulnerable" in Victoria (CNR 1995a) and is listed under the Victorian *Flora and Fauna Guarantee Act 1988*. An Action Statement is currently being prepared (Meredith in prep). Within the Bogong Unit of the Alpine National Park an area containing Alpine Water Skink sites has been included in the Special Protection Zone (DCE 1992a).

Species characteristics:

The Alpine Water Skink is restricted to alpine and sub-alpine areas above 1400 m. It has specialised habitat requirements and is restricted to sphagnum mossbed/health associations found along alpine and subalpine drainage lines and similar wet areas (Coventry and Robertson 1980). In the summer the semi-arboreal Alpine Water Skink basks on fallen timber and among rocks while during winter, when its habitat is generally covered with snow, it hibernates. Its diet consists of small insects (Jenkins and Bartell 1980, Meredith in prep). The Alpine Water Skink has a very restricted distribution in Victoria where it is known from only three localities: Davies Plains, the Playgrounds area of the Cobberas and the Bogong High Plains (Atlas of Victorian Wildlife).

Distribution in the North East Region

There are 28 records of the Alpine Water Skink within the North East Region; all are from the Bogong High Plains round Mt Cope and Falls Creek (Atlas of Victorian Wildlife, Meredith in prep). These sites are within Alpine National Park.

Disturbances and potentially threatening processes operating in the North East Region

The specialised and restricted habitat of the Alpine Water Skink is very susceptible to physical damage (Coventry and Robertson 1980, SAC 1992c). Sphagnum moss spreads at an extremely slow rate and needs perennial moisture for its growth and survival and damage to vegetation and lowering of the water table can result in habitat contraction (McDougall and Papst in prep.). Grazing and trampling by stock or brumbies damages such vegetation and is considered a major threat to the Alpine Water Skink (Meredith in prep., G. Brown pers. comm., P. Robertson pers. comm.). Cattle grazing has been removed from the Bogong high plains section of the Alpine National Park. Recreational activities such as cross country skiing, hiking and four-wheel driving also have the potential to seriously damage habitat (SAC 1992c, Meredith in prep.). Damming, quarrying and roading, apart from locally destroying areas of vegetation, can cause alterations in hydrology of the surrounding area, which may adversely impact on the sphagnum moss community (Meredith in prep, P. Robertson pers. comm.). The Rocky Valley Storage Dam inundated former Alpine Water Skink habitat and if the dam were to be raised further, additional habitat would be at risk (P. Robertson pers. comm.). Climate change associated with the enhanced greenhouse effect is predicted to reduce the amount of suitable alpine and sub-alpine habitat for this species and is potentially a significant threat to populations (Bennett *et al.* 1991).

Bandy Bandy *Vermicella annulata*

RARITY

a) Geographic Range

- Classification of range size within North East Region: Small
- Distribution of records within North East Region: From Myrrhee to near Granya with the majority of records clustered in Chiltern/Beechworth area
- Proportion of North East Region recorded from (%): 4

- Source: Atlas of Victorian Wildlife
- b) Abundance**
 - Classification of abundance: Low
 - Population Estimate: Unknown
 - Density: Unknown
 - Home Range (ha): Unknown
 - Source: SAC (1995), P. Robertson pers. comm.
- c) Habitat Specificity**
 - Classification of habitat specificity: Narrow
 - Vegetation types inhabited in the Region: Remnant woodland. Recorded from the following EVCs: Grassy Dry Forest, Heathy Dry Forest, Rocky Outcrop Shrubland/Herbland Mosaic
 - Source: SAC (1995), BioMap NRE (Nov 1997)
- DYNAMICS**
- Population Trend in Last Decade**
 - Increased, stable or declined: Unknown
 - Source: P. Robertson pers. comm.
- Population trend since discovery by Europeans**
 - Increased, stable or declined: Declined
 - Source: Ehmann (1992), 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): Males 2, Females 3
 - Mean clutch/litter/brood size: 2-13 (8)
 - Mean no of clutches/litters/broods per year: 1
 - Time of year young born/hatch: Autumn
 - Source: Shine (1980), P. Robertson pers. comm.
- b) Longevity**
 - Classification of lifespan: Possibly short-lived
 - Average lifespan (yrs): Unknown
 - Maximum lifespan (yrs): Unknown
 - Source: P. Robertson pers. comm.
- c) Morphology**
- Adult body size
 - Weight (g): Unknown
 - Length (mm): Mean lengths: Male 392, Female 544
 - Source: Shine (1980)
- d) Social organisation**
 - Colonial or non-colonial: Non-colonial
 - Territoriality: Unknown
 - Source: P. Robertson pers. comm.
- e) Other**
 - Nomadic, migratory, sedentary: Sedentary
 - Diet: Carnivore, feeds exclusively on Blind Snakes (*Ramphotyphlops* spp)
 - Source: Shine (1980), Keogh and Smith (1996), P. Robertson pers. comm.
- THREATS**
- 1. Clearing of Native Vegetation: Ranking (3)** G. Brown pers. comm.
- 2. Timber Harvesting: Ranking (2)** SAC (1995), G. Brown and P. Robertson pers. comm.
- 3. Fuel Reduction Burning: Ranking (2)** SAC (1995), G. Brown and P. Robertson pers. comm.
- 4. Firewood Collection: Ranking (2)** SAC (1995), G. Brown and P. Robertson pers. comm.
- 5. Unplanned Fire: Ranking (2)** SAC (1995), G. Brown and P. Robertson pers. comm.
- 6. Introduced Species: Ranking (1)** Ehmann (1992), G. Brown and P. Robertson pers. comm.
- 7. Grazing/Trampling: Ranking (2)** SAC (1995), G. Brown pers. comm.
- 8. Pest Control: Ranking (2)** Ehmann (1992), G. Brown pers. comm.
- 9. Road Construction and Maintenance: Ranking (1)** P. Robertson pers. comm.
- 10. Mining/Quarrying: Ranking (1)** P. Robertson pers. comm.
- 11. Tree Dieback: Ranking (0)** P. Robertson pers. comm.
- 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 pers. comm.
- 16. Other: Rock Harvesting: Ranking (1)** P. Robertson pers. comm.
- Current Management:**

Species characteristics:

The Bandy Bandy is a nocturnal, burrowing snake that feeds solely on blind snakes (*Ramphotyphlops* spp) (Shine 1980, Keogh and Smith 1996). It inhabits dry forests and shrublands where it shelters under embedded logs or rocks, often using the same shelter site for months (Ehmann 1992). There are three disjunct populations in Victoria from the Mallee, small remnants in the Goldfields and around the Chiltern/Beechworth area. Historically there were additional records scattered between these populations (Atlas of Victorian Wildlife).

Distribution in the North East Region

In the North East there are 13 records of the Bandy Bandy for this century; all of these date from the mid 1980s to early 1990s with the most recent find in 1992. Most records are concentrated around the Chiltern/Beechworth area, however there is one record in Myrree and another near Granya (Atlas of Victorian Wildlife). Bandy Bandy records are within State forest, Chiltern Box-Ironbark National Park and include a number of road-kills.

Disturbances and potentially threatening processes operating in the North East Region

Land clearing has reduced much of the Bandy Bandy's habitat to undisturbed areas of remnant bushland (SAC 1995). Further clearing of remaining habitat will adversely impact on this species, reducing its range and isolating populations (G. Brown pers. comm.). Processes such as timber harvesting, firewood collection and rock harvesting (for the garden trade) can reduce shelter sites. Grazing and trampling can compact and erode soil and lead to the simplification of understorey and ground layers. Processes that involve disturbance to the soil can also cause a decline in the numbers of Blind Snakes, thereby reducing prey availability (SAC 1995). An additional threat to the Bandy Bandy is the use of pesticides which can cause a decrease in the ants and termites which are the main prey item of Blind Snakes (Ehmann 1992). Inappropriate burning regimes are also considered to be detrimental to the Bandy Bandy (SAC 1995, G. Brown and P. Robertson pers. comm.). Predation by Cats is considered a minor threat (Ehmann 1992, G. Brown and P. Robertson pers. comm.).

Carpet Python

Morelia spilota variegata

RARITY

a) Geographic Range

- Classification of range size within North East Region: Large
- Distribution of records within North East Region: A few records from two widely separated locations: Wangaratta and near Burrowye
- Proportion of North East Region recorded from (%): < 1
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: Unknown
- Density: Unknown
- Home Range (ha): Male 8-103 (43), Female 3-52 (17) based on closely related sub species
- Source: Slip and Shine (1988a), Shine (1994), P. Robertson pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Narrow
- Vegetation types inhabited in the Region: Woodlands along major water courses, rocky dry slopes
- Source: Slip and Shine (1988a), P. Robertson pers. comm.

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Declined
- Source: P. Robertson pers. comm.

Population trend since discovery by Europeans

- Increased, stable or declined: Declined
- Source: G. Brown and 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: 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): Females 3-5, males probably earlier based on a smaller body size at maturity - varies with location
- Mean clutch/litter/brood size: 6-38 (16) - related to body size and differs with location
- Mean no of clutches/litters/broods per year: Possibly one clutch every third year
- Time of year young born/hatch: January to late February
- Source: Slip and Shine (1988b), Shine and Slip (1990), Ehmann (1992), Shine (1994)

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): Average 2000
- Length (mm): Average 200, up to 400
- Source: Cogger (1996), Shine and Fitzgerald (1996), P. Robertson pers. comm.

d) Social organisation

- Colonial or non-colonial: Non-colonial
- Territoriality: No; home ranges overlap
- Source: Shine and Fitzgerald (1996)

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Diet: Carnivore, adults feed mainly on small to medium-sized mammals and birds, juveniles mainly take small lizards and insects
- Source: Shine and Fitzgerald (1996), P. Robertson pers. comm.

THREATS

1. **Clearing of Native Vegetation: Ranking (3)** Allen (in prep.), P. Robertson pers. comm.
2. **Timber Harvesting: Ranking (3)** Allen (in prep.), P. Robertson pers. comm.
3. **Fuel Reduction Burning: Ranking (3)** Allen (in prep.), P. Robertson pers. comm.
4. **Firewood Collection: Ranking (3)** SAC (1993), Allen (in prep.), P. Robertson pers. comm.
5. **Unplanned Fire: Ranking (3)** P. Robertson pers. comm.
6. **Introduced Species: Ranking (3)** SAC (1993), Allen (in prep.), P. Robertson pers. comm.
7. **Grazing/Trampling: Ranking (1)** Allen (in prep.), P. Robertson pers. comm.
8. **Pest Control: Ranking (2)** Allen (in prep.), P. Robertson pers. comm.
9. **Road Construction and Maintenance: Ranking (1)** P. Robertson pers. comm.
10. **Mining/Quarrying: Ranking (1)** P. Robertson pers. comm.
11. **Tree Dieback: Ranking (1)** Allen (in prep.), P. Robertson pers. comm.
12. **Recreation: Ranking (1)** Allen (in prep.), P. Robertson pers. comm.
13. **Illegal Collecting/Harvesting: Ranking (2)** SAC (1993), Allen (in prep.), P. Robertson pers. comm.
14. **Vandalism: Ranking (1)** Allen (in prep.), P. Robertson pers. comm.
15. **Dams/Impoundments: Ranking (0)** P. Robertson pers. comm.

Current Management:

The Carpet Python is classified as "vulnerable" in Victoria (CNR 1995a) and is listed under the Victorian *Flora and Fauna Guarantee Act 1988*; an Action Statement is currently being prepared (Allen in prep). A research project in the Warby Ranges (Western RFA Region) investigating aspects of Carpet Python ecology including distribution and population estimates, key habitat requirements, effects of fire on the animals and their habitat and predation risk and amelioration, is currently being conducted as part of the RFA process.

Species characteristics:

The Carpet Python is a partly arboreal reptile which feeds on small to medium-sized mammals and birds. It most commonly predaes ambush-style, staying in a coiled position for days or weeks at a time. Alternatively, it actively hunts, often taking eggs and nestling birds (Shine and Fitzgerald 1996). The Carpet Python does not appear to rely on a specific microhabitat but does require sites providing sufficient shelter, particularly for the overwintering period during which time access to basking areas is also important (Shine 1994). This species inhabits woodland along major water courses in Northern Victoria, including remnant Black Box (*Eucalyptus largiflorens*) and River Red Gum (*E. camaldulensis*). Hollow-bearing trees and associated ground debris are essential and trees with thick covering vegetation are generally selected; treeless areas are rarely visited (Shine and Fitzgerald 1996, Allen in prep). Individual habitat selection appears to be influenced by prey availability (Shine 1994). Female Carpet Pythons brood their eggs; the production and subsequent care of eggs is energetically costly (Slip and Shine 1988b, Shine and Slip 1990) and females lose a large proportion of body weight during this time. It is thought that females do not breed in consecutive years as a result of this (Slip and Shine 1988b).

Distribution in the North East Region

There are three records of the Carpet Python in the North East to date, from two widely spaced locations. There is one record from the banks of the Owens River in Wangaratta, found in early 1997. (Atlas of Victorian Wildlife). This individual is thought to be part of populations in the nearby Warby Ranges (Western RFA Region). The other records are from the area near Burrowye in the north-east of the Region where a small population is thought to occur (Atlas of Victorian Wildlife, P. Robertson pers. comm.). Anecdotal accounts suggest that this species was once present in areas between the presently existing records (P. Robertson pers. comm.).

Disturbances and potentially threatening processes operating in the North East Region

Major threats to the Carpet Python are habitat loss and alteration that can result from clearing, timber harvesting, firewood collection, fuel reduction burning and wildfire (SAC 1993, Allen in prep, P. Robertson pers. comm.). These activities can result in the loss of hollow-bearing trees and disturbance to the ground debris layer, which provide shelter, nesting sites and foraging habitat. Predation by Foxes is very high and is considered a major threat to this species (Allen in prep., P. Robertson pers. comm.). Any declines in Rabbit numbers, due to control methods such as the Calicivirus, could have a big impact on Carpet Python populations as they are a major prey item (P. Robertson pers. comm.). In the past this species was often collected illegally for the pet trade and although this practice is now likely to be less prevalent, it is still considered a moderate threat (Allen in prep., P. Robertson pers. comm.). Road construction directly removes habitat and increases the risk of road kills (Allen in prep.). Carpet Pythons are sometimes killed by people in the mistaken belief that they are dangerous (Allen in prep.). Recreational activities, such as camping or hiking along rivers and bush tracks, can cause disturbance to individual animals (P. Robertson pers. comm.). Threats to this species may be exacerbated because of limited breeding opportunities and the vulnerable state of the females during this time.

Woodland Blind Snake *Ramphotyphlops proximus*

RARITY

a) Geographic Range

- Classification of range size within North East Region: Small
- Distribution of records within North East Region: Two records this century, from near Myrree and from Chiltern Box-Ironbark National Park
- Proportion of North East Region recorded from (%): 1.5
- 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: Narrow
- Vegetation types inhabited in the Region: Dry forest. Recorded from the following EVCs: Heathy Dry Forest, Shrubby Dry Forest
- Source: Brown and Bennett (1995), BioMap NRE (Nov 1997)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Unknown
- Source: P. Robertson pers. comm.

Population trend since discovery by Europeans

- Increased, stable or declined: Declined
- 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: 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

Adult body size

- 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 (usually solitary)
- Territoriality: Non-territorial
- Source: G. Brown and P. Robertson pers. comm.

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Diet: Insectivore; mainly the larvae and pupae of stinging ants (*Myrmecia*)
- Source: Webb and Shine (1993), P. Robertson pers. comm.

THREATS

1. **Clearing of Native Vegetation: Ranking (3)** G. Brown and P. Robertson pers. comm.
2. **Timber Harvesting: Ranking (1)** P. Robertson pers. comm.
3. **Fuel Reduction Burning: Ranking (1)** P. Robertson pers. comm.
4. **Firewood Collection: Ranking (2)** G. Brown pers. comm.
5. **Unplanned Fire: Ranking (1)** P. Robertson pers. comm.
6. **Introduced Species: Ranking (1)** P. Robertson pers. comm.
7. **Grazing/Trampling: Ranking (2)** G. Brown pers. comm.
8. **Pest Control: Ranking (2)** G. Brown pers. comm.
9. Road Construction and Maintenance: Ranking (0) P. Robertson pers. comm.
10. **Mining/Quarrying: Ranking (1)** P. Robertson pers. comm.
11. Tree Dieback: Ranking (0) P. Robertson pers. comm.
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 pers. comm.

Current Management:

The Woodland Blind Snake is classified as "rare" in Victoria (CNR 1995a). There are no current management prescriptions for the Woodland Blind Snake in the North East Region.

Species characteristics:

The Woodland Blind Snake is a small, subterranean snake that is rarely encountered. It inhabits dry forest and mallee mainly in the Riverina and Midland areas of northern Victoria (Brown and Bennett 1995). During rain and flooding it emerges to 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 is possibly favourable (Brown and Bennett 1995). Prey consists exclusively of invertebrates, mainly the larvae and pupae of large stinging ants (*Myrmecia*) (Webb and Shine 1993).

Distribution in the North East Region

Records in the North East represent the eastern most edge of the Woodland Blind Snake's distribution in Victoria. There are only two records of this species this century, one in 1973 (State forest near Myrrehe) the other in 1995 (Chiltern Box-Ironbark National Park). A few records scattered in-between these sites are dated pre-1900 (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the North East Region

Clearing of habitat is the major threat to the Woodland Blind Snake, with past clearing for agriculture probably responsible for its decline in the last 100 years. Due to its burrowing nature, this species is particularly sensitive to soil and ground layer disturbances, and grazing and trampling by stock. Activities that cause soil compaction and erosion are likely to have an impact through unfavourable changes to soil structure and humidity (Sadler and Pressey 1994) which may also have an effect on burrowing prey. Blind Snakes are rarely found on land subject to agricultural practices (Ehmann and Bamford 1993). Leaf litter and ground debris are important shelter sites for the Woodland Blind Snakes and removal or degradation of this layer can also occur as a result of processes such as fuel reduction burning, wildfire and firewood collection. 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 perceived to be a minor threat (P. Robertson pers. comm.).

Tree Skink

Egernia striolata

RARITY

a) Geographic Range

- Classification of range size within North East Region: Small
- Distribution of records within North East Region: Two small clusters of records at Tintalra and around Tallangatta
- Proportion of North East Region recorded from (%): 2
- 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: Wide
- Vegetation types used in the Region: Dry sclerophyll forest and woodland
- Source: Ehmann (1992)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Unknown
- Source: P. Robertson pers. comm.

Population trend since discovery by Europeans

- Increased, stable or declined: Unknown
- 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): 3
- Mean clutch/litter/brood size: 2-6
- Mean no of clutches/litters/broods per year: 1
- Time of year young born/hatch: Late summer
- Source: Ehmann (1992)

b) Longevity

- Classification of lifespan: Short-lived
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): Unknown
- Source: P. Robertson pers. comm.

c) Morphology

Adult body size

- Weight (g): Unknown
- Length (mm): To 110
- Source: Ehmann (1992)

d) Social organisation

- Colonial or non-colonial: Usually solitary, occasionally found in aggregations
- Territoriality: Unknown, possibly territorial
- Source: Ehmann (1992), P. Robertson pers. comm.

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Diet: Insectivore, carnivore
- Source: Ehmann (1992), P. Robertson pers. comm.

THREATS

1. **Clearing of Native Vegetation: Ranking (2)** G. Brown and P. Robertson pers. comm.
2. **Timber Harvesting: Ranking (2)** G. Brown and P. Robertson pers. comm.
3. **Fuel Reduction Burning: Ranking (2)** G. Brown and P. Robertson pers. comm.
4. **Firewood Collection: Ranking (2)** G. Brown and P. Robertson pers. comm.
5. **Unplanned Fire: Ranking (2)** G. Brown pers. comm.
6. **Introduced Species: Ranking (1)** P. Robertson pers. comm.
7. **Grazing/Trampling: Ranking (1)** P. Robertson pers. comm.
8. **Pest Control: Ranking (1)** P. Robertson pers. comm.
9. Road Construction and Maintenance: Ranking (0) P. Robertson pers. comm.
10. **Mining/Quarrying: Ranking (1)** P. Robertson pers. comm.
11. Tree Dieback: Ranking (0) P. Robertson pers. comm.
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 pers. comm.

Current Management:

There are no current management prescriptions for this species in the North East. The Tree Skink is not considered threatened in Victoria (CNR 1995a).

Species characteristics:

The Tree Skink is largely arboreal, living and foraging in hollow limbs, cracks and under loose bark of live and dead trees in dry sclerophyll forest and woodland. This species is typically found where stringybark eucalypts are present (P. Robertson pers. comm.). Fallen timber and leaf litter are also utilised and it is often associated with rocky outcrops (Ehmann 1992, Cogger 1996). Prey items include insects, spiders and small lizards (Ehmann 1992). Little is known of its biology and ecology. The Tree Skink has a very disjunct distribution in Victoria with isolated populations in the northern, north-western and north-eastern parts of the State totaling 195 records.

Distribution in the North East Region

There are 13 records from two localities in the North East: Tintalra and near Tallangatta. The species was most recently recorded in 1994 (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the North East Region

The arboreal nature of the Tree Skink and its use of logs and ground debris means that the most significant threats to this species are those that involve tree and log removal, such as clearing of vegetation, timber harvesting and firewood collection. As well as habitat removal these activities disturb the leaf litter layer, an additional foraging substrate. Inappropriate fire regimes and wildfire have the potential to alter vegetation and are also considered to be important threats to this species (P. Robertson pers. comm.). The risk of habitat degradation from grazing and mining/quarrying is regarded as minor. Both Cats and Foxes include reptiles in

their diet (May and Norton 1996) and Tree Skinks are therefore potential prey items. The control of Rabbits includes a method which involves destroying piles of timber and debris if it is suspected that they harbour this introduced pest. This practice effectively reduces available habitat for the Tree Skink (P. Robertson pers. comm.).

Red-throated Skink
Pseudemoia platynota

RARITY

a) Geographic Range

- Classification of range size within North East Region: Medium
- Distribution of records within North East Region: In far east of Region, from Mt Lawson area to Dartmouth Dam
- Proportion of North East Region recorded from (%): 5
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Medium
- Population Estimate: Unknown
- Density: Unknown
- Home Range (ha): Unknown
- Source: P. Robertson pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Narrow
- Vegetation types used in the Region: Dry sclerophyll forest and woodland
- Source: Cogger (1996)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Unknown
- Source: P. Robertson pers. comm.

Population trend since discovery by Europeans

- Increased, stable or declined: Unknown
- 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, possibly 2-3
- Mean clutch/litter/brood size: 3-9 (5.4)
- Mean no of clutches/litters/broods per year: 1
- Time of year young born/hatch: January-February
- Source: Greer (1989), P. Robertson pers. comm.

b) Longevity

- Classification of lifespan: Short-lived
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): Unknown
- Source: P. Robertson pers. comm.

c) Morphology

Adult body size

- Weight (g): Unknown
- Length (mm): 65-80 (71.6) for gravid females
- Source: Greer (1989)

d) Social organisation

- Colonial or non-colonial: Non-colonial
- Territoriality: Non-territorial
- Source: P. Robertson pers. comm.

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Diet: Insectivorous
- Source: P. Robertson pers. comm.

THREATS

1. **Clearing of Native Vegetation: Ranking (2)** G. Brown and P. Robertson pers. comm.
2. **Timber Harvesting: Ranking (2)** G. Brown and P. Robertson pers. comm.
3. **Fuel Reduction Burning: Ranking (3)** P. Robertson pers. comm.
4. **Firewood Collection: Ranking (2)** G. Brown pers. comm.
5. **Unplanned Fire: Ranking (2)** G. Brown pers. comm.
6. **Introduced Species: Ranking (1)** P. Robertson pers. comm.
7. **Grazing/Trampling: Ranking (2)** P. Robertson pers. comm.
8. **Pest Control: Ranking (0)** P. Robertson pers. comm.
9. **Road Construction and Maintenance: Ranking (1)** P. Robertson pers. comm.
10. **Mining/Quarrying: Ranking (1)** P. Robertson pers. comm.
11. **Tree Dieback: Ranking (1)** P. Robertson pers. comm.
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 pers. comm.

Current Management:

There are no current management prescriptions for the Red-throated Skink in the North East. The Red-throated Skink is not considered threatened in Victoria (CNR 1995a).

Species characteristics:

The Red-throated Skink inhabits dry sclerophyll forest and woodland. This species forages among leaf litter, fallen logs and rock crevices (Cogger 1996) where it hunts insects (P. Robertson pers. comm.). There is very little published information on this species. In Victoria the distribution of the Red-throated Skink is limited to the far north-east and east of the State. The species is infrequently recorded; there are currently 100 records in the Atlas of Victorian Wildlife.

Distribution in the North East Region

In the North East the Red-throated Skink occurs from Mt Lawson and Koetong area to around the Dartmouth Dam (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the North East Region

The major threat to the Red-throated Skink is loss of foraging substrate, principally through fuel reduction burning. This species depends on a ground layer of leaf litter, logs and debris so any disturbance to this layer will have an adverse impact on populations (P. Robertson pers. comm.). Other processes that involve disturbance to the ground layer include clearing of vegetation, timber harvesting, firewood collection, grazing and wildfire and may therefore be potential threats in known habitats. Roading and quarrying result in total loss of habitat and potentially fragment populations. Foxes and Cats are known to eat lizards (May and Norton 1996), though this is considered a minor threat to this species (P. Robertson pers. comm.).

Gray's Blind Snake

Ramphotyphlops nigrescens

RARITY

a) Geographic Range

- Classification of range size within North East Region: Large
- Distribution of records within North East Region: Scattered through-out Region except for alpine areas
- Proportion of North East Region recorded from (%): 8.5
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Medium
- Population Estimate: Unknown
- Density: Unknown
- Home Range (ha): Unknown
- Source: P. Robertson pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Narrow
- Vegetation types used in the Region: Dry forests, woodlands and heaths
- Source: Ehmann (1992), Brown and Bennett (1995)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Unknown
- Source: P. Robertson pers. comm.

Population trend since discovery by Europeans

- Increased, stable or declined: Possibly declined
- 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: 5-20 (9.22)
- Mean no of clutches/litters/broods per year: 1
- Time of year young born/hatch: Late Summer-Autumn
- Source: Ehmann (1992), P. Robertson pers. comm.

b) Longevity

- Classification of lifespan: Short-lived
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): Unknown
- Source: G. Brown and P. Robertson pers. comm.

c) Morphology

Adult body size

- Weight (g): Unknown
- Length (mm): Mean length 380, maximum 750
- Source: Ehmann (1992), Cogger (1996)

d) Social organisation

- Colonial or non-colonial: Non-colonial
- Territoriality: Non-territorial
- Source: P. Robertson pers. comm.

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Diet: Invertebrates: Probably exclusively pupae, larvae and eggs of ants.

- Source: Shine and Webb (1990), Ehmann (1992), P. Robertson pers. comm.

THREATS

1. **Clearing of Native Vegetation: Ranking (3)** P. Robertson pers. comm.
2. **Timber Harvesting: Ranking (2)** P. Robertson pers. comm.
3. **Fuel Reduction Burning: Ranking (2)** G. Brown pers. comm.
4. **Firewood Collection: Ranking (2)** G. Brown and P. Robertson pers. comm.
5. **Unplanned Fire: Ranking (2)** G. Brown pers. comm.
6. **Introduced Species: Ranking (1)** P. Robertson pers. comm.
7. **Grazing/Trampling: Ranking (2)** G. Brown pers. comm.
8. **Pest Control: Ranking (1)** P. Robertson pers. comm.
9. **Road Construction and Maintenance: Ranking (0)** P. Robertson pers. comm.
10. **Mining/Quarrying: Ranking (1)** P. Robertson pers. comm.
11. **Tree Dieback: Ranking (0)** P. Robertson pers. comm.
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 pers. comm.

Current Management:

There are no current management prescriptions for Gray's Blind Snake in the North East Region. Gray's Blind Snake is not considered threatened in Victoria (CNR 1995a).

Species characteristics:

Gray's Blind Snake is a worm-like burrowing snake that usually emerges from the soil only on warm nights or after rain (Cogger 1996). It may shelter under flat rocks and embedded logs, in soil under leaf litter or deep inside old termite nests and rotten tree stumps (Ehmann 1992). Feeding appears to be seasonal, and only occurs during the warmest months of the year (Webb and Shine 1993). Prey consists of pupae, larvae and eggs of a large variety of ant species (Ehmann 1992, Webb and Shine 1993). Gray's Blind Snake is found in a variety of habitats including dry forests, woodlands and heath (Ehmann 1992, Brown and Bennett 1995). Prey availability and soil penetrability, moisture content and particle size are probably important habitat features relating to the presence of this species (Ehmann and Bamford 1993). There are 76 records of Gray's Blind Snake in Victoria, found within a wide band stretching from central to north-east Victoria (Atlas of Victorian Wildlife).

Distribution in the North East Region

Records of Gray's Blind Snake are widely scattered throughout the North East Region and represent the main part of its recorded distribution in Victoria (Atlas of Victorian Wildlife). Sites are within State forest and on private land.

Disturbances and potentially threatening processes operating in the North East Region

Clearing of habitat is the major threat to Gray's Blind Snake (P. Robertson pers. comm.). The subterranean habits of this species makes it particularly vulnerable to disturbances which alter soil quality via soil compaction and erosion, such as grazing and other agricultural practices (Ehmann and Bamford 1993, Brown and Bennett 1995). Timber harvesting can also change soil characteristics and, along with fuel reduction burning, wildfire and firewood collection, can affect the leaf litter and ground layer which usually provide shelter. Pesticides may impact on this species by reducing the numbers of insect prey (Ehmann 1992). Blind Snakes are also vulnerable to predation by Foxes and Cats (Ehmann 1992, Ehmann and Bamford 1993) though this is considered a minor threat (P. Robertson pers. comm.).

Tree Goanna

Varanus varius

RARITY

a) Geographic Range

- Classification of range size within North East Region: Small
- Distribution of records within North East Region: Mainly concentrated between Chiltern Box-Ironbark National Park and Rutherglen
- Proportion of North East Region recorded from (%): 5.5
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Medium
- Population Estimate: Unknown
- Density: Unknown
- Home Range (ha): Males 65
- Source: Weavers (1993), 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

- Increased, stable or declined: Unknown
- Source: P. Robertson pers. comm.

Population trend since discovery by Europeans

- Increased, stable or declined: Unknown, possibly declined

- 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: 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
- Time of year young born/hatch: Early spring
- Source: Ehmann (1992), Green and King (1993), P. Robertson pers. comm.

b) Longevity

- Classification of lifespan: Probably long-lived
- 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, maximum recorded 765
- Source: Weavers (1988), 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.

THREATS

1. **Clearing of Native Vegetation: Ranking (3)** P. Robertson pers. comm.
2. **Timber Harvesting: Ranking (3)** Brown and Bennett (1995), G. Brown and P. Robertson pers. comm.
3. **Fuel Reduction Burning: Ranking (2)** G. Brown pers. comm.
4. **Firewood Collection: Ranking (2)** Brown and Bennett (1995), G. Brown and P. Robertson pers. comm.
5. **Unplanned Fire: Ranking (2)** G. Brown and P. Robertson pers. comm.
6. **Introduced Species: Ranking (1)** G. Brown and P. Robertson pers. comm.
7. **Grazing/Trampling: Ranking (1)** P. Robertson 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 pers. comm.
11. **Tree Dieback: Ranking (1)** P. Robertson pers. comm.
12. **Recreation: Ranking (1)** P. Robertson pers. comm.
13. **Illegal Collecting/Harvesting: Ranking (1)** P. Robertson pers. comm.
14. **Vandalism: Ranking (1)** P. Robertson pers. comm.
15. **Dams/Impoundments: Ranking (0)** P. Robertson pers. comm.

Current Management:

There are no current management prescriptions for this species in the North East Region. Although previously not considered threatened in Victoria (CNR 1995a), the species is considered data deficient.

Species characteristics:

The Tree Goanna is an opportunistic carnivore which forages widely for its varied diet of carrion, mammals, birds, reptiles and arthropods (Weavers 1989). It is partly arboreal including eggs and nestlings in its diet (Green and King 1993). Shelter can be a dug burrow, disused rabbit warren or tree crevices and hollows (Green and King 1993). The Tree Goanna depends on large trees (living and dead) for foraging, basking and shelter (Silveira *et al.* 1997). Eggs are laid in rotting stumps or termite nests (Ehmann 1992). 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).

Distribution in the North East Region

Records of the Tree Goanna in the North East Region are mostly concentrated in the area between Chiltern Box-Ironbark National Park and Rutherglen. Other records are between Benalla and Glenrowan, and as far east as Koetong (Atlas of Victorian Wildlife).

Disturbances and potentially threatening processes operating in the North East Region

The Tree Goanna is potentially threatened by processes such as timber harvesting and clearing which can involve the loss of large trees, upon which this species depends (Brown and Bennett 1995). These processes also result in habitat fragmentation which is seen as a threat to this species because

of its tendency to use connected remnants. Fuel reduction burning and wildfire are regarded as a moderate threat to the Tree Goanna as they can result in loss of foraging, sheltering and 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 road kills, a not uncommon occurrence for this species (P. Robertson pers. comm.). Certain Rabbit control methods such as digging up burrows and destroying accumulations of logs and debris (that may harbour Rabbits) could reduce available shelter and foraging opportunities (P. Robertson pers. comm.). The Tree Goanna exhibits dietary overlap with Foxes and Cats and so is in competition for food, although the impact of this is likely to be small (G. Brown and P. Robertson pers. comm.). In the past the Tree Goanna has been a target for illegal collection though presently it is considered a minor threat for this species (P. Robertson pers. comm.). Animals 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.).

AMPHIBIANS

Spotted Tree Frog

Litoria spenceri

RARITY

a) Geographic Range

- Classification of range size within Region: Small
- Distribution of records within Region: Records have a restricted and patchy distribution.
- Proportion of Region recorded from (%): 6
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: Howqua River approximately 400 adults, Snowy/Lightning Creeks approximately 500 adults, Jamieson River approximately 250 adults, Wongungarra River approximately 180 adults, Big River (Mitta Mitta) approximately 175 adults, Wheeler Creek approximately 625 adults and West Kiewa River <25 adults. Total approximately 2155 adults.
- Density: Variable; Jamieson, Howqua, Wongungarra, West Kiewa and Bundarra Rivers and Wheelers Creek, < 5 individuals/km, Big River (Mitta Mitta) and Lightning Creek <10 individuals/km and Snowy Creek, approximately 15 individuals/km.
- Home Range (m): <200m
- Source: Gillespie and Hollis (1996), Robertson and Gillespie (in prep), Robertson *et al.* (in prep)

c) Habitat Specificity

- Classification of habitat specificity: Narrow
- Vegetation types inhabited in the Region: Restricted to rock habitats mostly near rapid water along steep banked sections of streams. Adjacent stream-side EVCs include: Montane Dry Woodland, Riparian Forest, Shrubby Dry Forest, Damp Forest and Herb-rich Foothill Forest.
- Source: Gillespie and Hollis (1996), NRE BioMap (November 1997)

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Declined
- Source: Gillespie and Hollis (1996)

Population trend since discovery by Europeans

- Increased, stable or declined: Declined
- Source: Gillespie and Hollis (1996)

SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: High
- Source: Robertson and Gillespie (in prep), G. Gillespie pers. comm.

b) Dispersal

- Classification of powers of dispersal: Low
- Average distances dispersed: No dispersal
- Maximum distance dispersed: No dispersal
- Source: G. Gillespie pers. comm.

LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity (yrs): ≥ 4 females, ≥ 2 males,
- Mean clutch/litter/brood size: 530 eggs
- Mean no of clutches/broods per year: 1
- Time of year young born/hatch: November/December (eggs laid)
- Source: Gillespie *et al.* (1995), Gillespie (1997)

b) Longevity

- Classification of lifespan: Long-lived
- Average lifespan (yrs): 6-10
- Maximum lifespan (yrs): 13 females, 10 males
- Source: G. Gillespie pers. comm.

c) Morphology

Adult body size

- Weight (g): 15 females, 6 males (maximum)
- Length (mm): 36.5-56 adult females, 28-42 adult males
- Source: G. Gillespie pers. comm.

d) Social organisation

- Colonial or non-colonial: Non-colonial
- Territoriality: Males during breeding season
- Source: Gillespie (1993), G. Gillespie pers. comm.

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Diet: Insectivore
- Source: Ehmann *et al.* (1992), Robertson and Gillespie (in prep), G. Gillespie pers. comm.

THREATS

1. **Clearing of Native Vegetation: Ranking (1)** G. Gillespie pers. comm..

2. **Timber harvesting: Ranking (2)** Campbell and Doeg (1989), Watson *et al.* (1991), deMaynadier and Hunter (1995), Gillespie and Hollis (1996), O' Shaughnessy *et al.* (1997), Robertson and Gillespie (in prep), G. Gillespie pers. comm.

3. **Fuel Reduction Burning: Ranking (-)** Watson *et al.* (1991), Robertson and Gillespie (in prep), G. Gillespie pers. comm.

4. **Firewood Collection: Ranking (1)** G. Gillespie pers. comm.

5. **Unplanned Fire: Ranking (-)** Campbell and Doeg (1989), Tyler (1997), Robertson and Gillespie (in prep), G. Gillespie pers. comm.

- 6. Introduced Species: Ranking (3)** Watson *et al.* (1991), Gillespie *et al.* (1995), Tyler (1997), G. Gillespie pers. comm.
- 7. Grazing/Trampling: Ranking (2)** Watson *et al.* (1991), Gillespie and Hollis (1996), Tyler (1997), Robertson and Gillespie (in prep.), G. Gillespie pers. comm.
- 8. Pest Control: Ranking (2)** Bidwell and Gorrie (1995), Robertson and Gillespie (in prep.), G. Gillespie pers. comm.
- 9. Road Construction and Maintenance: Ranking (2)** Campbell and Doeg (1989), Watson *et al.* (1991), Gillespie and Hollis (1996), O' Shaughnessy *et al.* (1997), Robertson and Gillespie (in prep.), G. Gillespie pers. comm.
- 10. Mining/Quarrying: Ranking (3)** Hall (1988), Watson *et al.* (1991), Gillespie and Hollis (1996), Robertson and Gillespie (in prep.), G. Gillespie pers. comm.
11. Tree Dieback: Ranking (0) G. Gillespie pers. comm.
- 12. Recreation: Ranking (2)** Watson *et al.* (1991), Gillespie and Hollis (1996), Robertson and Gillespie (in prep.), G. Gillespie pers. comm.
13. Illegal Collection/Harvesting: Ranking (-)
14. Vandalism/Disturbance by Humans: Ranking (-)
- 15. Dams/Impoundments: Ranking (2)** Watson *et al.* (1991), Robertson and Gillespie (in prep.), G. Gillespie pers. comm.
- 16. Other: Climate Change Ranking: (2)** Bennett *et al.* (1991), G. Gillespie pers. comm.

Current Management:

The Spotted Tree Frog is classified as "endangered" in Victoria (CNR 1995a) and is listed under the Victorian *Flora and Fauna Guarantee Act* 1988. An action statement is currently being prepared (Robertson *et al.* in prep). The species is also listed under the Commonwealth *Endangered Species Protection Act* 1992 and a draft Recovery Plan has been prepared (Robertson and Gillespie in prep). As part of the North East Region Comprehensive Regional Assessment, Spotted Tree Frog surveys targeting known and predicted populations are being conducted and current monitoring programs which have been conducted over the past three years will be expanded. Fish surveys will also be undertaken in streams where Spotted Tree Frogs historically and currently occur, and research will be extended to allow refinement of threat-abating prescriptions where appropriate.

Species characteristics:

The Spotted Tree Frog inhabits rocky, swift-flowing upland streams in dissected mountainous country. The distribution of individuals along the stream is patchy and is generally associated with substrates of loose rock, rocky banks and rapids. Adjacent stream-side vegetation is used for shelter and basking. Eggs are deposited under large boulders within the stream. Tadpole development occurs instream over summer, and metamorphosis takes place in late summer and early autumn (Watson *et al.* 1991, Hero *et al.* 1995, Robertson and Gillespie in prep.). Extensive searches of every major stream within the broad distribution of the Spotted Tree Frog have found only 11 extant populations in Victoria. The distribution of the species is fragmented and there has been a significant decline over the last 20 years (Watson *et al.* 1991, Gillespie and Hollis 1996, Robertson and Gillespie in prep, Robertson *et al.* in prep.). Surveys are conducted during the breeding season (late spring and early summer) and are confined to rivers; use of adjoining forest in the non-breeding season is unknown (G. Gillespie pers. comm., Robertson *et al.* in prep).

Distribution within the North East Region:

Within the North East Region, extant populations of the Spotted Tree Frogs have been recorded from the Howqua, Jamieson, Wongungarra, West Kiewa and Big (Mitta Mitta) Rivers and from the Snowy, Lightning and Wheeler Creeks. The species was last recorded from the King River in 1977, the Buckland River in 1961 and Buffalo Creek in 1983. These populations are now presumed to be extinct. The Snowy, Lightning and Wheeler Creek populations and Wongungarra River population are within State forest. Populations from the Howqua, Jamieson, West Kiewa and Big (Mitta Mitta) Rivers are within both State forest and the Alpine National Park (Robertson and Gillespie in prep, Atlas of Victorian Wildlife).

Disturbances and Potentially Threatening Processes within the North East Region:

Disturbances in and adjacent to streams and in catchments which affect water quality and flow and cause altered stream bed conditions (e.g. sedimentation), and changes to stream-side vegetation are likely causes of Spotted Tree Frog population declines (Gillespie and Hollis 1996). The major source of unacceptable increases in stream sedimentation is likely to be roads and tracks including fire trails and accessible major and minor roads used for timber extraction, recreation and management access (O' Shaughnessy *et al.* 1997). Timber harvesting operations also have significant effects on both water quality and quantity (Campbell and Doeg 1989, O' Shaughnessy *et al.* 1997). Roads near streams and post-1972 timber harvesting in catchments have been negatively correlated with Spotted Tree Frog abundance (Gillespie and Hollis 1996). The effects of fuel reduction burning in Spotted Tree Frog catchments is unknown but may represent a threat (Watson *et al.* 1991). Although currently illegal in Victoria, eductor dredging which causes major alterations to the stream bed (Hall 1988) and has been negatively correlated with Spotted Tree Frog abundance, is known to occur in the Snowy Creek (Gillespie and Hollis 1996, G. Gillespie pers. comm.). Hydrological modification of streams through construction of dams and impoundments and water releases from existing

impoundments may adversely affect populations (Gillespie *et al.* 1995). Anthropogenic disturbances including recreation/human access to catchments, off-road vehicles, and clearance of bank vegetation for bush camping, have been negatively correlated with the relative abundance of the Spotted Tree Frog. Predation of eggs and larvae by trout may reduce or preclude recruitment to the adult stage (Gillespie *et al.* 1995, Robertson and Gillespie in prep, G. Gillespie pers. comm.). Invasion of riparian vegetation by introduced weeds may result in loss and degradation of habitat (Tyler 1997, Robertson and Gillespie in prep.). However, herbicide use may be detrimental to both adults and tadpoles (Bidwell and Gorrie 1995, Robertson and Gillespie in prep.). Habitat alteration as a consequence of the Enhanced Greenhouse Effect is a significant threat to the Spotted Tree Frog (Bennett *et al.* 1991, G. Gillespie pers. comm.). The small size and isolation of most Spotted Tree Frog populations makes them vulnerable to stochastic events such as wild fire (Robertson and Gillespie in prep).

Alpine Tree Frog *Litoria verreauxii alpina*

RARITY

a) Geographic Range

- Classification of range size within Region: Small
- Distribution of records within Region: Patchy limited distribution, all records are from alpine areas
- Proportion of Region occupied (%): Approximately 3
- Source: Atlas of Victorian Wildlife

b) Abundance

- Classification of abundance: Low
- Population Estimate: Unknown
- Density: Unknown
- Home Range (ha): Unknown
- Source: G. Gillespie pers. comm.

c) Habitat Specificity

- Classification of habitat specificity: Narrow
- Vegetation types inhabited in the Region: Dry Subalpine Shrubland, Damp Subalpine Heathland, Wet Subalpine Heathland, Subalpine Woodland, Montane Dry Woodland, Montane Damp Forest. EVCs recorded from in the North East Region include: Montane Dry Woodland, Sub-alpine Woodland, Montane Damp Forest and Treeless Sub-alpine Complex
- Source: Gillespie *et al.* (1995), NRE BioMap (November 1997), G. Gillespie pers. comm.

DYNAMICS

Population Trend in Last Decade

- Increased, stable or declined: Declined
- Source: Gillespie *et al.* (1995)

Population trend since discovery by Europeans

- Increased, stable or declined: Declined
- Source: Gillespie *et al.* (1995)

SPATIAL DYNAMICS

a) Population variability

- Classification of population variability: Unknown
- Source: G. Gillespie pers. comm.

b) Dispersal

- Classification of powers of dispersal: Low
- Average distances dispersed: Unknown
- Maximum distance dispersed: Unknown
- Source: G. Gillespie pers. comm.

LIFE HISTORY PARAMETERS

a) Reproductive output

- Classification of reproductive output: Low
- Age of sexual maturity (yrs): Unknown
- Mean clutch/litter/brood size: Unknown (Whistling Tree Frog *Litoria verreauxii* - 500-1000 eggs)
- Mean no of clutches/litters/broods per year: 1
- Time of year young born/hatch: November-January
- Source: Hero *et al.* (1991), Green and Osborne (1994), Gillespie *et al.* (1995), G. Gillespie pers. comm.

b) Longevity

- Classification of lifespan: Unknown
- Average lifespan (yrs): Unknown
- Maximum lifespan (yrs): Unknown
- Source: G. Gillespie pers. comm.

c) Morphology

Adult body size

- Weight (g): Unknown
- Length (mm): 30 snout-vent
- Source: Green and Osborne (1994), Cogger (1996)

d) Social organisation

- Colonial or non-colonial: Colonial (breeding)
- Territoriality: Unknown
- Source: G. Gillespie pers. comm.

e) Other

- Nomadic, migratory, sedentary: Sedentary
- Diet: Opportunistic predator of small invertebrates including beetles, flies, spiders and the larvae of moths
- Source: Pengilly (1971), G. Gillespie pers. comm.

THREATS

1. Clearing of Native Vegetation: Ranking (-)
2. Timber harvesting: Ranking (0) G. Gillespie pers. comm.
3. Fuel Reduction Burning: Ranking (-)

4. Firewood Collection: Ranking (0) G. Gillespie pers. comm.
5. Unplanned Fire: Ranking (-)
6. Introduced Species: Ranking (-)
7. **Grazing/Trampling: Ranking (3)** Gillespie *et al.* (1995), G. Gillespie pers. comm.
8. **Pest Control: Ranking (1)** G. Gillespie pers. comm.
9. **Road Construction and Maintenance: Ranking (1)** G. Gillespie pers. comm.
10. **Mining/Quarrying: Ranking (1)** G. Gillespie pers. comm.
11. Tree Dieback: Ranking (0)
12. **Recreation: Ranking (2)** G. Gillespie pers. comm.
13. Illegal Collection/Harvesting: Ranking (-)
14. Vandalism/Disturbance by Humans: Ranking (-)
15. Dams/Impoundments: Ranking (-) Gillespie *et al.* (1995)
16. **Other: Climate Change Ranking: (3)** Bennett *et al.* (1991), Brereton *et al.* (1995), Gillespie *et al.* (1995), Hunter *et al.* (1997), Tyler (1997)

Current Management:

The species is classified as "insufficiently known" in Victoria (CNR 1995a). There are no current management actions in operation to ameliorate potential threats to this species in the North East Region.

Species characteristics:

The Alpine Tree Frog is a high-altitude subspecies of the Whistling Tree Frog. This largely terrestrial species occurs in southern NSW and eastern Victoria and inhabits woodland, heath, grassland and herb field at high montane, subalpine and alpine altitudes. During the breeding season, male Alpine Tree Frogs call while partially submerged at the edges of large pools in fen and wet grassland. Eggs are deposited in large jelly-like clumps around submerged vegetation. Tadpoles can be found in pools from November-January and metamorphosis occurs from December to January. The Alpine Tree Frog is rarely seen during the non-breeding season although some individuals have been found under flat rocks in stream beds or in rocky areas near streams, amongst litter and under logs (Green and Osborne 1994, Gillespie *et al.* 1995). The Alpine Tree Frog was formerly abundant in alpine and subalpine areas. Since the mid 1980s it has undergone a marked decline (Gillespie *et al.* 1995, Tyler 1997). A recent survey for the species in the Australian

Alps National Parks confirmed a dramatic decline throughout its entire range (Hunter *et al.* 1997).

Distribution in the North East Region:

The Alpine Tree Frog has been recorded from 11 different localities within the North East Region. All records are from the high country and are mostly from the vicinity of Mt Bogong, Mt Hotham and Mt Buller; the majority of records are from National Parks including the Alpine National Park. There are only three recent records, two from the Big River (Mitta Mitta) in 1992 and 1993 and a 1997 record from a small dam at Horsehair Plain (Bogong High Plains) (McMahon *et al.* 1997). All other records are pre-1976 (Atlas of Victorian Wildlife). Recent surveys which incorporated historical locations from Bogong High Plains, and the Buffalo Plateau failed to find extant populations (Hunter *et al.* 1997).

Disturbances and potentially threatening process operating in the North East Region:

Large breeding populations of the Alpine Tree Frog occur on plains or open valleys where there are stream side pools, fens and bogs. It also breeds around the margins of artificial lakes (Gillespie *et al.* 1995). The ecology of the Alpine Tree Frog is not well understood. However, disturbances which impact on the breeding sites and non-breeding habitat are likely to adversely affect populations. Because the species is recorded from alpine environments, development of ski resort facilities and the associated recreational activities may result in loss and modification of habitat and adversely affect populations. Trampling of breeding sites by grazing cattle is potentially a significant threat. Climate change associated with the Enhanced Greenhouse Effect may result in altered breeding conditions and is a major threat to alpine frog species including the Alpine Tree Frog (Gillespie *et al.* 1995). An increase in UV radiation as a consequence of ozone depletion, associated with the enhanced greenhouse effect, is known to cause the death of the eggs and larvae of this species and has been implicated as a major causal factor in population declines (Hunter *et al.* 1997, Tyler 1997, G. Gillespie pers. comm.).

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APPENDIX H: INSECT SPECIES RECORDED FROM THE NORTH EAST VICTORIA RFA REGION * "

Family	Genus	Species	Family	Genus	Species
Chrysomelidae	<i>Auqomela</i>	<i>hypochalcea</i>	Rhinotermitidae	<i>Coptotermes</i>	<i>frenchi</i>
Chrysomelidae	<i>Calomela</i>	<i>bartoni</i>	Rhinotermitidae	<i>Coptotermes</i>	<i>lacteus</i>
Chrysomelidae	<i>Calomela</i>	<i>curtisi</i>	Rhinotermitidae	<i>Heterotermes</i>	<i>ferox</i>
Chrysomelidae	<i>Calomela</i>	<i>ioptera</i>	Termitidae	<i>Amitermes</i>	<i>xylophagus</i>
Chrysomelidae	<i>Calomela</i>	<i>maculicollis</i>	Termitidae	<i>Microcerotermes</i>	<i>implacidus</i>
Chrysomelidae	<i>Calomela</i>	<i>satelles</i>	Termitidae	<i>Nasutitermes</i>	<i>dixoni</i>
Chrysomelidae	<i>Calomela</i>	<i>vittata</i>	Termitidae	<i>Nasutitermes</i>	<i>fumigatus</i>
Chrysomelidae	<i>Cheiloxena</i>	<i>westwoodii</i>	Termopsidae	<i>Porotermes</i>	<i>adamsoni</i>
Chrysomelidae	<i>Lema</i>	<i>trilineata</i>	Termopsidae	<i>Stolotermes</i>	<i>victoriensis</i>
Chrysomelidae	<i>Microdonacia</i>	<i>grevilleae</i>			
Chrysomelidae	<i>Microdonacia</i>	<i>incerta</i>	Castniidae	<i>Synemon</i>	<i>plana</i>
Chrysomelidae	<i>Platycolaspis</i>	<i>pubescens</i>	Noctuidae	<i>Australothis</i>	<i>rubrescens</i>
Dytiscidae	<i>Allodessus</i>	<i>bistriqatus</i>	Noctuidae	<i>Helicoverpa</i>	<i>punctigera</i>
Elmidae	<i>Austrolimnius</i>	<i>anytus</i>	Noctuidae	<i>Uraba</i>	<i>luqens</i>
Elmidae	<i>Austrolimnius</i>	<i>celsus</i>			
Elmidae	<i>Austrolimnius</i>	<i>metasternalis</i>	Corydalidae	<i>Archichauliodes</i>	<i>guttiferus</i>
Elmidae	<i>Austrolimnius</i>	<i>montanus</i>			
Elmidae	<i>Austrolimnius</i>	<i>mormo</i>	Aeshnidae	<i>Austroaeschna</i>	<i>atrata</i>
Elmidae	<i>Austrolimnius</i>	<i>olenus</i>	Aeshnidae	<i>Austroaeschna</i>	<i>inermis</i>
Elmidae	<i>Austrolimnius</i>	<i>victoriensis</i>	Aeshnidae	<i>Austroaeschna</i>	<i>multipunctata</i>
Hydrophilidae	<i>Pseudohydrobius</i>	<i>floricola</i>	Aeshnidae	<i>Austroaeschna</i>	<i>subapicalis</i>
Scarabaeidae	<i>Anoplognathus</i>	<i>hirsutus</i>	Aeshnidae	<i>Austroaeschna</i>	<i>unicornis</i>
Scarabaeidae	<i>Anoplognathus</i>	<i>montanus</i>	Amphipterygidae	<i>Diphlebia</i>	<i>lestoides</i>
Scarabaeidae	<i>Anoplognathus</i>	<i>pallidicollis</i>	Coenagrionidae	<i>Ischnura</i>	<i>aurora</i>
Scarabaeidae	<i>Anoplognathus</i>	<i>porosus</i>	Gomphidae	<i>Austrogomphus</i>	<i>australis</i>
Scarabaeidae	<i>Anoplognathus</i>	<i>suturalis</i>	Gomphidae	<i>Austrogomphus</i>	<i>cornutus</i>
Scarabaeidae	<i>Onthophaqus</i>	<i>auritus</i>	Gomphidae	<i>Austrogomphus</i>	<i>divaricatus</i>
Scarabaeidae	<i>Onthophaqus</i>	<i>australis</i>	Gomphidae	<i>Austrogomphus</i>	<i>querini</i>
Scarabaeidae	<i>Onthophaqus</i>	<i>blackwoodensis</i>	Gomphidae	<i>Austrogomphus</i>	<i>ochraceus</i>
Scarabaeidae	<i>Onthophaqus</i>	<i>dandalu</i>	Gomphidae	<i>Hemigomphus</i>	<i>gouldii</i>
Scarabaeidae	<i>Onthophaqus</i>	<i>declivis</i>	Gomphidae	<i>Hemigomphus</i>	<i>heteroclytus</i>
Scarabaeidae	<i>Onthophaqus</i>	<i>dunningi</i>	Lestidae	<i>Austrolestes</i>	<i>analis</i>
Scarabaeidae	<i>Onthophaqus</i>	<i>granulatus</i>	Lestidae	<i>Austrolestes</i>	<i>leda</i>
Scarabaeidae	<i>Sericesthis</i>	<i>geminata</i>	Lestidae	<i>Austrolestes</i>	<i>psyche</i>
Scarabaeidae	<i>Sericesthis</i>	<i>niqrolineata</i>	Megapodaqronidae	<i>Arqiolestes</i>	<i>griseus</i>
			Megapodaqronidae	<i>Austroarqiolestes</i>	<i>icteromelas</i>
Chironomidae	<i>Botryocladus</i>	<i>grapeth</i>	Protoneuridae	<i>Nososticta</i>	<i>solida</i>
Chironomidae	<i>Botryocladus</i>	<i>mdfrc</i>	Synlestidae	<i>Synlestes</i>	<i>weyersii</i>
Chironomidae	<i>Cricotopus</i>	<i>acornis</i>			
Chironomidae	<i>Cricotopus</i>	<i>albitarsis</i>	Tettigoniidae	<i>Austrodictes</i>	<i>monticolus</i>
Chironomidae	<i>Cricotopus</i>	<i>annuliventris</i>	Tettigoniidae	<i>Nanodectes</i>	<i>harpax</i>
Chironomidae	<i>Cricotopus</i>	<i>brevicornis</i>			
Chironomidae	<i>Cricotopus</i>	<i>conicornis</i>	Austroperlidae	<i>Acruroperla</i>	<i>atra</i>
Chironomidae	<i>Cricotopus</i>	<i>cooki</i>	Eustheniidae	<i>Thaumatoperla</i>	<i>alpina</i>
Chironomidae	<i>Cricotopus</i>	<i>hillmani</i>	Gripopterygidae	<i>Dinotoperla</i>	<i>brevipennis</i>
Chironomidae	<i>Cricotopus</i>	<i>parbicinctus</i>	Gripopterygidae	<i>Dinotoperla</i>	<i>fontana</i>
Chironomidae	<i>Eukiefferiella</i>	<i>insolida</i>	Gripopterygidae	<i>Dinotoperla</i>	<i>serricauda</i>
Chironomidae	<i>Imparipecten</i>	<i>pictipes</i>	Gripopterygidae	<i>Eunotoperla</i>	<i>kershawi</i>
Chironomidae	<i>Rheotanytarsus</i>	<i>juliae</i>	Gripopterygidae	<i>Illiesoperla</i>	<i>mayi</i>
			Gripopterygidae	<i>Riekoperla</i>	<i>alpina</i>
Kalotermitidae	<i>Glyptotermes</i>	<i>neotuberculatus</i>	Gripopterygidae	<i>Riekoperla</i>	<i>rugosa</i>
Kalotermitidae	<i>Kalotermes</i>	<i>convexus</i>	Gripopterygidae	<i>Riekoperla</i>	<i>tuberculata</i>
Kalotermitidae	<i>Kalotermes</i>	<i>rufinotum</i>			
Rhinotermitidae	<i>Coptotermes</i>	<i>acinaciformis</i>			

*from the Database of the Australian National Insect Collection, Canberra (excludes Hymenoptera)