

Threatened Tasmanian Orchids

Flora Recovery Plan



Australian Government



Tasmania

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Disclaimer

This Recovery Plan has been prepared under the provisions of both the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the Tasmanian *Threatened Species Protection Act 1999* (TSP Act). The original Plan, adopted in 2006, covered 68 species of which 34 were listed at the time on both Acts, the remainder being listed only on the TSP Act, and 33 species were endemic to Tasmania. This revised Plan covers 77 species (with 7 new listings and 1 delisting), of which 40 are listed as threatened under both State and Commonwealth legislation, the remaining being listed as threatened under the TSP Act only. Of the 40 EPBC-listed species covered by this revised Plan, 38 are endemic to Tasmania; for the two EPBC-listed species that also occur in other States, *Caladenia brachyscapa* and *Pterostylis cucullata* subsp. *cucullata*, this Plan addresses the Tasmanian populations only. Adoption as a national Recovery Plan under the EPBC Act refers only to species listed under that Act that have a decision to have a recovery plan. The 36 species for which this plan will be adopted are listed in the ‘Species covered by this Plan & conservation status’ section.

As noted in the disclaimer to the original Plan, the taxonomy of orchids is under virtually constant review. The revised Plan takes account of taxonomic and nomenclatural work in the interim. Should a species covered by this Plan be segregated into more than one taxon, all populations of the original and new species will remain covered by this Plan under the original listing of the species. In the event of new species being listed, the general content and actions of this Plan will be relevant but the Plan will need to be revised in relation to specific objectives, actions and priorities.

The information provided in this Plan was accurate at the time of preparation. The attainment of objectives outlined in this Plan may be subject to budgetary and other constraints. Recommended recovery actions may be subject to modification due to changes in knowledge or conservation status.

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Cover photo: *Caladenia dienema* (windswept spider-orchid) by Mark Wapstra.

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Abbreviations

ANOS	Australian National Orchid Society
AOF	Australian Orchid Foundation
BGPA	Botanic Gardens & Parks Authority (Western Australia)
CITES	Convention on International Trade in Endangered Species
CBD	Convention on Biological Diversity
DIER	Department of Infrastructure, Energy and Resources (Tasmania)
DPIPWE	Department of Primary Industries, Parks, Water and Environment (Tasmania)
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
FPA	Forest Practices Authority (Tasmania)
FT	Forestry Tasmania
HO	Tasmanian Herbarium, Hobart
MEWG	Mineral Exploration Working Group (Tasmania)
MSB	Millennium Seed Bank
NRM	Natural Resource Management
NVA	Natural Values Atlas (Tasmania)
ORG	Orchid Research Group (Canberra)
PCAB	Policy and Conservation Advice Branch, DPIPWE (Tasmania)
PLCP	Private Land Conservation Program (DPIPWE)
PPP	Project Prioritisation Protocol
PWS	Parks and Wildlife Service (Tasmania)
RBG	Royal Botanic Gardens (Melbourne)
RTBG	Royal Tasmanian Botanical Gardens
TFGA	Tasmanian Farmers and Graziers Association
TLC	Tasmanian Land Conservancy
TPT	Threatened Plants Tasmania
TSCC	Tasmanian Seed Conservation Centre
TSN	Tasmanian Threatened Species Network
TSP Act	Tasmanian <i>Threatened Species Protection Act 1995</i>
TSS	Threatened Species Section, PCAB/DPIPWE (Tasmania)
TTOFRP	Tasmanian Threatened Orchid Flora Recovery Plan
TTORT	Tasmanian Threatened Orchid Recovery Team

Taxonomy follows Baker & de Salas (2013), except where otherwise noted, and common names follow Wapstra et al. (2005).

The listing status of species referred to in this Plan was correct at the time of publication. Readers are referred to the DPIPWE and Australian Government Department of the Environment and Energy web sites for updates.

TABLE OF CONTENTS

SUMMARY	1
BACKGROUND INFORMATION	2
Species covered by this Plan & conservation status.....	2
Threatened orchid conservation in Tasmania.....	7
<i>Threatened Tasmanian Orchids Recovery Plan 2006–2010</i>	7
<i>Prioritisation of threatened flora recovery actions</i>	8
Tasmanian orchid habitat, distribution and threats.....	8
<i>Tasmanian orchid habitat</i>	8
<i>Habitat critical to the survival of species</i>	8
<i>Reservation status</i>	9
<i>Distribution and decline</i>	9
<i>Threats to orchid populations</i>	10
<i>Biology of nominated threatened orchids</i>	18
<i>Orchid mycorrhizal interactions</i>	18
<i>Orchid pollinator interactions</i>	19
Taxonomy and nomenclature	19
RECOVERY PROGRAM	21
Recovery objectives and performance criteria	21
Strategies and actions for recovery	22
Plan duration, funding and achievement	34
Objectives of the EPBC Act and TSP Act.....	40
Social and economic impacts.....	40
Affected interests	40
Indigenous roles and interests	40
International obligations.....	41
Broader biodiversity benefits and impacts.....	42
Management practices.....	42
BIBLIOGRAPHY	45
APPENDIX 1. Review of TTOFRP 2006–2010	48
APPENDIX 2. List of species covered by this Plan, habitat descriptions and priority populations...	65
APPENDIX 3. Prioritisation schedule of recovery actions for species included in this Plan	86
Table 1. Conservation status of Tasmania’s orchid species.....	2
Table 2. Orchid species included in Recovery Plan: population summary.....	4
Table 3. Recovery objectives and performance criteria for all species	21
Table 4. Budget.....	36
Table 5. Threatened orchids known to occur on Aboriginal land (& year last recorded).....	41
Figure 1. Distribution of native orchids in Tasmania.....	3
Figure 2. Distribution of threatened orchid species in Tasmania (●= extant; ○= locally extinct)	12

SUMMARY

This Plan is a revision of the *Flora Recovery Plan: Threatened Tasmanian Orchids 2006–2010* (TTOFRP; TSS 2006) and provides a framework for the continued recovery of threatened orchid species, and for orchid conservation more generally in Tasmania. This revised Plan covers 77 species listed on the *Tasmanian Threatened Species Protection Act 1995*, and 40 that are also listed on the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*. This plan will be adopted for 36 of the 40 EPBC listed species.

Prior to the 2000s, Tasmania's threatened orchids were managed largely on an *ad hoc* basis subject to funding and other priorities. The 2006–2010 TTOFRP provided a mechanism for a coordinated approach to recovery actions, meeting many broad and specific conservation management objectives for Tasmanian threatened orchids. This current Recovery Plan includes a review of progress under the 2006–2010 TTOFRP.

The long-term objectives of recovery are to minimise the risk of extinction in the wild to threatened orchids in Tasmania and to increase the likelihood of each species becoming self-maintaining through the staged implementation of recovery actions. A commitment to the management of threatened orchids beyond the life of this Plan is needed if long-term objectives are to be realised. This Plan seeks to address short-term management issues relating to specific orchid populations.

Specific recovery objectives for the threatened orchids in this Plan are listed below:

1. to maintain and/or increase the number of known subpopulations of each species;
2. to maintain and/or increase the number of individuals within subpopulations of each species;
3. to maintain and/or increase the extent, condition and security of habitat critical to survival of each species;
4. improve the management and prioritisation of recovery actions through a better understanding and resolution of Tasmanian orchid taxonomy;
5. conduct research into the life history, and biological and ecological requirements of threatened orchids in Tasmania to improve habitat management and mitigate intrinsic threats to orchid subpopulations;
6. better understand the impacts of disturbance on threatened orchids to improve habitat management and mitigate extrinsic threats to orchid subpopulations;
7. to establish and maintain a genetically representative *ex situ* collection of seed and mycorrhizal fungi of all species;
8. to successfully trial orchid translocation projects; and
9. to raise public awareness of orchid conservation issues, and develop mechanisms to encourage and coordinate community participation in orchid recovery programs.

BACKGROUND INFORMATION

Tasmania has a very rich and unique flora existing in a variety of habitats including alpine herbfields, heathland, ancient rainforests, native grasslands and windswept coastal vegetation (Reid et al. 1999). Tasmania's orchids are ubiquitous, occurring in all these habitats, often reliant on highly specific biological and ecological interactions for growth and survival. However, due to the specific nature of these interactions and the changes imposed on Tasmania's landscape through anthropogenic activities, many of Tasmania's orchids are threatened with extinction. A total of 213 native orchid species have been recorded in Tasmania (Baker & de Salas 2013), an increase of 18 species recognised for the State since the last Recovery Plan was prepared. Seventy-four species are endemic to Tasmania, including two endemic to Macquarie Island (administratively part of Tasmania); one introduced species (*Disa bracteata*, a native of South Africa) has also been recorded in Tasmania (Baker & de Salas 2013).

Species covered by this Plan & conservation status

This Plan covers 77 species, of which 41 are endemic to Tasmania. All species are listed on the TSP Act, and 40 are listed on the EPBC Act, 38 of which are endemic to Tasmania (Table 1 and Figure 1). This Plan will be adopted for 36 of the 40 EPBC listed species: *Caladenia anthracina*, *Caladenia campbellii*, *Caladenia caudata*, *Caladenia dienema*, *Caladenia lindleyana*, *Caladenia pallida*, *Caladenia saggicola*, *Caladenia sylvicola*, *Caladenia tonellii*, *Corunastylis brachystachya*, *Corunastylis firthii*, *Diuris lanceolata*, *Prasophyllum amoenum*, *Prasophyllum apoxychilum*, *Prasophyllum atratum*, *Prasophyllum castaneum*, *Prasophyllum crebriflorum*, *Prasophyllum favonium*, *Prasophyllum incorrectum*, *Prasophyllum limnetes*, *Prasophyllum milfordense*, *Prasophyllum olidum*, *Prasophyllum perangustum*, *Prasophyllum pulchellum*, *Prasophyllum robustum*, *Prasophyllum secutum*, *Prasophyllum stellatum*, *Prasophyllum taphanyx*, *Prasophyllum tunbridgense*, *Pterostylis commutata*, *Pterostylis pratensis*, *Pterostylis rubenachii*, *Pterostylis wapstrarum*, *Pterostylis ziegeleri*, *Thelymitra jonesii* and *Thynniorchis notbofagicola*.

Since the original Plan, five species have been added to the schedules of both the TSP and EPBC Acts (*Nematoceras dienemum*, *Nematoceras sulcatum*, *Prasophyllum atratum*, *Prasophyllum crebriflorum* and *Prasophyllum limnetes*), one has been added to the TSP Act (*Thelymitra atronitida*), and one to the EPBC Act (*Prasophyllum taphanyx*). One species (*Pterostylis atriola*) has been delisted from the EPBC Act. One species (*Prasophyllum* aff. *pyriforme*) has been removed from the schedules of the TSP Act as it is no longer regarded as a distinct entity; rather it is part of the widespread and non-threatened *Prasophyllum rostratum*. One species is now listed under a different name on the EPBC Act: *Prasophyllum incorrectum* was listed as part of *Prasophyllum correctum*, a species now regarded as endemic to Victoria; both species are now listed in their own right under the EPBC Act.

The conservation and population status of all orchid species in Tasmania currently listed as threatened under either the TSP Act or EPBC Act are detailed in Table 2. All species listed under either Act are included in this Plan.

Table 1. Conservation status of Tasmania's orchid species

Status	TSP Act	EPBC Act
Critically Endangered	n/a	25
Endangered	54	10
Vulnerable	8	4
Rare	13	n/a
Presumed Extinct/Extinct	2	1
Total	77	40
Endemic	41	38

Species are nominated for listing on the TSP Act as presumed extinct (Schedule 3.1), endangered (Schedule 3.2), vulnerable (Schedule 4) or rare (Schedule 5) if they meet the criteria for the respective threat categories as defined by the 'Guidelines for Eligibility for Listing under the Tasmanian *Threatened Species Protection Act 1995*' (DPIPWE 2008). Species are nominated for listing on the EPBC Act as Extinct, Critically Endangered, Endangered or Vulnerable if they meet the criteria as defined by the EPBC Act. Both State and Commonwealth agencies have protocols for assessing nominations through formal scientific advisory committees.

Listing of species under the Tasmanian and Commonwealth legislation is a dynamic process. Implementation of this Plan will provide additional and improved information with respect to present distributions, current threats and declines. Consequently, the conservation status of species covered by this Plan may change after the Plan is adopted. Should a species covered by this Plan be segregated into more than one species, all subpopulations of the original and new species will remain covered by this Plan under the original listing of the species until the original and new species have their conservation status re-assessed. In the event of new species being listed, the general content and actions of this Plan will be relevant but the Plan may need to be revised in relation to specific objectives, actions and priorities.

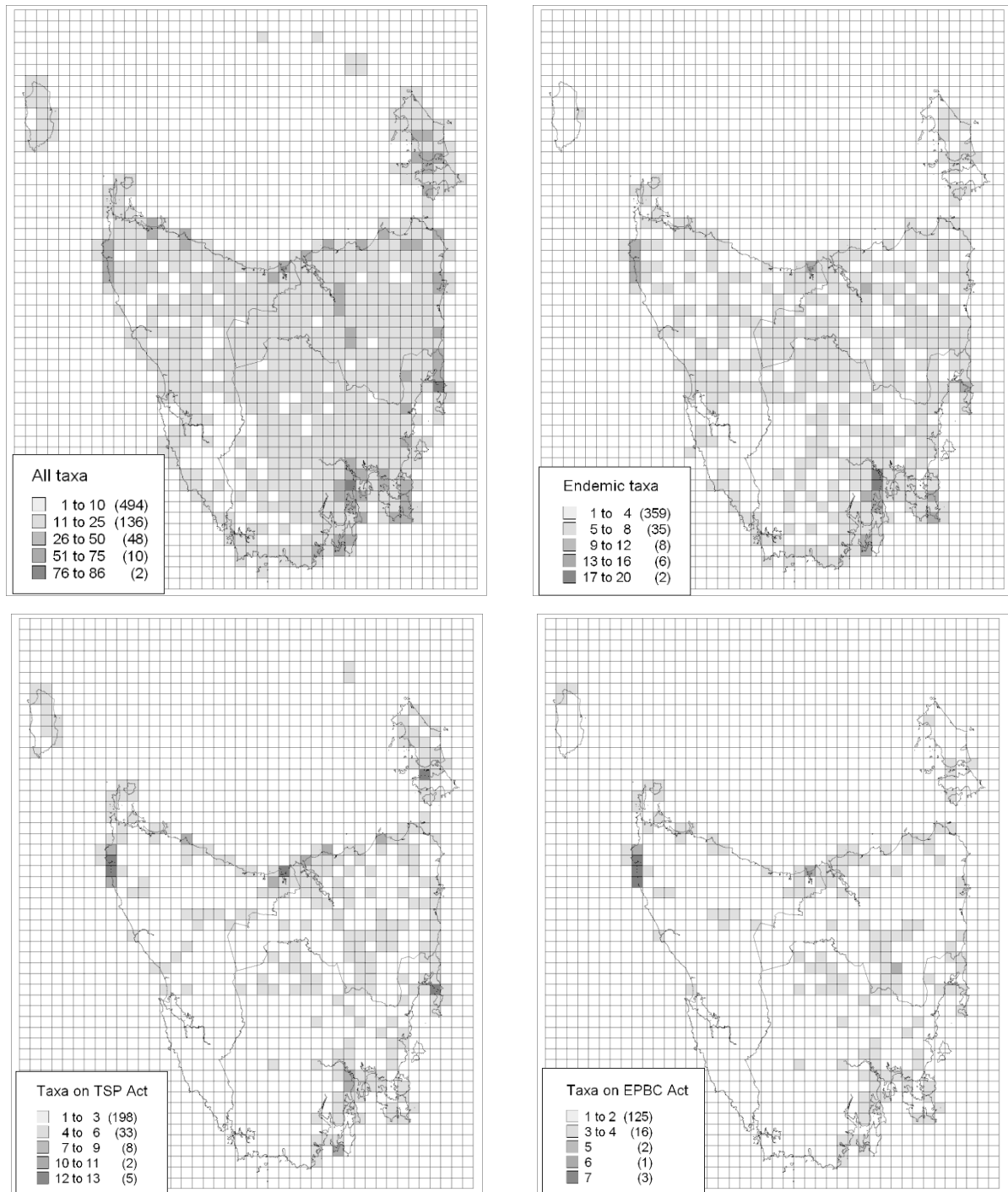


Figure 1. Distribution of native orchids in Tasmania

(Data from DPIPWE's Natural Values Atlas (December 2012), overlain on 10 km by 10 km grid and three NRM regions (Cradle Coast, North & South); records with accuracy >1 km excluded)

Table 2. Orchid species included in Recovery Plan: population summary

Species	Common Name	TSP Act	EPBC Act	End	Extant pops	Res'd pops	Private pops	Other pops	Last seen	Linear range (km)	Extent of occ. (km ²)	Number of plants
<i>Caladenia anthracina</i>	blacktip spider-orchid	e	CR	end	7	3	4	0	2012	34	461	< 250
<i>Caladenia aurantiaca</i>	orangetip fingers	e			3	3	0	0	2008	2	4	< 250
<i>Caladenia australis</i>	southern spider-orchid	e			1	1	0	0	1968			1
<i>Caladenia brachyscapa</i>	short spider-orchid	e	EX		2	0	0	2	2009	14		unknown
<i>Caladenia campbellii</i>	thickstem fairy fingers	e	CR	end	3	0	2	1	2010	35	103	< 250
<i>Caladenia cardiophylla</i>	heartlip spider-orchid	x			1	1	0	0	1947			unknown
<i>Caladenia candata</i>	tailed spider-orchid	v	VU	end	27	14	3	10	2011	363	35380	5000 to 6000
<i>Caladenia congesta</i>	blacktongue finger-orchid	e			23	9	13	1	2010	312	12900	< 1000?
<i>Caladenia dienema</i>	windswept spider-orchid	e	EN	end	16	12	1	3	2012	104	3610	< 250
<i>Caladenia filamentosa</i>	daddy longlegs	r			40	6	20	14	2011	385	33400	< 1000
<i>Caladenia lindleyana</i>	lindleys spider-orchid	e	CR	end	4	0	3	1	2006	219	4260	< 50
<i>Caladenia pallida</i>	rosy spider-orchid	e	CR	end	2	0	2	0	1987	95		< 50
<i>Caladenia patersonii</i>	patersons spider-orchid	v			41	14	25	2	2011	299	18900	< 1000
<i>Caladenia prolata</i>	white fingers	e			3	3	0	0	2004	103	130	< 250
<i>Caladenia pusilla</i>	tiny fingers	r			> 50	> 20			2012	500	102400	10000+
<i>Caladenia sagicola</i>	sagg spider-orchid	e	CR	end	2	1	1	0	2012	10	2.5	400 to 500
<i>Caladenia sylvicola</i>	forest fingers	e	CR	end	1	0	0	1	2009	0.3	0.01	< 20
<i>Caladenia tonellii</i>	robust fingers	e	CR	end	7	3	2	2	2011	163	2360	< 250
<i>Calochilus campestris</i>	copper beard-orchid	e			1	1			1979			unknown
<i>Chiloglottis trapeziformis</i>	broadlip bird-orchid	e			5	1	4	0	2010	230	14180	unknown
<i>Corunastylis brachystachya</i> **	shortspike midge-orchid	e	EN	end	5	4	1	0	2011	80	1960	< 100
<i>Corunastylis firthii</i> ***	firths midge-orchid	e	CR	end	2	2	0	0	1999	14		< 20
<i>Corunastylis morrisii</i>	bearded midge-orchid	e			7	3	2	2	2013	390	27000	< 100
<i>Corunastylis nuda</i>	tiny midge-orchid	r			23	5	13	5	2011	360	45700	< 1000?
<i>Corunastylis nudiscapa</i>	bare midge-orchid	e		end	3	0	1	2	2013	24.8	13.2	< 250
<i>Corybas fordhamii</i>	swamp pelican-orchid	e			1	1	0	0	2009			< 150

Species	Common Name	TSP Act	EPBC Act	End	Extant pops	Res'd pops	Private pops	Other pops	Last seen	Linear range (km)	Extent of occ. (km ²)	Number of plants
<i>Cryptostylis leptochila</i>	small tongue-orchid	e			7	3	4	0	2007	30	91	< 600
<i>Cyrtostylis robusta</i>	large gnat-orchid	r			>> 50	> 15			2011	480	96000	>> 10000
<i>Diuris lanceolata</i>	large golden moths	e	EN	end	5	3	2	0	2008	60	745	< 1000
<i>Diuris palustris</i>	swamp doubletail	e			17	11	6	0	2011	330	61000	< 250
<i>Hydorchis orbicularis</i>	swamp onion-orchid	r			13	5	5	3	2007	244	16100	unknown
<i>Microtidium atratum</i>	yellow onion-orchid	r			31	18	9	4	2011	404	67000	>> 10000
<i>Nematoceras dienemum</i>	windswept helmet-orchid	v	CR	eMI	11	11	0	0	2009	15	12	<< 10000
<i>Nematoceras sulcatum</i> ****	grooved helmet-orchid	e	CR	eMI	4	4	0	0	2011	6		12-13000
<i>Orthoceras strictum</i>	horned orchid	r			> 35	> 15			2010	484	91800	unknown
<i>Prasophyllum amoenum</i>	dainty leek-orchid	v	EN	end	5	5	0	0	2013	23	120	500–600
<i>Prasophyllum apoxychilum</i>	tapered leek-orchid	v	EN	end	14	8	1	5	2011	310	22100	< 200
<i>Prasophyllum atratum</i>	three hummock leek-orchid	e	CR	end	1	1	0	0	2010	0.9	0.2	c. 1000
<i>Prasophyllum castaneum</i>	chestnut leek-orchid	e	CR	end	5	5	0	0	2010	71	102	< 50
<i>Prasophyllum crebriflorum</i>	crowded leek-orchid	e	EN	end	13	4	8	1	2011	128	2470	> 10000?
<i>Prasophyllum favonium</i>	western leek-orchid	e	CR	end	7	7	0	0	2011	29	37	< 250
<i>Prasophyllum incorrectum</i>	golfers leek-orchid	e	CR	end	3	2	1	0	2012	27	60	5000
<i>Prasophyllum limnetes</i>	marsh leek-orchid	e	CR	end	1	1	0	0	2012	< 1	< 1	< 25
<i>Prasophyllum milfordense</i>	milford leek-orchid	e	CR	end	1	1	0	0	2012	0.6	0.06	200
<i>Prasophyllum olidum</i>	pungent leek-orchid	e	CR	end	1	0	1	0	2012	0.06	0.24	150
<i>Prasophyllum perangustum</i>	knocklofty leek-orchid	e	CR	end	1	0	0	1	2009	0.02	0.0002	< 10
<i>Prasophyllum pulchellum</i>	pretty leek-orchid	e	CR	end	12	11	0	1	2010	365	33640	< 200
<i>Prasophyllum robustum</i>	robust leek-orchid	e	CR	end	1	0	1	0	2008	0.03	0.01	c. 50
<i>Prasophyllum secutum</i>	northern leek-orchid	e	EN	end	14	5	6	3	2008	320	32900	< 500
<i>Prasophyllum</i> sp. Arthurs Lake (R.Smith DLJ11363) Tas Herbarium	mountain leek-orchid	e		end	4	1	1	2	2000	126	1750	unknown
<i>Prasophyllum stellatum</i>	ben lomond leek-orchid	e	CR	end	2	0	0	2	2013	83	180	< 100
<i>Prasophyllum tadgellianum</i>	tadgells leek-orchid	r			8	5	2	1	2012	72	2400	unknown
<i>Prasophyllum taphanys</i>	graveside leek-orchid	e	CR	end	1	0	1	0	2012	0.0002	0.00001	3

Species	Common Name	TSP Act	EPBC Act	End	Extant pops	Res'd pops	Private pops	Other pops	Last seen	Linear range (km)	Extent of occ. (km ²)	Number of plants
<i>Prasophyllum tunbridgense</i>	tunbridge leek-orchid	e	EN	end	5	1	4	0	2012	30	67	< 50
<i>Pterostylis atriola</i>	snug greenhood	r		end	15	7	0	8	2012	300	31500	2 to 5000
<i>Pterostylis commutata</i>	midlands greenhood	e	CR	end	9	1	7	1	2012	53	395	< 100
<i>Pterostylis cucullata</i> subsp. <i>cucullata</i>	leafy greenhood	e	VU		16	11	5	0	2009	350	31400	> 10000
<i>Pterostylis falcata</i>	sickle greenhood	e			1	0	1	0	1972			unknown
<i>Pterostylis grandiflora</i>	superb greenhood	r			> 30	13			2011	178	9800	unknown
<i>Pterostylis lustra</i>	greenhood	e			5	2	3	0	2007	33	182	< 50
<i>Pterostylis pratensis</i>	liawenee greenhood	v	VU	end	11	2	9	0	2010	123	1505	> 10000?
<i>Pterostylis rubenachii</i>	arthur river greenhood	e	EN	end	5	5	0	0	2012	25	56	< 1000
<i>Pterostylis sanguinea</i>	banded greenhood	r			22	6	16	0	2010	368	33500	unknown
<i>Pterostylis squamata</i>	ruddy greenhood	v			> 30	8			2011	231	15000	unknown
<i>Pterostylis tunstallii</i>	tunstalls greenhood	e			5	2	3	0	2010	60	675	< 200?
<i>Pterostylis wapstrarum</i>	fleshy greenhood	e	CR	end	4	0	3	1	2009	76	1400	< 200
<i>Pterostylis zigeleri</i>	grassland greenhood	v	VU	end	26	6	20	0	2012	330	43000	6000 to 7000
<i>Thelymitra antennifera</i>	rabbit ears	e			12	10	2	0	2011	347	22560	> 2000
<i>Thelymitra atronitida</i>	blackhood sun-orchid	e			8	4	1	3	2012	300	8880	300
<i>Thelymitra benthamiana</i>	blotched sun-orchid	e			3	0	3	0	2005	4	0.3	< 200
<i>Thelymitra bracteata</i>	leafy sun-orchid	e			4	0	3	1	2009	222	1370	< 100
<i>Thelymitra holmesii</i>	bluestar sun-orchid	r			26	8	11	7	2009	495	98200	< 1000
<i>Thelymitra jonesii</i>	skyblue sun-orchid	e	EN	end	8	4	3	1	2008	360	50600	< 100
<i>Thelymitra malvina</i>	mauvetuft sun-orchid	e			13	5	7	1	2010	465	70500	< 50
<i>Thelymitra mucida</i>	plum sun-orchid	r			5	1	4	0	2010	340	46100	< 50
<i>Thynninorchis buntiana</i>	elbow orchid	x			0	0	0	0	1972			1
<i>Thynninorchis notbofagicola</i> *****	myrtle elbow orchid	e	CR	end	1	1	0	0	2003	0.01	0.00001	3

NOTES: Species in bold indicates listed since original Recovery Plan; TSP Act and EPBC Act entries refer to the current listed status (** = listed on EPBC Act as *Genoplesium brachystachyum*, *** = listed as *Genoplesium firthii*, **** = listed as *Corybas sulcata*, ***** = listed as *Arthrochilus buntianus* subsp. *notbofagicola*); **end** denotes species endemic to Tasmania, **eMI** = endemic to Macquarie Island; **Extent of occ.** = extent of occurrence (= minimum convex polygon enclosing all known extant subpopulations); **Res'd pops** = subpopulations occurring on reserves listed under the Tasmanian *Nature Conservation Act 2002*, including areas covered by conservation covenants; **Other pops** = subpopulations on the following tenures: Aboriginal land, Commonwealth land, Councils, Hydro Tasmania, State Forest and unallocated Crown land.

TSS (2009a) undertook an assessment, using expert opinion and information gathered during the Orchid Recovery Project 2006–2009, of all Tasmanian orchid species (at the time 211), and made recommendations on their conservation status under the TSP Act. This review indicated that several species listed only on the TSP Act probably warrant delisting (*Caladenia pusilla*, *Corunastylis nuda*, *Cyrtostylis robusta*, *Microtidium atratum*, *Pterostylis pratensis*), down-listing (*Thelymitra antennifera*, *Pterostylis atriola*, *Pterostylis cucullata*), or up-listing (*Pterostylis falcata*), and that some species currently unlisted probably warrant listing (*Chiloglottis valida*, *Thelymitra inflata*). Of these species, *Pterostylis atriola* has been down-listed from endangered to rare on the TSP Act, and delisted from the EPBC Act, and *Pterostylis falcata* has been uplisted from rare to endangered on the TSP Act.

The Tasmanian Scientific Advisory Committee under the TSP Act is to review all species listed on the TSP Act. This will consider the recommendations of TSS (2009a) in relation to the conservation status of orchids. The Memorandum of Understanding between DPIPW and the Australian Government Department of the Environment and Energy will facilitate the subsequent consideration of these species under the EPBC Act.

Threatened orchid conservation in Tasmania

Traditionally, local orchid enthusiasts in Tasmania have identified many sites and undertaken informal monitoring of subpopulations. In more recent years, specific projects have been implemented resulting in the preparation of *The Orchids of Tasmania* (Jones et al. 1999), listing statements, the 2006–2010 TTOFRP, as well as numerous survey and monitoring activities and on-ground protection measures.

Conservation of orchids on mainland Australia is further advanced. Conservation activities, including detailed monitoring of subpopulations, hand pollination, seed collection, seed germination trials, mycorrhizal fungal baiting and culture trials, have been ongoing in some areas for up to ten years. These activities have been undertaken primarily by ‘research groups’ associated with botanic gardens (e.g. the BGPA, RBG and RTBG).

Threatened Tasmanian Orchids Recovery Plan 2006–2010

Prior to the 2006–2010 TTOFRP (TSS 2006), conservation measures for threatened Tasmanian orchids had been undertaken on an *ad hoc* basis. In 2003, a recovery team was set up to oversee orchid recovery in Tasmania. The team was made up of representatives from key organisations including TSS, FPA, DIER, TFGA, PWS, TSN, RTBG, ANOS and community members active in orchid conservation. Members of the team provided their time as in-kind contribution. The release of the TTFORP led to a flurry of orchid conservation-related projects (Larcombe 2008, Janes 2008), and significant advances have been made in demographic monitoring (ECOTas 2008, Larcombe 2009a, Larcombe 2009b, TSS 2009b), collection and storage of seed of threatened and/or endemic species (Janes 2010), isolation of mycorrhizal fungi (Janes 2009 & 2010), identifying new and confirming historical subpopulations (Dalglish 2003, Dalglish & Schahinger 2006, ECOTas 2009), on-ground conservation management works (Larcombe 2007, TSS 2009a), and formalisation of documentation such as listing statements. Conservation measures under the 2006–2010 Plan have included searches for new subpopulations, collation of distribution and subpopulation data, fencing, pest plant control, liaison with the community, landowners and managers, preparation of management plans and guidelines, reservation efforts, ongoing taxonomic review, preparation of listing statements for threatened species as required under the TSP Act, and preparation of nominations for listing or a change of listing status under State and Commonwealth threatened species legislation as appropriate.

Activities undertaken under the auspices of the 2006–2010 TTOFRP are summarised in Appendix 1. These actions are listed against the specific objectives of the original Plan and form the basis of adjustments to priorities to the revised actions and costing in the current Plan. The recovery strategy for this revised Plan has been changed based on a review of the 2006–2010 TTOFRP, and the following recovery program details reflect these changes.

In summary, the previous Recovery Plan was partially successful. It resulted in a more strategic and pro-active approach to orchid conservation management in Tasmania. Implementation of the Plan allowed many gaps in knowledge to be identified and addressed, available resources were used more efficiently and conservation actions were in line with State and regional strategies and the overall objectives of orchid recovery. Surveys undertaken made significant contributions to filling gaps in the knowledge of threatened orchids in Tasmania. TSS (2009a) provides an overview of the surveys undertaken during the period 2007–2009 under the previous Recovery Plan, as well as a review of species that require baseline surveys.

Although most specific objectives and recovery actions have been addressed to some extent, some have not been fully achieved, as summarised in Appendix 1.

This outcome is due to one or a combination of the following:

- significantly less funding received to complete recovery actions than budgeted;
- loss of project officer responsible for surveys and implementing recovery actions;
- some criteria operated on a time scale beyond the life of the Recovery Plan;
- seasonal constraints as Tasmania was in severe drought during the employment term of the project officer;
- some criteria were not measurable;
- difficulties with contamination and procedure implementation for mycorrhizal isolation and cultures;
- some actions were not implemented;
- as performance criteria were only provided to assess progress of the actions, some criteria which could have been used to measure achievement of objectives were not monitored during implementation.

Prioritisation of threatened flora recovery actions

In 2009 Tasmania's threatened flora and fauna were subjected to a cost-benefit analysis that identified the minimum set of actions (defined as a 'project' under the analysis) required to secure each species over a 50-year period, the so-called Project Prioritisation Protocol (PPP; TSS 2010). The benefit (B) to the species from undertaking the project was weighed against the likelihood of actions being successful (S) and their expected cost (C), allowing projects to be ranked on the basis of their 'efficiency' ($= (B \times S)/C$). Species listed as endangered or vulnerable on the TSP Act were considered (318 in all); 57 threatened orchids were assessed, of which 15 were deemed to be data deficient, 14 were deemed to be secure without any actions (that is, there was no perceived benefit to the species), and 28 had projects developed, each project including a suite of actions.

The results of the PPP analysis have allowed projects for individual orchid species to be viewed within the context of Tasmania's higher flora, as well as within the Orchidaceae family itself. The actions outlined in this Plan include those developed during the PPP process, with the priority for their implementation reflecting their respective PPP rankings (tempered, in some cases, by the emergence of new data in the interim). In addition, those species deemed to be data deficient were subject to a separate analysis that assessed the relative priorities for extension surveys; these priorities are also reflected in this Plan.

Tasmanian orchid habitat, distribution and threats

Tasmanian orchid habitat

Threatened orchids occur across Tasmania, including offshore islands and Macquarie Island. Threatened orchids are present in all Tasmanian bioregions and can be found in most major Tasmanian ecosystems including dry sclerophyll forests and woodlands, alpine environments, wet sclerophyll forests, buttongrass moorlands, coastal heaths and coastal and inland grasslands (Jones et al. 1999, Jones 2006). The majority of threatened orchid populations occur in dry forests and woodlands, grasslands and coastal ecosystems, all of which have been subject to significant loss and modification since European settlement. Habitat descriptions are provided for all species in Appendix 2. The quality of information on habitat varies greatly between species and populations. Habitat descriptions are unavailable or brief for some taxa. Detailed descriptions of known habitats and threats specific to the species covered by this Plan are addressed in relevant listing statements (see Appendix 3 for a list of species with listing statements). Additional habitat details can be found in Jones et al. (1999), Jones (2006) and Collier (2010).

Habitat critical to the survival of species

Habitat critical to the survival of species is defined as specific areas within and beyond a species' current distribution range containing biological and ecological characteristics essential to the continued existence of the species. Therefore, habitat critical to the survival of a particular species includes all areas deemed important to that species' survival or recovery, whether the species currently resides in those areas, historically resided in those areas, or may successfully recruit there in the future. By identifying and providing protection for habitat considered critical to the species' survival, the extinction risk of a species may be significantly reduced. Designating habitat critical to the survival of the species also provides vital information to land management authorities, private landowners and the general public about where important habitat for listed species is located — and why they should help conserve it. For Tasmania's terrestrial orchids, key biological and ecological characteristics critical to their survival, namely the presence of mycorrhizal fungi and insect pollinators are largely unknown.

General habitat characteristics for the listed orchid taxa are described in Appendix 2. Within this general habitat, habitat that is critical to the survival of the species includes the area occupied by ‘important’ subpopulations (as described below and listed in Appendix 2), the local catchment known to support those subpopulations, and adjacent habitat suitable for subpopulation expansion.

Note that the area of occupancy may not be known for all important subpopulations; similarly, habitat suitable for subpopulation expansion may need to be identified and mapped.

Appendix 2 includes priority subpopulations for species listed on the TSP and EPBC Acts; these subpopulations are considered critical for the survival of the respective species and are therefore considered to be ‘important populations’. The conservation status of the species, subpopulation size, habitat condition, practicalities of management and conservation security were considered in their selection.

The list of priority subpopulations is by no means complete and it is important to recognise that this list is dynamic and requires revision, as baseline surveys are conducted, as new information becomes available, as the status of threatening processes change, and as negotiations with landowners and managers progress.

Reservation status

Many priority subpopulations occur on private land, unallocated Crown land or Public Reserves managed for purposes other than nature conservation. Representation of threatened orchid species in statutory reserves ranges from well represented to unrepresented (Table 2). Species are considered reserved if they are contained within the reserve categories listed in Schedule 1 of the *Tasmanian Nature Conservation Act 2002*. Reserve categories which have nature conservation as their primary aim include Nature Reserves, State Reserves and National Parks. Conservation Areas, Nature Recreation Areas, Regional Reserves, Forest Reserves and Game Reserves offer a level of protection, though their primary aim may not be conservation.

Species on private land protected by a conservation covenant under the *Tasmanian Nature Conservation Act 2002* are also reserved.

Species in State Forest that occur in Special Management Zones are not reserved. However, it is recognised that management prescriptions specific to the conservation of species within the zone can offer adequate and appropriate protection/management from forestry activities (Orr & Gerrard 1998). Information on the reservation status of each species is detailed in Table 2 and for priority subpopulations in Appendix 2.

Distribution and decline

Attempting to assess the decline in Tasmanian orchids since European settlement is fraught with difficulties. Prior to the 2000s there was limited formal monitoring of orchid subpopulations in Tasmania. Changes in species’ distribution and subpopulations over time have, in general, not been documented systematically and have been observed and reported largely by orchid enthusiasts. Records provided by enthusiasts and professional botanists and specimens lodged at herbaria provide insights into the extent of occurrence of species, and current land use provides an indication as to subpopulations that are likely to have become extinct. However, as a consequence of patchy and ephemeral occurrences, as well as the lack of permanent monitoring, our knowledge of the distribution of threatened orchid subpopulations and subpopulation demographics in Tasmania is generally incomplete. The location of many subpopulations has been recorded as a point with a radius of no greater than 100 m precision, often much lower.

Accurate subpopulation data is lacking for the majority of subpopulations of threatened orchid species. This revised Recovery Plan recognises the need for more precise location details through baseline surveys reviewing records of extant subpopulations (Recovery Action 1a).

As a result of work conducted to complete the *Orchid Atlas of Tasmania* (Ziegeler et al. 1996) and *The Orchids of Tasmania* (Jones et al. 1999), and under the previous Recovery Plan (see TSS 2009a), distributional data on most threatened species is available. However, information for newly described species is generally limited and many recorded subpopulations have not been observed in recent years (Table 2). It is also likely that there are still undiscovered subpopulations in Tasmania. It is important that the current status of recorded subpopulations is determined and that undiscovered subpopulations are located through extension surveys (Recovery Action 1b), so that managing authorities can be advised as to appropriate management.

Determination of declines in geographic range, the size and number of known subpopulations and the area they occupy is inherently difficult for threatened orchids. Generally anecdotal evidence, herbarium records and land clearance patterns have been used to broadly estimate declines. Long-term monitoring of high priority permanently marked subpopulations is required to improve accuracy and determine causes of decline (Recovery Actions 2a and 2b).

A summary of the current knowledge of present distributions for each species covered by this Plan is given in Figure 2, with priority populations for each species detailed in Appendix 2. A summary of the current knowledge of the past and present distributions for each species is also provided in their respective listing statements and in Jones et al. (1999). Appendix 3 identifies species that have listing statements and the current status of the statements, including those still under preparation (see Recovery Action 1c).

Threats to orchid populations

Tasmania's orchids have been subject to a range of threats since European settlement, including clearance, fragmentation and degradation of habitat, agricultural practices, inappropriate fire regimes, deleterious grazing and disturbance regimes, and the spread of diseases and pest species. For many orchids the impacts of these threats have been amplified by small population sizes and narrow distributions.

Fire is a major environmental factor in southern Australia, with many orchids requiring some level of fire disturbance, and developing special adaptations to cope with it (Jones 2006). For many terrestrial orchids fire is an integral part of their life cycle, to the extent that some species will only flower after fire, while others flower much more profusely following a summer burn (Jones 2006). However, not all fires have a beneficial effect: an absence of fire, less frequent and less intense fires, or too frequent fires, could all prevent recruitment of individuals to the population, leading over the longer term to declines and local extinctions. Fire regimes in many of Tasmania's ecosystems have been altered since European settlement. Aboriginal firestick farming practices have ceased; wildfires are deliberately lit and actively suppressed; regular low intensity burns are conducted to protect assets, and ecological burns are conducted for various management purposes. Due to the lack of long-term monitoring it is generally unclear how changes in fire regimes have influenced orchid distributions in Tasmania.

Inappropriate habitat disturbance (e.g. soil disturbance or removal, slashing of vegetation) is also a threat; however, some level of habitat disturbance is apparently required for the maintenance of some species. Different types of disturbance, and the intensity, frequency and season of the disturbance events will influence the species' population structure.

Recreational activities (such as off-road vehicle use or walking/hiking) may lead to fragmentation and heavy disturbance of habitat, as well as direct damage to orchid plants. Heavily disturbed, exposed soil also encourages the proliferation of weeds. Grazing and trampling of orchid plants and habitat may also be caused by feral and domesticated herbivores such as livestock, rabbits and pigs, as well as by native animals such as the red-necked wallaby (*Macropus rufogriseus*). The superb lyrebird (*Menura novaehollandiae*), introduced to Tasmania from the Australian mainland in the 1930s, also poses a threat to orchids through its destructive foraging activities (Jones et al. 1999).

The red-legged earth mite (*Halotydeus destructor*) is a known pest of orchids in Tasmania (Norris 2007). This arthropod attacks all stages of plants, and in southern Australia is generally active from May to October (Lawrence 2009).

Small population size has the risk that populations will become smaller than the minimum viable population limit. Many species are known from only a few sites, and some from a single location. Some species may also have low reproductive output, but information on the number of plants that flower in any given year, and whether or not pollination and recruitment is taking place, is generally lacking. These species are particularly susceptible to extinction from localised stochastic events. A single catastrophic event could cause extinction or reduce the total population to critically low levels. Land clearance, significant soil disturbance (e.g. ploughing), and application of fertiliser have the potential to eliminate species from a site in a single event. Loss of a few plants due to localised drought, fire, browsing and similar events has the potential to reduce a population to critically low numbers. Small populations may also experience a decline in genetic diversity and reproductive vitality and may be less effective at attracting pollinators. The effect of mortality in small subpopulations is accentuated in the absence of significant recruitment. Seed production can be limited and flowering events may be highly variable from year to year. Demographic studies of *Prasophyllum correctum* in Victoria demonstrated that up to 71% of mature plants were dormant in any given year (Coates 2001).

The threats to important subpopulations of each species are summarised in Appendix 2. Listing statements contain more detailed information on threats to species (see Appendix 3 for a list of species with such statements).

Illegal collection of orchids is considered a threat to populations in Victoria (Coates et al. 2002). Significant impacts from illegal collection have not been officially recorded in Tasmania. However, as public awareness of threatened orchids increases with the implementation of this Plan, pressures from illegal collection may also increase. It should be noted that during the period of the last Recovery Plan (2006–2010), no incidents of actual

or suspected illegal collection of threatened Tasmanian orchids were recorded.

Additional concerns for some species include inadequate representation within reserves, unverified or imprecise location data, limited population data, and a poor understanding of ecological requirements. The location of subpopulations, their associated habitat and whether they flower in a given year is typical of the type of information that has been collected. Information on subpopulation size is generally lacking. Consequently, in most cases, it has not been possible to assess the effects of management and/or whether subpopulations are in decline.

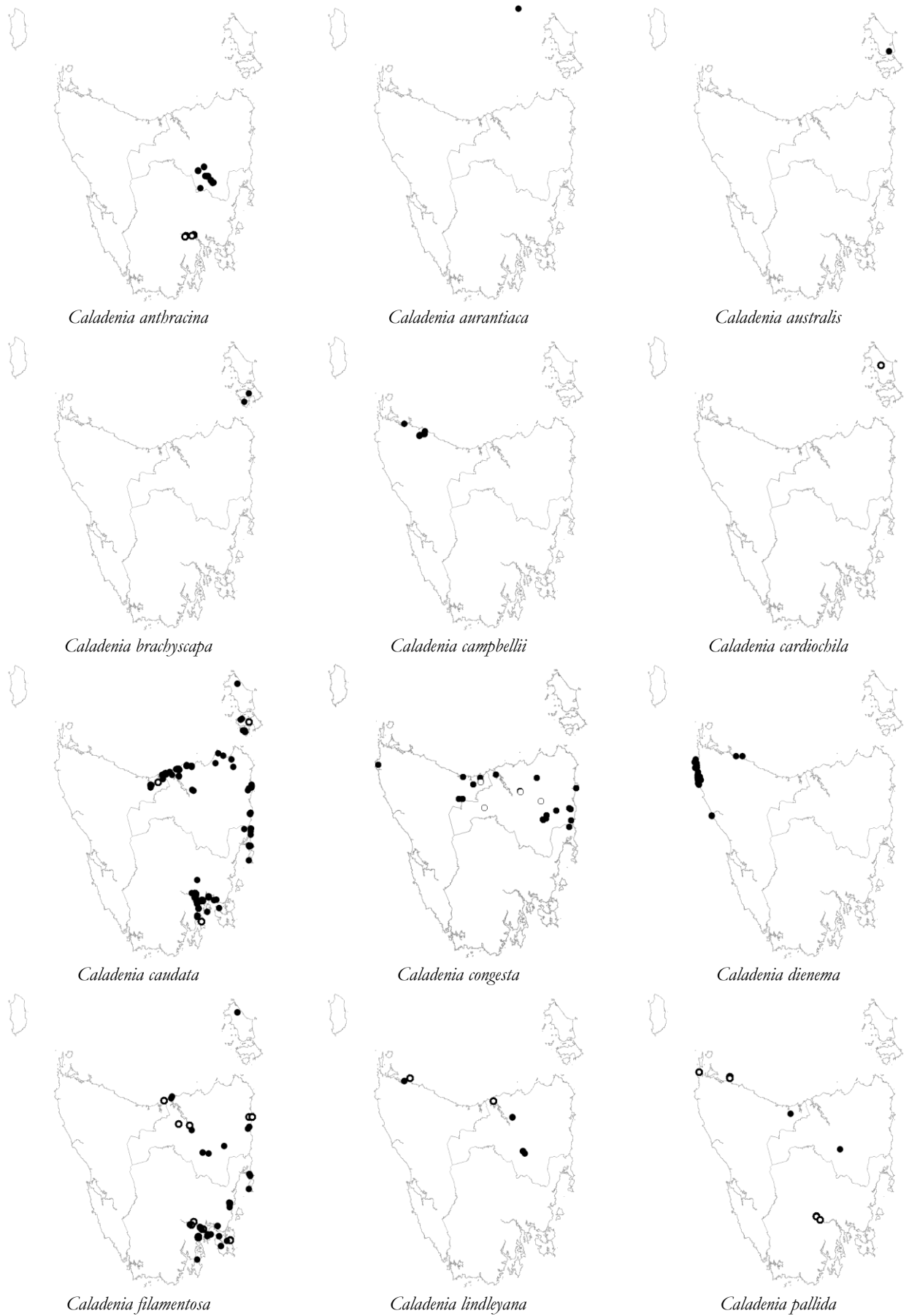


Figure 2. Distribution of threatened orchid species in Tasmania (●= extant; ○= locally extinct)

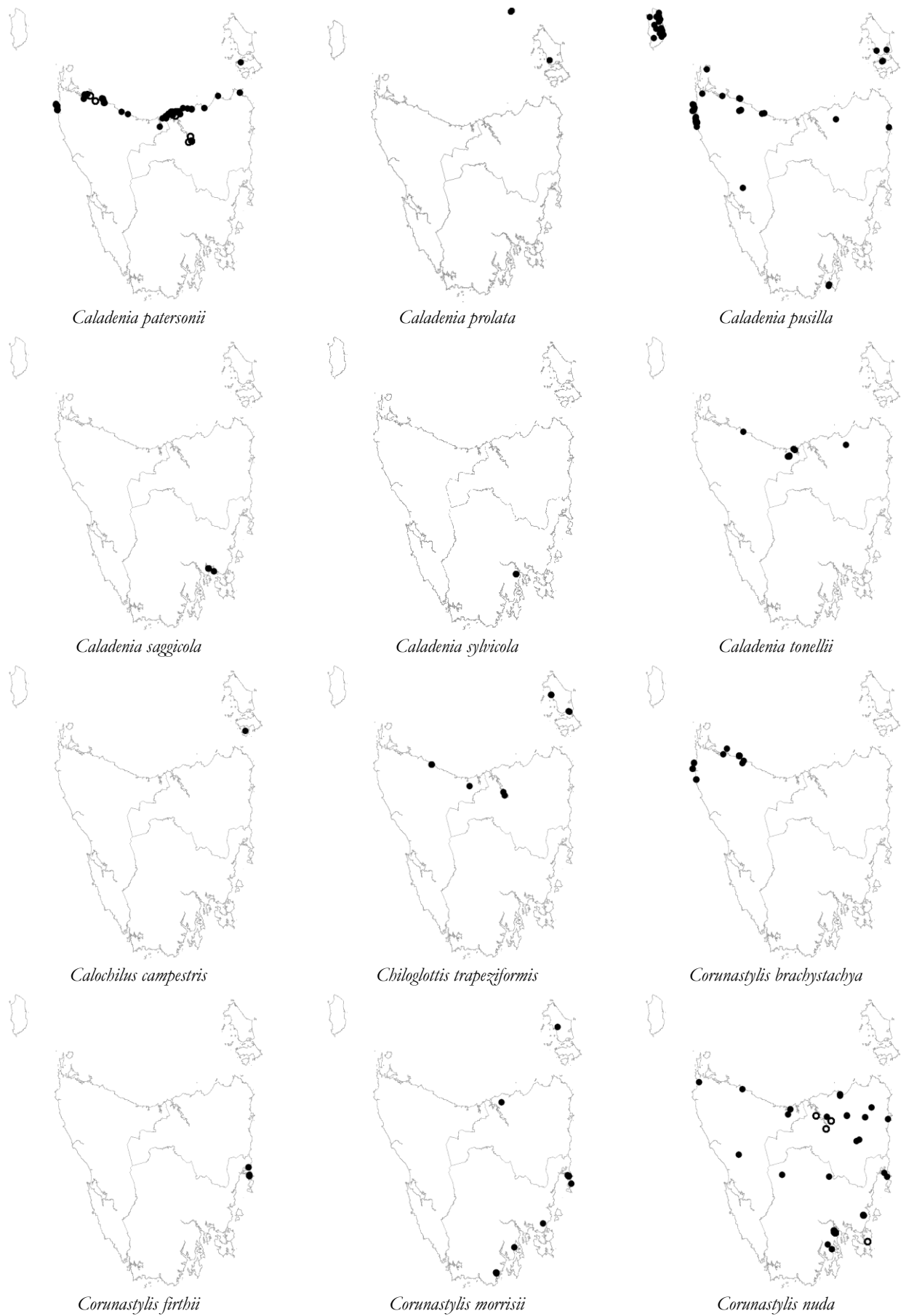


Figure 2 (cont'd). Distribution of threatened orchid species in Tasmania (● = extant; ○ = locally extinct)

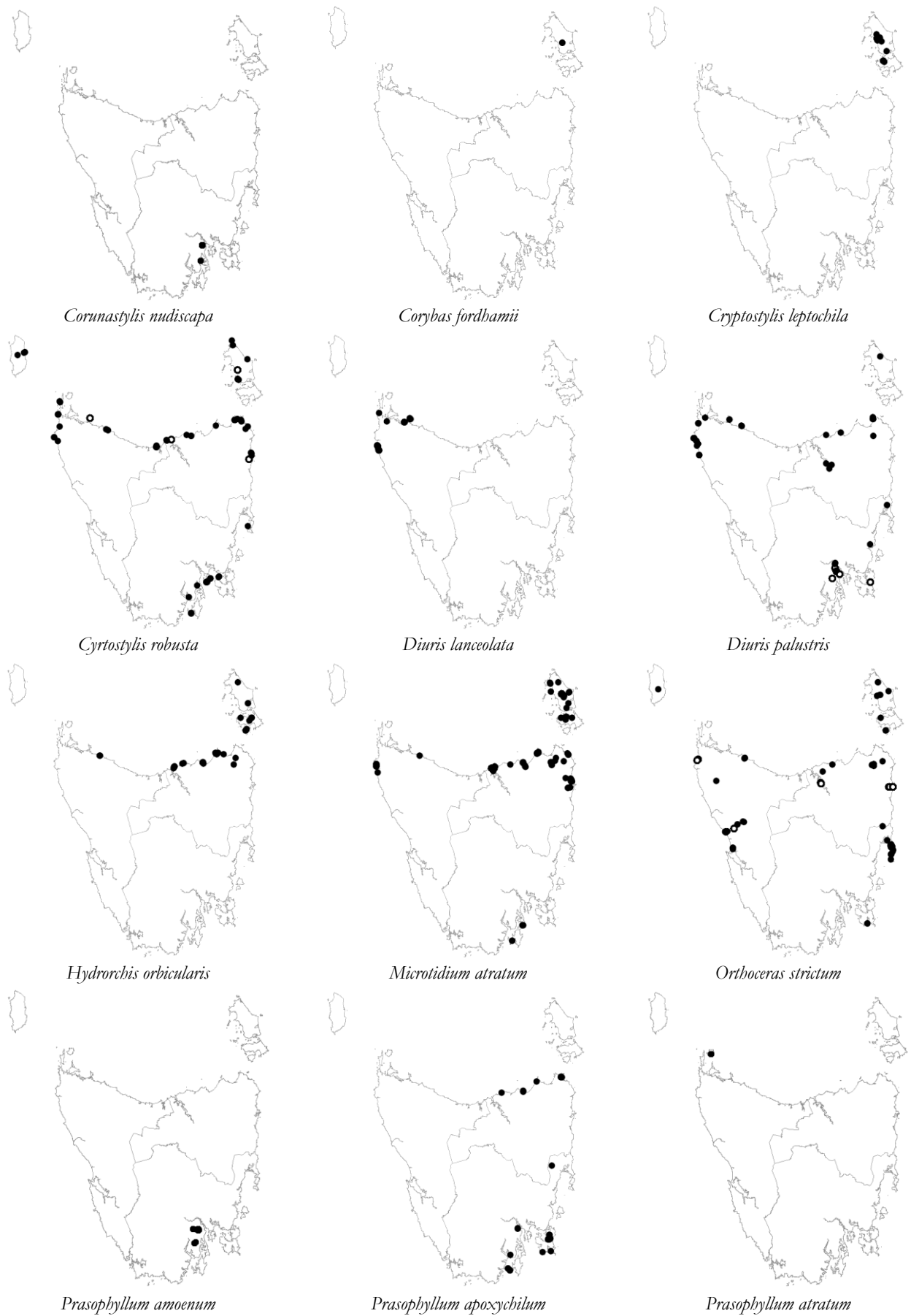


Figure 2 (cont'd). Distribution of threatened orchid species in Tasmania (●= extant; ○= locally extinct)

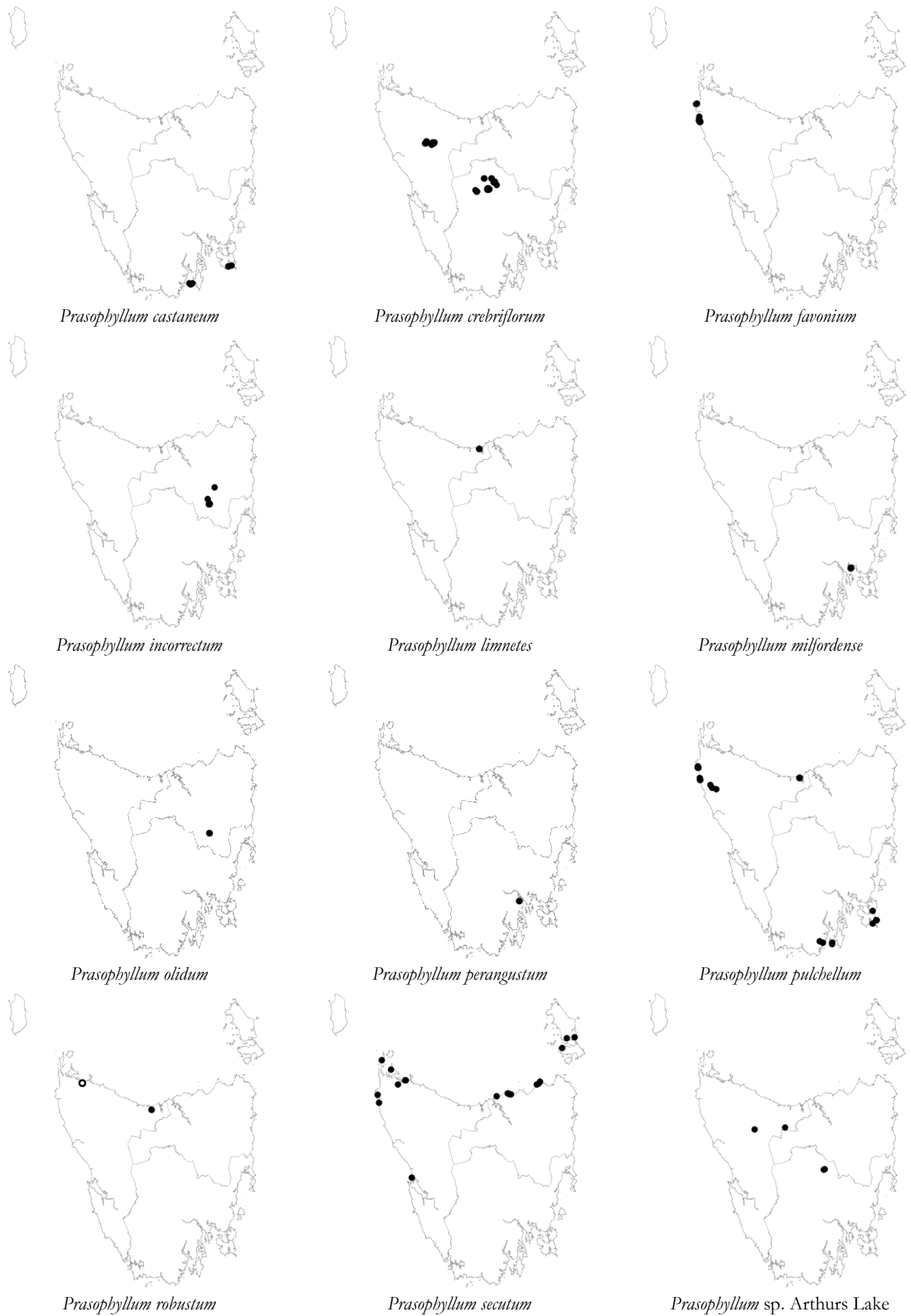


Figure 2 (cont'd). Distribution of threatened orchid species in Tasmania (●= extant; ○= locally extinct)

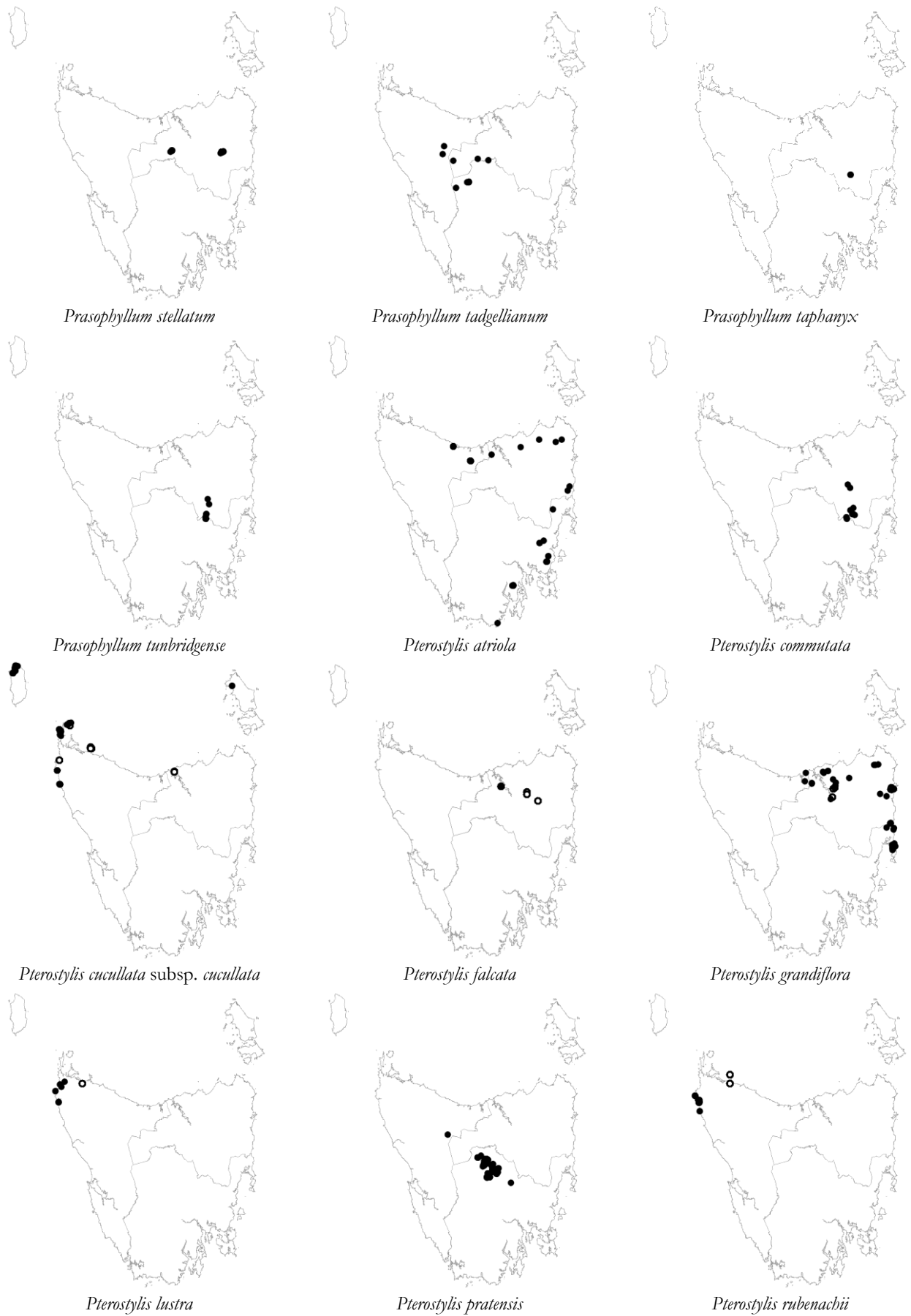


Figure 2 (cont'd). Distribution of threatened orchid species in Tasmania (●= extant; ○= locally extinct)

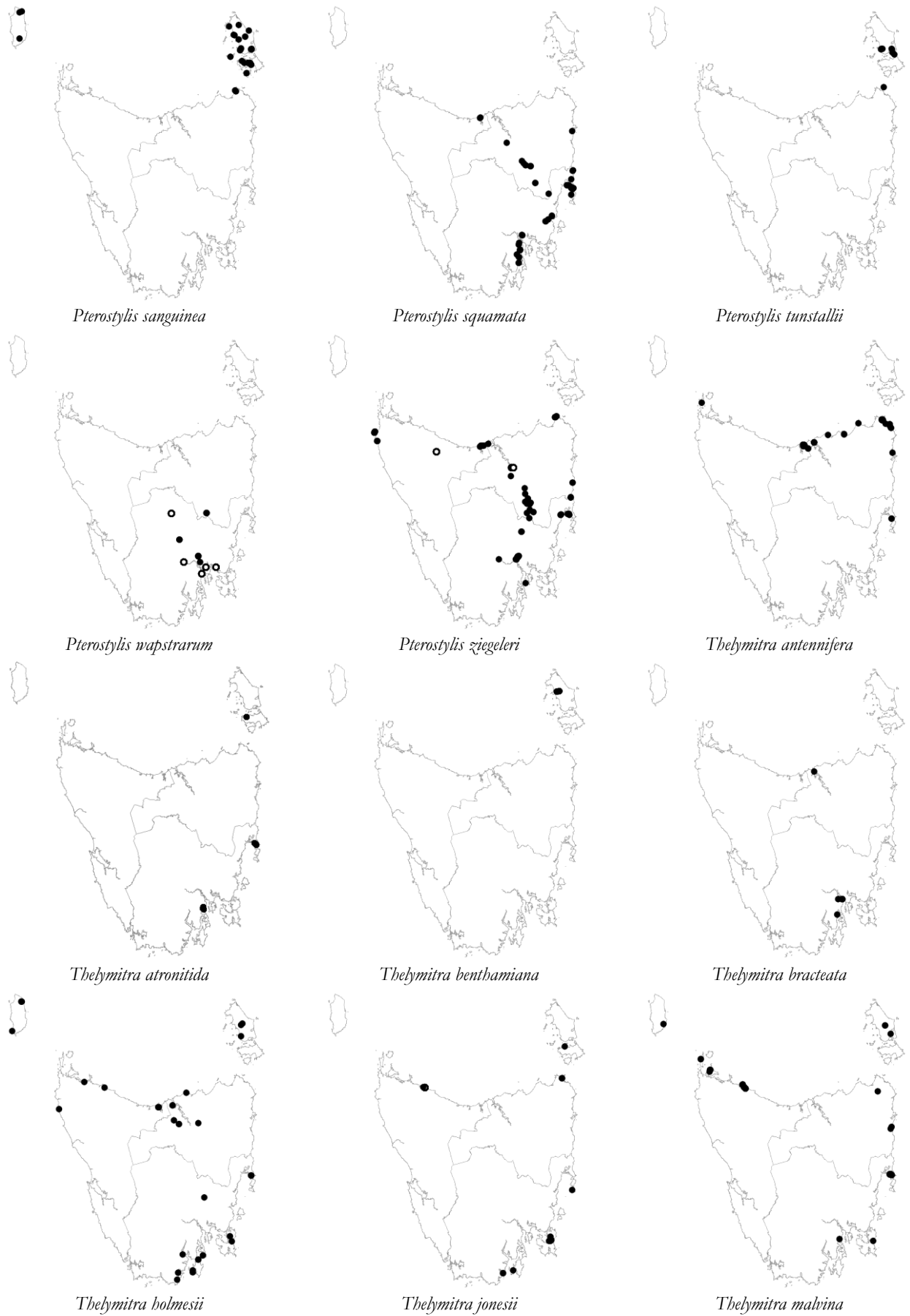


Figure 2 (cont'd). Distribution of threatened orchid species in Tasmania (● = extant; ○ = locally extinct)



Figure 2 (cont'd). Distribution of threatened orchid species in Tasmania (●= extant; ○= locally extinct)

As many orchids do not emerge or flower every year, or can only be identified for a brief period when in flower, it can be difficult to assess the impact of proposed developments through one-off impact assessment surveys. This makes it more difficult to protect the habitat of threatened orchids. As such it is imperative to collate and maintain precise location information (Recovery Action 1a) and to identify potential habitat for threatened orchids (Recovery Action 1b). This information needs to be readily available so that it can be incorporated into assessment processes. More detailed threat descriptions are required to provide sound management advice to landowners and managers (Recovery Action 9a).

Biology of nominated threatened orchids

The orchids listed in this Plan are terrestrial taxa that are seasonally herbaceous perennials (that is, they die-back to an underground storage organ, with the seasonal emergence of leaves and flowers), the one exception being the perennial above-ground species *Cryptostylis leptochila*. Most of the orchids listed in this Plan perennate using a swollen, underground storage organ(s) that comprise ovoid tubers, elongated tuberous roots or rhizomatous structures. These organs can be buried in leaf litter or soil, with some species of *Caladenia* extending their tubers to a depth of more than 20 cm, and provide an over-summering (dry season) means of perennation. All taxa produce a seasonal crop of replacement or additional tuberous structures which rely in the main on the carbon import arising from the production of a new leaf. It is important that this leaf be retained for the duration of the growing season to provide the carbon necessary to ensure the production of a fully-developed replacement tuber; if the orchids happened to be burnt or browsed during the growing season, then the capacity of the orchid to re-emerge the following season will be deleteriously impacted.

Orchid mycorrhizal interactions

Orchids rely on mycorrhizal associations to facilitate seed germination and growth. This is an obligate interaction for orchids since their minute seeds are undifferentiated and do not contain sufficient stored nutrition for development of the embryo (Arditti & Ghani 2000). Thus the orchid-mycorrhizal association is essential to facilitate uptake of soil nutrients and water to the germinating seed and developing plant. In temperate terrestrial orchids, the association extends to adulthood, where mature plants retain mycorrhizal associations to varying degrees of infection and nutritional dependency.

The orchid mycorrhizal interactions of Australian orchids are known to be highly specific for many species (Warcup 1973) and recent research has linked this specificity with intrinsic rarity and threat (Swarts et al. 2010). Orchid mycorrhizal specialisation has direct consequences on orchid distribution where the often widespread but patchy distributions of orchid populations are the result of narrow associations and patchy fungal distributions. Therefore many species may be limited to unique and highly specialised interactions which may contribute to orchid rarity if the mycorrhizal fungus is itself rare or if anthropogenically induced change has influenced mycorrhizal distribution. This has important management implications for identifying habitat critical to orchid survival, mitigating the impacts of disturbance or changed hydrology, and ensuring mycorrhizal cultures are held in long-term storage to reduce the risk of extinction (Swarts & Dixon 2009).

To test mycorrhizal interactions as drivers of orchid rarity, fungal specificity between orchids and their obligate mycorrhizal partners needs to be determined, as does the ecological/functional significance of the orchid mycorrhizal interaction in limiting orchid abundance and distribution. Orchid mycorrhizal diversity, biology and requirements for survival are almost completely unknown for Tasmanian orchids. In this Plan, Recovery Actions 5a and 5b aim to better understand Tasmania's orchid mycorrhizal interactions for improved *in situ* habitat management.

Propagation science aims to successfully build or rebuild self-sustaining populations in safe sites and establish a representative *ex situ* living collection in botanic gardens (Batty et al. 2006). Cultured mycorrhizal fungi can be used to test germination efficacy and mycorrhizal specificity in factorial trials using seed from species from the same orchid genus. In this way, the diversity of mycorrhizal fungi can be tested against their compatibility with a variety of species to establish the most efficacious fungi and which should be used in propagation programs. Recovery Action 7b aims to secure the long term *ex situ* conservation of Tasmanian's through mycorrhizal isolation and culture storage, and Recovery Action 7c aims to make use of mycorrhizal cultures for the *ex situ* propagation of plants for establishing living collections and translocation.

Orchid pollinator interactions

The diversity of species in the Orchidaceae can be attributed in greater part to pollinator-mediated speciation. Given their rich species diversity and extraordinary plant-animal interactions, orchids offer unique opportunities for testing the hypothesis of pollinator-driven speciation. Tasmanian orchids are no exception where a wide range of pollination strategies are utilised, including food rewarding, food deception, autogamy and sexual deception (Adams & Lawson 1993).

The strategy of sexual deception has been the subject of considerable research within Australia given the significant diversity of orchids utilising this pollination method (Bower 2000). As with mycorrhizal specialisation, many orchids with very specific pollinator requirements are often those which face significant extinction threat (Swarts & Dixon 2009). Knowledge of Tasmanian orchid pollinator interactions and which habitat is likely to support orchid pollinators is extremely poor, highlighting a significant need for future research.

One of the major knowledge gaps is whether the orchid pollinator is limiting fruit set, distribution and range expansion. As orchids are usually dependent on their pollinators for sexual reproduction, orchid distribution must match the distribution of its pollinators. What is the distribution and abundance of the insect, first locally, and then at the larger landscape scale? From a conservation management perspective, does the insect occur in suitable habitat and sites with the orchid? This Plan aims to conduct research into orchid pollinator interactions through Recovery Action 5c to better inform conservation planning and management.

Taxonomy and nomenclature

The Orchidaceae is a taxonomically complex family. More than a third of Australia's native orchids have undergone name changes or reclassification in the past 50 years (Jones 1988, Banks 1998, Jones et al. 1999, Jones 2006). Orchid taxonomy continues to be refined with new genera created and old genera reinstated, as exemplified by Jones et al. (2001) and Jones et al. (2002). In recent years the taxonomic study of Australia's native orchids has largely become centralised at the Orchid Research Group within the Australian National Herbarium in Canberra and is strongly supported by the Australian Orchid Foundation. The Royal Botanic Gardens (Melbourne) has also played an important role, particularly with respect to the taxonomy of the genus *Thelymitra*. Tasmanian orchids are now studied in a more systematic way and within a national context. Consequently, many have proved to be distinct from close mainland relatives and many new species have recently been described (Jones et al. 1999).

The nomenclature used in this Plan follows that used in the *Census of Vascular Plants of Tasmania* (Baker & de Salas 2013). Due to the dynamic nature of orchid taxonomy many of the names used in this Plan differ from those published in *The Orchids of Tasmania* (Jones et al. 1999), some listing statements, and even the first Recovery Plan. In addition, Jones (2006) in his nationwide treatise of all orchid species utilised many generic names that have not been adopted by the Tasmanian Herbarium (HO; Baker & de Salas 2013), the latter basing the majority of their nomenclatural decisions on determinations made by the Council of Heads of Australasian Herbaria.

Despite the recognition of almost 20 new species since Jones et al. (1999) and the large number of species and

generic level splits that have occurred Australia-wide over the last decade (Jones 2006), there is still considerable taxonomic uncertainty surrounding key species-complexes in Tasmania's orchids. This taxonomic uncertainty creates difficulties in field identification by botanists and orchid enthusiasts, uncertainty in the species' conservation status, a potential misallocation of recovery action priorities and ambiguity in devising the most appropriate management strategies at the *in situ* level. In this Recovery Plan, it has been recognised (Recovery Objective 4) that Tasmanian orchid taxonomy is in significant need of revision with certain species-complexes identified for revision at a morphometric and molecular level (Recovery Action 4a, Appendix 3). This Plan also recognises the need to incorporate taxonomic revision in conservation planning, re-evaluating conservation status, and relevant databases (Recovery Action 4b). A revised field guide for Tasmanian orchids is recommended (Recovery Action 4c), as well as a strategy to facilitate improved and accepted identification of species (Recovery Action 9d).

RECOVERY PROGRAM

Recovery objectives and performance criteria

The **overall objective** of recovery in the long-term is to minimise the likelihood of extinction in the wild of threatened orchid species listed on the TSP Act and EPBC Act. The aims of the actions in this Plan are to maintain self-sustaining subpopulations of species, to increase the likelihood of each species becoming self-sustaining in the long-term, and to establish a genetically representative *ex situ* collection of each species.

Within the life span of the Plan (ten years), **specific objectives** for recovery for Tasmania's threatened orchids have been developed for the species in this Plan (Table 3). Each recovery objective has performance criteria that provide targets for measuring their achievement. The criteria for achieving objectives 1, 2, 3 (*in situ*) and 7 (*ex situ*) constitute a quantifiable decrease in the risk of extinction over the ten years of the implementation of the Recovery Plan. Achievement of the other objectives will contribute to achieving these key objectives.

Table 3. Recovery objectives and performance criteria for all species
(note that the order of recovery objectives is not hierarchical)

Recovery objective	General performance criteria
1. To maintain and/or increase the number of known subpopulations of each species	1.1 For species with more than 10 extant subpopulations, the number of known subpopulations has been maintained
	1.2 For species with less than 10 extant subpopulations, the number of known subpopulations has been maintained or increased
2. To maintain and/or increase the number of individuals within subpopulations of each species	2. An increase in the number of individuals within all priority subpopulations through presence/absence and extension surveys, and critical management actions as identified in Appendix 2
3. To maintain and/or increase the extent, condition and security of habitat critical to survival of each species	3.1 The area of habitat critical to the survival of each species is mapped through baseline and extension surveys in the first five years of the Plan
	3.2 The condition and security of habitat critical to the survival of each species is maintained or increased over ten years through improved management planning, advocacy of protection with private landowners and an increase in land under conservation agreements
4. Improve management and prioritisation of recovery actions through a better understanding and resolution of Tasmanian orchid taxonomy	4.1 Taxonomic revisions have been completed for key species-complexes within <i>Caladenia</i> , <i>Prasophyllum</i> , <i>Pterostylis</i> and <i>Thelymitra</i>
5. Conduct research into the life history and biological and ecological requirements of threatened orchids in Tasmania to improve habitat management and mitigate intrinsic threats to orchid subpopulations	5.1 Research projects have been undertaken relating to key aspects of orchid biology and ecology within the ten year duration of this Plan
	5.2 Intrinsic threats to orchid subpopulations are identified through this research resulting in improved <i>in situ</i> habitat management practices
6. Better understand the impacts of disturbance on threatened orchids to improve habitat management and mitigate extrinsic threats to orchid subpopulations	6.1 The impacts of disturbances such as habitat fragmentation, fire, slashing, track maintenance and increased road activity are better understood and are informing recovery actions
	6.2 Extrinsic threats to orchid subpopulations are identified through this research resulting in improved <i>in situ</i> habitat management practices

Recovery objective	General performance criteria
7. To establish and maintain a genetically representative <i>ex situ</i> collection of seed and mycorrhizal fungi of all species	7.1 Seed and mycorrhizal fungi from each species have been collected and placed in long-term storage at the TSCC and BGPA
	7.2 <i>In vitro</i> germination trials have been successful for the selected species in propagating an <i>ex situ</i> living collection (Appendix 3 – Action 8a)
8. To successfully trial orchid translocation projects	8.1 Orchid translocation feasibility assessment completed
	8.2 Orchid translocation proposal approved and translocation implemented in recipient sites
9. To raise public awareness of orchid conservation issues and develop mechanisms to encourage and coordinate community participation in orchid recovery programs	9.1 Private landowners and public land management authorities are increasingly involved in implementing recovery actions during the term of this Plan
	9.2 Increase in active involvement of community groups and volunteers in implementing recovery actions during the term of this Plan

Strategies and actions for recovery

This Plan identifies the range of recovery actions necessary for the ongoing conservation and recovery of threatened orchids in Tasmania. The level and type of threat faced by individual species and subpopulations varies widely, as does the quality of distributional and site specific information. Consequently not all actions are necessary or possible for each species or subpopulation, and the significance of required actions will differ between subpopulations. To achieve each recovery objective, recovery strategies have been developed for the species in this Recovery Plan. Each strategy contains a description and justification of recovery actions necessary to meet the objective. Each recovery action may contribute to achieving more than one recovery objective. It should be noted that different recovery actions associated with each strategy may vary in necessity and priority among species in this Plan. Refer to Appendix 3 for the allocation of priorities of actions to individual species.

Recovery of priority subpopulations will be achieved through adopting an adaptive management approach. Management of priority subpopulations will aim to mitigate threatening processes relevant to the subpopulation and its habitat. Management actions will be documented, monitored and adjusted as trends in subpopulation sizes are detected. Additional protective measures will be implemented for non-priority subpopulations whenever opportunities arise, except where they will preclude similar actions being implemented for populations listed for priority action.

Further development and maintenance of DPIWE's Natural Values Atlas database (NVA) will ensure landowners and managers have ready access to distributional data and information regarding conservation and management of threatened orchid subpopulations. Systems will be established to encourage and facilitate community and industry involvement in recovery actions. Protection of important orchid habitats on private and public land will be pursued. This Plan is consistent with the aims of the Tasmanian *Threatened Species Strategy* (DPIWE 2000) and *Nature Conservation Strategy* 2002–2006 (DPIW 2006).

Recovery Strategy 1: Determine the current extent of occurrence and number of subpopulations of each species, and identify habitat critical to the survival of each species**Recovery Action 1a: Conduct presence/absence surveys of previously recorded sites and evaluate the suitability of habitat for orchid survival***Justification*

Improving baseline data will help to develop a better understanding of each species' current distribution and allow a more accurate determination of potential habitat for extension surveys (Recovery Action 1b). It will also help to identify further critical management actions (Recovery Action 3a). Baseline surveys will provide opportunities to map the location of subpopulations accurately and describe habitats and threats, and allow the list of priority subpopulations to be re-evaluated and habitat critical to the survival of each species to be determined.

Methods

Data will be collected from previously recorded sites to determine their status and where current data is deemed insufficient for management purposes. Botanical contractors, regional staff, orchid enthusiasts and volunteers will be engaged to collect survey data where appropriate. Appendix 2 lists priority subpopulations requiring baseline surveys and Appendix 3 identifies the priority for surveys based on work completed during the previous Plan and those identified through the PPP. This action may need to be repeated for some subpopulations in the case of successive poor seasonal emergence, but should ideally be completed in two to three years.

Recovery Action 1b: Conduct extension surveys in habitat assessed as suitable for orchid presence and of significant priority for surveying*Justification*

Discovery of new subpopulations may improve the conservation status of a species. Ongoing extension surveys and continued observation of recorded subpopulations would greatly assist the conservation of threatened orchids in Tasmania by allowing for a more informed prioritisation of recovery actions, as well as allowing the list of priority subpopulations to be re-evaluated and habitat critical to the survival of each species to be determined.

Methods

Orchid enthusiasts and volunteers will be encouraged to conduct extension surveys in priority habitat (e.g. previously unsurveyed suitable habitat, habitat experiencing a recent disturbance event and opportunistic surveys in new locations). Surveys will only be undertaken with the permission of the landowner/manager. Departmental staff will provide additional guidance as to which habitat is high priority for surveys as new information becomes available. Landowners, botanical consultants and regional staff will also be encouraged to record and report on orchid subpopulations. New information on subpopulations of threatened orchids will be reported to DPIPWE for incorporation into the NVA database (Recovery Action 1c), and where relevant, advice on management. Departmental staff will be required to coordinate this action. Priorities for extension surveys for individual species are allocated in Appendix 3.

Recovery Action 1c: Manage and collate spatial data, and update information sources*Justification*

It is essential that information collected during implementation of this Plan is stored in a logical manner and is readily available to land management and planning authorities. The database systems maintained by DPIPWE (i.e. the NVA database and reporting system) are adequate for the purposes of this Plan.

Methods

Data obtained through Recovery Actions 1a and 1b will be added to the NVA database. Departmental officers will continue to enter new data as it becomes available. In addition, there is a backlog of data to be 'cleaned' from old database systems, and further coordination of data between DPIPWE and the HO and the Queen Victoria Museum & Art Gallery to be undertaken. Additionally, information stored in the *Atlas of Living Australia*

pertaining to Tasmania species must be linked to the HO with specimen duplicates (or photocopies of images) from interstate herbaria (primarily Canberra, Melbourne and Adelaide) incorporated into the HO collection.

Recovery Action 1d: Prepare and update listing statements for listed species incorporating new information from surveys, demographic monitoring and research

Justification

Listing statements are a formal requirement of the TSP Act. They provide information on the identification, ecology, reservation and conservation status, threats and conservation management requirements on known subpopulations. They are the primary source of information for land management authorities, landowners, community groups and individuals participating in management of threatened orchids, including actions under this Plan. For Tasmanian orchid species not covered under this Plan, regular reviews may be required.

Methods

The TSS has an administrative process of coordinating the production of listing statements and making the statements publicly available. The production of a 'batch' of listing statements is best undertaken and coordinated by an external consultant, with oversight by departmental staff. Listing statements will need to be updated as new information becomes available. Appendix 3 lists species for which listing statements are either required or need to be updated.

Recovery Strategy 2: Determine subpopulation sizes and demographic trends

Recovery Action 2a: In priority subpopulations, record the number and location of flowering plants

Justification

Thoroughly surveying the number of plants in a subpopulation and accurately marking their locations for presence/absence in subsequent years is advantageous for determining population size and trends, and for measuring the success of recovery actions. Regular surveys can also result in the discovery of additional individuals and track the increase/decline of a subpopulation over time and in response to environmental change or disturbance.

Methods

Important subpopulations requiring monitoring were identified through the previous TTOFRP and the recent PPP and are recorded in Appendix 2 with priorities allocated in Appendix 3. Population surveys involve systemically counting the number of flowering and vegetative plants and using a GPS to record individual or small patch location of plants in each subpopulation. In some sites individual plants are marked along a transect line. It is recommended that all subpopulations be monitored at least every three to four years, particularly when environmental conditions are suitable for re-emergence and flowering. Population data needs to be entered into the NVA (refer to Recovery Action 1c).

Recovery Action 2b: Monitor the demographics of selected subpopulations

Justification

Annual monitoring of subpopulation demographics provides vital information about the health and sustainability of the monitored subpopulation. Data collected include the rates of flowering, pollination, seed set, recruitment and herbivory. This will enable a better understanding of plant and population longevity, which is important for devising management practice.

Methods

Important subpopulations requiring detailed demographic monitoring were identified through the PPP and are recorded in Appendix 2 with priorities allocated in Appendix 3. Departmental staff, community groups (e.g. TPT) and volunteers will be encouraged to collect annual demographic data for selected subpopulations. These subpopulations have been chosen based on highest priority and those where data has been collected historically. Annual demographic data will be collected for selected subpopulations following the methods of Collier (2011). Generally this involves permanently tagging individual plants and recording rates of flowering, pollination, seed set, recruitment and herbivory. In some instances, their life history stages (e.g. leaf, bud, flower, pollinated, capsule, browsed, etc.) may be recorded at regular intervals throughout the flowering season each year.

Demographic studies in Victoria have shown that monitoring is required for at least 5 to 10 years before reliable data becomes available (Coates 2001). It is anticipated that through the long life span of this revised plan, data from monitoring will guide management at some point during the life of this Plan. Therefore an adaptive management approach including implementation, monitoring and review phases will be adopted.

Recovery Strategy 3: Secure, protect and manage habitat critical to survival

Recovery Action 3a: Undertake critical management actions identified through survey work and habitat evaluation, PPP and as new threats are determined

Justification

Survey work and habitat evaluation completed during the previous Plan and work completed in the PPP process identified management actions considered critical to the recovery of the respective species; these are detailed in Appendix 2 and prioritised in Appendix 3.

Methods

Departmental and regional staff, landowners and volunteers will implement critical actions in order of determined priority as resources permit. Some of these actions may include:

- i) Developing and implementing an appropriate fire management strategy to maintain or increase the growth and regeneration of each taxon. Where appropriate provide maps of known occurrences to local and state Rural Fire Services and seek inclusion of impact prevention and/or mitigation measures in bushfire risk management plan/s, risk registers and/or operation maps. Such measures could relate to a species-specific regime, including fire suppression or promotion, promoting fires of a certain frequency or temperature, or general caution around the species, such as not setting up camp or constructing fire breaks in the species' habitat.
- ii) Identifying and removing or controlling weeds that present a risk to threatened orchids, using appropriate methods. Manage sites to prevent introduction of invasive weeds that could become a threat to orchids, using appropriate methods. Ensure chemicals (if used) or other mechanisms used to eradicate weeds do not have a significant adverse impact on orchids.
- iii) Developing a feral animal control strategy to reduce the threat of trampling, disturbance, and herbivory from feral animals (e.g. rabbits and pigs).
- iv) Erecting appropriate exclusion fencing or other barriers to reduce the risk of herbivory and trampling to subpopulations due to livestock, and erecting appropriate fencing around specific populations to reduce impacts from adjacent residential and recreational activities. If livestock grazing occurs in the area, ensure land owners/managers use an appropriate management regime (e.g. seasonal access) and rate of stocking that does not detrimentally affect orchid species. Where possible, limit movement of people through populations of threatened orchids, using signs to alert visitors to the presence of the species, and advise how their behaviour can affect the survival of orchids.
- v) Providing a suitable/optimal disturbance regime to maintain subpopulations and promote survival (e.g. appropriate level of soil disturbance/removal or vegetation clearance).
- vi) Implementing appropriate integrated management actions to control and minimise the adverse impacts of existing infestations of pests and diseases. Implement suitable hygiene protocols to protect orchid species from potential outbreaks of pests and diseases.
- vii) Providing advice on the distribution and habitat critical to the survival of appropriate species to organisations involved with clearing vegetation.
- viii) Developing and implementing a roadside marker scheme for roadside populations and other important populations, and with the cooperation of local councils and road authorities, encourage the responsible authorities to appropriately manage the population(s).

Further critical management actions are likely to be identified as baseline surveys are conducted and these will be implemented as they are identified.

Recovery Action 3b: Assess patterns of Tasmanian orchid species richness and endemism and the adequacy of the protected areas (CAR) system for capturing subpopulations of threatened orchids*Justification*

For many orchid species in Tasmania inadequate representation within reserves, unverified or imprecise location data, limited population data and a poor understanding of ecological requirements are typical threats. Consequently, until recently it has not been possible to assess the effects of management and/or whether subpopulations are in decline. This action aims to investigate patterns of orchid species richness and endemism, and assess the adequacy of the protected area system for capturing orchid biodiversity in order to better inform reserve design policy and biodiversity evaluation.

Methods

The distribution of Tasmania's approximately 200 orchid species will be mapped with GIS software using collection records in NVA and HO. Biogeographic analyses of factors associated with orchid rarity will be used to assess: i) whether orchid subpopulations are adequately represented within the existing reserve system; ii) how rare species are distributed among geographic provinces and; iii) which landscape features are correlated with species' turnover and speciation. It is anticipated this data will be incorporated into a much larger meta-analysis of Tasmanian biodiversity values to enhance the identification of targets for reservation and to improve the efficiency of additions to the Natural Reserve System. This will also lead to an improved guidance of extension surveys (Recovery Action 1b), developing vegetation management agreements (Recovery Action 3d), and reserve planning and establishment (Recovery Action 3b).

Recovery Action 3c: Encourage private landowners to consider covenants for conservation purposes under legislative agreement*Justification*

Many priority subpopulations occur on private land. A conservation covenant is an agreement between a landholder and the State government that is registered on the land title in perpetuity. Reserving private land under conservation covenants improves the reservation status for subpopulations, and as such provides them with an additional level of legal protection and the potential of funding opportunities for on-ground works (e.g. fencing, weed control, grazing control, fire management).

Methods

Long-term protection for priority subpopulations on private land will be sought through voluntary conservation covenants. Priority subpopulations on private land will be identified and targeted through Private Land Programs, including DPIPW's PLCP and TLC's revolving fund program, and such programs will be assisted with covenant negotiations where appropriate. Under this action departmental staff will monitor compliance to existing covenants containing threatened orchids.

Recovery Action 3d: Develop management agreements with landowners/managers to pursue long-term protection of priority subpopulations from detrimental changes in land management*Justification*

Sites of significant size, of particular importance or providing habitat for multiple threatened orchid species may already have or require management agreements to ensure the orchids and associated vegetation communities are managed appropriately (e.g. informal management agreements at the Campbell Town and Ross cemeteries (Leonard 2002a & 2002b, Lyall 2008)). Management agreements provide detailed recommendations for mitigating threats to a particular site, and can be used by government agencies, landowners, community groups and volunteers to assist with site management. While many reserves may have some sort of management plan, most do not contain reference or specific actions pertaining to threatened orchids.

Methods

The respective management authorities will be informed of the location and management requirements of priority subpopulations. A commitment to manage the site for conservation of the subpopulation will be sought and, where possible, management agreements will be negotiated (e.g. Public Authority Management Agreement

under the TSP Act). Departmental staff will work with landowners/managers to develop and implement management plans that address the needs of the subpopulation and associated vegetation communities. Priority subpopulations occurring within State and private forests managed for timber production, the agricultural sector, the mining sector and under local council jurisdiction will be brought to the attention of the appropriate managing authority. Management prescriptions will be developed by departmental staff in consultation with land management authorities and, where appropriate, special management zones will be established. Exclusion zones will be negotiated where long-term protection cannot be achieved through management prescriptions. In plans already developed not containing reference to orchids, a protocol (generic guidelines) will be developed to add appropriate information to existing, revised and new management plans. Development of plans may require outside expertise in which case appropriate consultants will be engaged where resources permit. Appendix 2 identifies specific subpopulations for certain species where vegetation management agreements are required. Additional sites will be identified as this Plan is implemented and agreements developed for these sites.

Recovery Action 3e: Assess the currency and management implementation of reserves previously established primarily for threatened orchid conservation

Justification

In the last decade, several formal and informal reserves have been established on public and private land, primarily to manage subpopulations of threatened orchids. Documenting the history of establishment of these reserves, the planning systems established to ensure the function of the reserve is known to land managers, and whether identified actions (e.g. map identification, exclusion zones with a site, undertaking a burn, etc.) have been implemented, would inform future ‘reserve’ establishments and management.

Methods

A project officer with significant knowledge of land use history will compile this information by liaising with land managers, prepare a report evaluating the success of prior management initiatives — with recommendations for future management — and make this information available to relevant agencies. Specific sites to be reviewed include i) several Special Management Zones on State Forest; ii) formal conservation covenants on private land (e.g. Surrey Hills, Rubicon Sanctuary, Campbell Town Golf Course); and iii) informal management plans (e.g. Henry Somerset Orchid Sanctuary, Campbell Town and Ross cemeteries).

Recovery Strategy 4: Undertake taxonomic revisions of key species-complexes within Tasmanian orchid genera (*Caladenia*, *Prasophyllum*, *Thelymitra* and *Pterostylis*) to improve management and allocation of recovery action priorities

Recovery Action 4a: Review the taxonomy of species-complexes including the *Caladenia patersonii* and *carnea* groups, *Thelymitra* (*‘paucinuda’* group), *Prasophyllum* (*truncatum*) group and *Pterostylis* (*longifolia*, *mutica*) groups using morphological and genetic methods

Justification

There is uncertainty regarding the identification of individuals in several key species-complexes in Tasmania, some of which include threatened species. This confusion creates concerns with respect to conservation management and planning, and implementation of recovery actions in this Plan. The key species-groups, which include threatened orchid taxa, are: *Caladenia patersonii*, *Prasophyllum truncatum*, *Pterostylis* *‘longifolia, mutica’* and *Thelymitra* *‘paucinuda’* (an informal name loosely applied in Tasmania to the *Thelymitra pauciflora-nuda* group of species).

Methods

The species and species-complexes that are recommended for taxonomic revision are identified in Appendix 3. Taxonomic revision might be undertaken using a combined morphological (following methods of Collier (2011) and molecular genetics approach (Fay & Krauss 2003)). These methods enable a complimentary approach to taxonomic revision, where the morphology of individuals within a subpopulation is studied in detail in conjunction with the new technology of molecular genetics.

Recovery Action 4b: Incorporate taxonomic revision in conservation planning, re-evaluating conservation status, prioritisation scheduling and databases

Justification

Once taxonomic revision has been completed and accepted by the Council of Heads of Australasian Herbaria (CHAH), this new information must be updated and incorporated in DPIPW's NVA and the HO database. If name changes have occurred to species covered in this Recovery Plan, a revision of actions pertaining to impacted species must be revised, and the relevant listing statement updated.

Methods

Updates in nomenclature changes/revision will be incorporated into the five year review of this Recovery Plan, associated listing statements, the NVA and HO databases. Where species occur on private and publicly managed land, landowners will be notified of name changes, as well as any implications to the management of that species.

Recovery Action 4c: Prepare a fully updated and revised Tasmanian-based orchid field identification guide

Justification

The Orchids of Tasmania (Jones et al. 1999), though well-received in terms of its format, is nomenclaturally and taxonomically out-of-date. The more recent publication of Jones (2006) is an Australian-wide treatment, but lacks identification keys and employs a taxonomy not endorsed by the Tasmanian Herbarium. Consequently, the identification of many Tasmanian orchids is complex, not only for the amateur orchid enthusiast but also for trained experts in orchid taxonomy. An opportunity exists to produce a simplified peer-reviewed key through HO's *Flora Online* project. However, there are limitations in the template format (e.g. no annotated/illustrated keys, no links to images of population/geographic variability). A multi-faceted orchid specialist team (Recovery Action 9d) is required to compile a Tasmanian-based orchid field identification guide that integrates a printed hard copy with an online Wiki-style user and master editable guide, allowing a discussion forum, plant identifications via images, and thoughts on taxonomy and nomenclature.

Methods

Liaise with HO staff to assemble an external team of orchid specialists to put together the *Flora Online Orchidaceae* treatment with variations to the template to allow inclusion of specific identification keys (e.g. a vegetative key, *Thelymitra* column key, *Thelymitra* leaf key and numerous images of variation, key features, etc.). Establish an expert multi-disciplinary team of local orchid specialists to author and edit the key (Recovery Action 9d), with external review by interstate orchid experts. Such a 'document' should be updateable and subject to version control and (voluntary) peer review, providing many advantages for land use and conservation management.

Recovery Strategy 5: Undertake research into mycorrhizal and pollinator requirements of Tasmanian orchids and their impact on orchid rarity for improved *in situ* habitat management

Recovery Action 5a: Conduct research to isolate, culture and identify mycorrhizal partners of selected species

Justification

Tasmanian orchids, like almost all orchids, require the presence of mycorrhizal fungi for germination and growth. The association remains with the orchid throughout its lifetime and is responsible for nutrient and water uptake. A better understanding of the relationships between mycorrhizal fungi and threatened orchids in Tasmania may improve the chances of successful recovery. Orchid mycorrhizal diversity, biology and ecological requirements for survival are almost completely unknown for Tasmanian orchids.

Methods

The TTORT will encourage research through the RTBG into Tasmanian species and investigate the most effective way of isolating and storing mycorrhizal fungi. Species prioritised for mycorrhizal research are those that are most threatened and for which isolations have not been attempted or been successful. The RTBG's TSCC has a well-established laboratory and protocols (developed from the previous Plan) for the isolation and culture of Tasmanian orchid mycorrhizae. Mycorrhizal cultures will be identified through DNA sequencing

following the methods described in Swarts (2007).

Recovery Action 5b: Conduct *in situ* seed baiting trials to determine mycorrhizal presence and distribution ranges for selected species

Justification

Orchid mycorrhizal ecology and distribution in the landscape is largely unknown yet mycorrhizal presence and persistence at a site is essential for orchid survival. Orchid mycorrhizae vary both in their spatial distribution in soils and their capacity to support germination and growth of orchid seed and plants. For orchid conservation, a site must have the mycorrhizal inoculum potential (inoculum potential is defined as the capacity of a fungus to support germination and plant establishment at a site) to sustain seed germination, seedling establishment and subsequent growth and development of the plant (including reproductive output). Failure to ensure adequate and long-term establishment of the appropriate mycorrhizal fungus may ultimately lead to translocation failure and loss of an orchid species.

Methods

Mycorrhizal presence and persistence at a site can be tested through *in situ* ‘seed baiting’ techniques where orchid seed is placed in nylon mesh packets and positioned along transect lines in field sites (Brundrett et al. 2003, Swarts et al. 2010). Packets are retrieved at the end of the growing season and successful germination of orchid seed indicates the presence of a suitable mycorrhizal partner for that species. These tests will be undertaken for selected species (see Appendix 3) and sites to determine: i) the suitability of habitat for orchid survival; ii) if the orchid’s distribution range is limited by the distribution of its partnering mycorrhiza; and iii) to identify potential sites for translocation/reintroduction.

Whereas *in situ* seed baiting is one way of selecting sites where mycorrhiza occur, the technique has high risks associated with the quantity of seed required, the need for baiting at specific times of the year (when the mycorrhiza are most active — usually the commencement of the growing season), the need for adequate soil moisture during the baiting period, and unknown issues associated with soil disturbance. These factors singly or in combination can therefore lead to ‘false negatives’. What has been found is that terrestrial orchid translocations can be highly successful where:

- translocation sites are habitat-matched to parental sites (soils, vegetation, aspect, topography) and plants are generated symbiotically so that the translocated orchids have the capacity to self-inoculate a site, and/or,
- that at the time of planting or just prior to planting, mycorrhizal inoculum can be incorporated into the soil where the plant is to be grown.

Recovery Action 5c: Collect fruit set data and conduct pollinator baiting trials to determine pollinator presence/absence, identity and distribution ranges and pollinator suitable habitat

Justification

Orchid reproduction and fruit set depends on pollination, usually by insect or animal vectors. While pollination has largely driven the huge diversification seen in the Orchidaceae family, more recently the loss of pollinators and reduced fruit set has been implicated as one of the major threats facing orchid survival (Peakall & Beattie 1996). Pollinators of Tasmanian orchids, their distribution and requirements for survival are almost entirely unknown and research is required to determine if Tasmanian orchids are facing significant extinction threat through pollinator limitations.

Methods

A variety of pollination strategy specific methods can be used to determine pollinator presence/absence at a site. These include using flowers as ‘bait’ to attract pollinators for sexually deceptive orchids and setting pan traps in populations of food deceptive orchids to survey for insect presence and abundance. Mark and recapture methods are also an effective measure of the number of pollinators in a patch and the size of the patch (Bower 2000). Data collected will include fruit set, insect presence/absence, abundance, identity (of captured insects), diversity as well as associated vegetation types and potential food plants. Species and sites selected for this action will include orchids employing the deceptive pollination strategies (sex and food), as these are considered to have the greatest risk.

Recovery Strategy 6: Undertake research into the impact of disturbance on orchid demographics

Recovery Action 6a: Conduct simulated disturbance trials in selected habitat of *Caladenia*, *Prasophyllum*, *Pterostylis* and *Thelymitra* to determine the influence of disturbance on dormancy, recruitment, flowering, fruit set and mycorrhizal activity

Justification

Many of Tasmania's most threatened orchids occur in highly sensitive habitats or in areas surrounded by a variety of land use types that subject the orchids to a wide range of disturbances. While it is very difficult to predict the impact of disturbance on orchid subpopulations, it is very likely the disturbance will have some impact (positive or negative). Orchids respond to disturbance (fire regime, slashing, old vehicle tracks, etc.) in different ways (often quite positively) depending on their biology and ecology, yet there is extremely limited to no data available that supports this anecdotal evidence. Where land use comes in close proximity to subpopulations of threatened orchid taxa, mitigation in the form of avoidance by x metres or exclusion zones is usually recommended, however, long term data is required to evaluate the impact of disturbance.

Methods

Disturbances such as slashing, fire, grazing, and increased vehicle or human activity can be simulated in experimental plots to determine the impact of disturbance on key Tasmanian orchid genera – *Caladenia*, *Prasophyllum*, *Thelymitra* and *Pterostylis*. Treatments must be established using rigorous scientific design and methodology. These genera are representative of the range in mycorrhizal infection patterns, pollination strategies and habitat types found in Tasmanian orchids. Permanent monitoring plots will be set up in sites in close proximity to land use and subject to disturbance to record changes in orchid demographics over the duration of the Recovery Plan.

Recovery Action 6b: Reevaluate management practice based on trial results and implement management recommendations

Justification

Based on the accumulation and analysis of data gathered from these trials and monitoring plots, protocols and management strategies for slashing, burning, site activities (such as grading, clearing, stock piling and herbicide spraying) may need to be re-evaluated.

Methods

Accumulate and analyse data from simulated trials and permanent monitoring plots to determine the impact of disturbance on orchid subpopulations. New protocols for each management activity will be written and incorporated into site management plans of Recovery Action 3d.

Recovery Strategy 7: Preserve orchid seed and mycorrhizal fungi in perpetuity

Recovery Action 7a: Collect seed from previously uncollected species and subpopulations and preserve in long-term storage

Justification

Seed collections provide an effective means of storing a genetically representative sample of a population, particularly with orchid species given the propensity towards outcrossing (Rasmussen & Whigham 1993). As orchid seed is short-lived and is unlikely to persist in the soil seed-bank for more than one season, the *ex situ* collection of seed is an important means of safeguarding against species' extinction. Seed collections also facilitate the propagation of large numbers of plants by *in vitro* methods for use in future translocations, developing an *ex situ* living collection and for educational purposes. Orchid seed is well known to survive for a long period of time in *ex situ* storage.

Methods

At the TSCC, an *ex situ* orchid seed collection has been established with over 140 accessions representing about 80 species. There are many species in this Plan that have yet to be collected — these will be prioritised for collection over the duration of this Plan (see Appendix 3). In addition, some additional subpopulations of species already collected will be targeted to ensure that collections span the species' geographic range. Seed collection protocols will follow standard protocols for Australian orchid seed collection and storage (Swarts

2007), and for some species may require the use of hand pollination to ensure seed set. Representative samples of each new collection will be stored at the TSCC and the liquid nitrogen *ex situ* storage facility at the BGPA, Western Australia.

Recovery Action 7b: Isolate and culture mycorrhizal fungi from uncollected species and subpopulations and maintain in long-term storage

Justification

Fungi isolated from plants can be cultured and used to assist propagation and cultivation of *ex situ* populations, or be introduced into the wild to promote *in situ* seed germination or enable translocation or establishment of new wild subpopulations from propagated plants. Mycorrhizal fungi can be successfully stored on potato dextrose agar for up to 5 years and in liquid nitrogen for an indefinite period (Batty et al. 2001).

Methods

The TSCC holds a small collection of mycorrhizal fungi that have been successfully isolated and cultured from Tasmanian orchids. Orchid species covered in this Plan for which no collections have been made will be prioritised (see Appendix 3). Orchid roots colonised with mycorrhizal fungi will be collected *in situ* and brought to the TSCC for isolation and culture following best practice techniques (Ramsey et al. 1986, Swarts 2007). Up to three plates for each subpopulation cultured will be placed in long-term storage at the TSCC and in liquid nitrogen at the BGPA.

Recovery Action 7c: Conduct *in vitro* germination trials to determine seed viability and mycorrhizal compatibility

Justification

In vitro germination trials provide the capacity to test: i) the effectiveness and compatibility of cultured mycorrhizal fungi; ii) the specificity of the orchid mycorrhizal partnership; and iii) the viability of the orchid seed collections. As species from different genera or habitats may require different conditions to initiate germination and break dormancy, *in vitro* germination where conditions can be manipulated, facilitates this process. When germination has occurred, propagating orchids under *in vitro* conditions provides the most effective method for bringing orchids to maturity and thus developing an *ex situ* living collection.

Methods

Methods for the germination and propagation of Australian orchids under *in vitro* conditions have been well-established, however, slight variations in methods may be required for Tasmanian orchids given the significant range in environmental conditions experienced for orchids *in situ* (Batty et al. 2006; Swarts 2007). Using the laboratories at the TSCC, each mycorrhizal culture will be tested using this methodology to ensure compatibility with and viability of its corresponding seed collection.

Recovery Strategy 8: Establish an *ex situ* living collection of selected species for subpopulation rebuilding through translocations, a potential source of seed and for public display

Recovery Action 8a: Establish and maintain *ex situ* populations at the RTBG

Justification

Ex situ populations may be required to safeguard species at risk of imminent extinction in the wild. They could be used to provide a seed source for restocking of existing wild populations. *Ex situ* populations may also provide seed and plants for restoration of species extinct in the wild or establishment of new populations in the wild. *Ex situ* living collections also provide an effective medium for education and developing public awareness.

Methods

The RTBG will be engaged to implement techniques for propagation and cultivation of the threatened orchid species identified in Appendix 3. Staff will work with volunteers from the Friends of the RTBG to assist. Guidelines for propagation and cultivation for species will be prepared. Orchid conservation and threats to orchid populations will be promoted through the orchid display at the RTBG Conservatorium.

Recovery Action 8b: Prepare a translocation feasibility assessment of species and sites to be considered

Justification

For species with a significant extinction risk, translocation can be a very useful method for: i) restocking subpopulations with propagated individuals; ii) re-establishing an orchid subpopulation at a site where it has become extinct; iii) establishing an orchid subpopulation at a new site; iv) assisting migration of an orchid subpopulation into new habitat; and v) removing plants from one site to another in the case of development (as a last resort). Given the difficulties and considerable resources (time and propagule availability) required to propagate orchids, translocations require a detailed feasibility assessment along with a long-term monitoring and management plan. A feasibility assessment determines the need, risks (genetic mixing), feasibility, methods and post-translocation management and follow-up for the next ten years.

Methods

A feasibility assessment must follow the *Guidelines for Translocation of Threatened Plants in Australia* (Vallee et al. 2004), with consideration given to orchid-specific requirements for mycorrhizal and pollinator associations. The assessment will identify if the translocation is necessary, appropriate, and how it should proceed. Associated risks, benefits and costs need to be considered. Data from Recovery Actions 5a, 5b, 5c and 6a need to be incorporated in the decision-making process. Data from these actions will facilitate the identification of species or subpopulations in need of translocation and potential recipient sites where translocation may be successful (i.e. sites where mycorrhizal presence has been established and where suitable pollinators (and their food plants) are known to occur. Species prioritised for translocation feasibility assessments are identified in Appendix 3.

Recovery Action 8c: Prepare and implement translocation proposals for selected species

Justification

If translocation has been recommended through the decision feasibility assessment of Action 8b, then a translocation proposal needs to be prepared in accordance with State and Commonwealth legislative requirements.

Methods

Translocation proposals will be prepared and implemented following the feasibility assessment and methods described in Vallee et al. (2004). Proposals will only be implemented following endorsement by DPIPWE, the Australian Government Department of the Environment and Energy (where relevant) and the TTORT (refer to Recovery Action 9d) overseeing the implementation of this Plan. Staff at the RTBG will be involved in the propagation process and the establishment of populations at a site. Species prioritised for translocations are identified in Appendix 3.

Recovery Strategy 9: Engage and inform private landowners, public authorities, community groups and volunteers in active orchid conservation recovery implementation

Recovery Action 9a: Provide information and advice to private landowners and land management authorities about the location and management requirements of species and subpopulations

Justification

Landowners/managers need to be notified of the presence of threatened orchid subpopulations as soon as they are located, and informed of their responsibilities under the TSP and EPBC Acts.

Methods

Due to the substantial work undertaken under the original Plan (as described in Appendix 1), the time requirement to complete this action has been significantly reduced. It should be noted that the majority of new subpopulations are likely to be detected as a result of targeted surveys for development proposals – where this is the case, landowners/managers are usually informed of the discoveries by external parties rather than dedicated project officer or departmental staff.

Recovery Action 9b: Encourage and support private landowners, land management authorities,

community groups and volunteers to participate and be involved in orchid recovery planning and actions

Justification

Community, and in particular landowner, participation and involvement is important to the success of this Recovery Plan. This action aims to increase the number of community groups and private landowners involved with orchid conservation and recovery actions.

Methods

Community group and landowner involvement can be increased by encouraging them to adopt an orchid subpopulation either on privately owned land or in habitat that they manage or are concerned about. Through this adoption, Recovery Actions of 1a, 1b (surveys), 2a and 2b (monitoring) are more likely to be completed for a wider variety of species. This facilitates spreading the work load across the State, as well as increases the likelihood of obtaining consistent and reliable data. Field-based training may be required to provide volunteers with necessary skills in identification, data collection and implementation of recovery actions. Private landowners and community groups will also be encouraged to apply for grants to assist in achieving Action implementation.

Recovery Action 9c: Increase public awareness about orchid conservation, this Recovery Plan and recovery actions undertaken, through a variety of media outlets

Justification

Community involvement in the recovery process will improve the chances of success by generating interest in orchid conservation, raising public awareness of threatening processes and empowering communities to take responsibility for conservation and land management issues.

Methods

Wherever possible departmental staff will promote orchid recovery projects and community participation through local newsletters, newspapers, radio, television and community events. Orchid conservation will be further promoted through the development and display of an *ex situ* living collection at the RTBG (refer to Recovery Action 8a).

Recovery Action 9d: Re-establish the Tasmanian Threatened Orchid Recovery Team (TTORT) as the Tasmanian Native Orchid Network

Justification

Recovery of threatened orchids in Tasmania will be best achieved through a coordinated effort from government agencies, public and private landowners, botanists, ecologists, horticulturalists, orchid enthusiasts, community groups and volunteers. It is important that information and skills be shared between all parties. Within the TTORT an expert panel for orchid identification needs to be established where identification of specimens, photographs and email requests are channelled.

Methods

Re-establishment of the TTORT as the Tasmanian Native Orchid Network is needed to continue to oversee, at a broad level, the implementation of the Plan, and to assist DPIPWE and consultants in assigning priorities to objectives and actions, based on the most up-to-date information. The Network is expected to be self-sustaining and ongoing throughout the life of this Plan. Members are expected to provide their time and costs as in-kind support through their respective organisations, but some costs may be reimbursed at cost for private community members. Ten meetings (on average 1/year but may be staged as needs require). Network members will be encouraged to apply for funding and resources to complete the research components of this Plan. Within this network, a panel of specialists will be established to revise the Tasmanian field guide to native orchids (Recovery Action 4c) and review collections — whether digitally collected or live collected — via an email system following an agreed protocol. Users (i.e. consultants, enthusiasts) may submit an image or lodge a specimen at HO for review by the expert panel. The panel will form a consensus (or at least parties agree to disagree with justifications) so that management/mitigation can be developed. This process will be subject to an annual review to assess how the team is operating.

Plan duration, funding and achievement

This Recovery Plan is intended to guide the implementation of recovery actions for the next ten years, though it is recognised that full recovery of each species is a long-term process and may extend beyond the life of this Plan. Given the long-term objective and nature of species' recovery, it is anticipated that progress of the Plan in meeting the objectives will be assessed within five years. It is envisaged that the TTOFRP will require continued funding beyond the term of this Plan if the overall recovery objectives are to be achieved. Costings for the actions identified in this Plan are detailed in Table 4. To facilitate applications for funding and implementation, recovery actions for individual species have been prioritised, whilst other actions have an overarching application to each species in the Plan (Appendix 3).

Though this is a fully costed plan, options can be developed for staging or undertaking critical-path research and conservation actions in the event that a threatened orchid subpopulation faces a more immediate threat. These staged actions are context dependent, e.g., an episodic disease or pest outbreak, and thus where a threat emerges the Tasmanian Department of Primary Industries, Parks, Water and Environment should be contacted for advice.

Implementation of the Plan will be overseen by the Tasmanian Native Orchid Network (refer to Recovery Action 9d). The coordination of recovery actions will require the appointment of a project officer, as no current position exists in this capacity. Funding for the project officer is essential for successful implementation of the Plan. Departmental staff will be required to provide a managerial role in facilitating communication between stakeholders, establishing networks and adaptive management decision making. The Plan will be reviewed at the end of the implementation phase, at which time the achievement of objectives will be assessed against the measured performance criteria detailed in the Plan, and recommendations for future action determined.

As identified in the review of the 2006–2010 TTOFRP (Appendix 1), many of the actions in this Plan will be performed by community groups, orchid enthusiasts and conservationists. Many of the recovery actions in this Plan will require the participation of regional NRM bodies. Where appropriate, actions in the Plan should be incorporated into regional strategic plans for implementation and review. Funding will be sought through the NRM framework. Support will also be sought from a range of other sources. To aid implementation the NRM regions containing priority subpopulations have been identified in Appendix 2.

For the research components of this Plan (Recovery Strategies 4, 5 and 6), the appointment of a research scientist with knowledge of orchid taxonomy and orchid conservation techniques is desirable. The research will address significant knowledge gaps and will lead to substantially improved priority allocation, identification of habitat critical to the survival of species, development of management practises and a better understanding of the key ecological interactions critical for orchid survival. The RTBG provides a specialist capacity through the TSCC in which orchid conservation research can take place. The TSCC has a well-equipped laboratory with the essential facilities required to complete the research identified in this Plan. A well-established working relationship between the TSCC and RTBG Horticulture staff provides a valuable in-kind resource to take the science from the laboratory to secure lasting living collections of threatened orchids. In addition, well-established linkages between RTBG, DPIPW and the University of Tasmania, provide an excellent capacity to build future research grant applications. Funding for research activities may also be sourced from a range of competitive grants which are available for botanical conservation research. These include the Australian Research Council or Australian Botanical Resources Study.

Recognising the limited resources available to fund research actions, it should be noted that research outcomes can be achieved through undertaking single-species studies to solve more complex conceptual issues or to highlight directions to take for further research. Recent studies on Tasmanian orchids by Wapstra et al. (2011) on the distribution, ecology and conservation status of *Prasophyllum stellatum*, Norris (2007) on the effects of mites on orchid populations, and Collier (2011) on the complex taxonomy and morphology of *Prasophyllum limnetes*, highlight the ability of single-species studies to inform and influence conservation practises for a wide range of other species. In this Plan, research-based recovery action priorities have been allocated to species representing important Tasmanian genera with a biology and ecology most reflective of the Tasmanian orchid flora. This approach maximises research efficiencies with limited resources and will provide benchmark understanding and informed management recommendations across a wide variety of species. In addition, much of this research, with adequate supervision, can be achieved through the University of Tasmania's honours or postdoctoral research program. In this way, contributions to achieving Recovery Objectives can be made by a greater network of people, and the resulting information disseminated, including through the publication of

research findings in peer-reviewed journals.

Table 4. Budget

Recovery Action	Expense	Units (days/yr)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total (\$)
1a: Presence-absence surveys	PO	50	16615.4	17113.8	17627.3	18156.1	18700.8	19261.8	19839.6	20434.8	21047.9	21679.3	190476.8
	AS	10	2769.2	2852.3	2937.9	3026.0	3116.8	3210.3	3306.6	3405.8	3508.0	3613.2	31746.1
	Travel/car hire	50	15000.0	15450.0	15913.5	16390.9	16882.6	17389.1	17910.8	18448.1	19001.6	19571.6	171958.2
	Accom/meals	40	10000.0	10300.0	10609.0	10927.3	11255.1	11592.7	11940.5	12298.7	12667.7	13047.7	114638.8
	Survey costs		3000.0	3090.0	3182.7	3278.2	3376.5	3477.8	3582.2	3689.6	3800.3	3914.3	34391.6
1b: Extension surveys	PO	50	16615.4	17113.8	17627.3	18156.1	18700.8	19261.8	19839.6	20434.8	21047.9	21679.3	190476.8
	AS	10	2769.2	2852.3	2937.9	3026.0	3116.8	3210.3	3306.6	3405.8	3508.0	3613.2	31746.1
	Travel/car hire	50	15000.0	15450.0	15913.5	16390.9	16882.6	17389.1	17910.8	18448.1	19001.6	19571.6	171958.2
	Accom/meals	50	12500.0	12875.0	13261.3	13659.1	14068.9	14490.9	14925.7	15373.4	15834.6	16309.7	143298.5
	Survey costs		3000.0	3090.0	3182.7	3278.2	3376.5	3477.8	3582.2	3689.6	3800.3	3914.3	34391.6
1c: Listing statements	Contract wages		3000.0	3090.0	3182.7	3278.2	3376.5	3477.8	3582.2	3689.6	3800.3	3914.3	34391.6
1d: Manage spatial data	PO	10	3323.1	3422.8	3525.5	3631.2	3740.2	3852.4	3967.9	4087.0	4209.6	4335.9	38095.4
	AS	5	1384.6	1426.2	1468.9	1513.0	1558.4	1605.1	1653.3	1702.9	1754.0	1806.6	15873.1
2a: Population monitoring	PO	140	46523.1	47918.8	49356.3	50837.0	52362.1	53933.0	55551.0	57217.5	58934.0	60702.1	533334.9
	AS	20	5538.5	5704.6	5875.8	6052.0	6233.6	6420.6	6613.2	6811.6	7016.0	7226.4	63492.3
	Travel/car hire	140	42000.0	43260.0	44557.8	45894.5	47271.4	48689.5	50150.2	51654.7	53204.3	54800.5	481482.9
	Accom/meals	100	25000.0	25750.0	26522.5	27318.2	28137.7	28981.9	29851.3	30746.8	31669.3	32619.3	286597.0
	Survey costs		5000.0	5150.0	5304.5	5463.6	5627.5	5796.4	5970.3	6149.4	6333.9	6523.9	57319.4
2b: Demographic monitoring	PO	140	46523.1	47918.8	49356.3	50837.0	52362.1	53933.0	55551.0	57217.5	58934.0	60702.1	533334.9
	AS	20	5538.5	5704.6	5875.8	6052.0	6233.6	6420.6	6613.2	6811.6	7016.0	7226.4	63492.3
	Travel/car hire	140	42000.0	43260.0	44557.8	45894.5	47271.4	48689.5	50150.2	51654.7	53204.3	54800.5	481482.9
	Accom/meals	100	25000.0	25750.0	26522.5	27318.2	28137.7	28981.9	29851.3	30746.8	31669.3	32619.3	286597.0
	Survey costs		5000.0	5150.0	5304.5	5463.6	5627.5	5796.4	5970.3	6149.4	6333.9	6523.9	57319.4
3a: Undertake critical management actions	PO	40	13292.3	13691.1	14101.8	14524.9	14960.6	15409.4	15871.7	16347.9	16838.3	17343.4	152381.4
	AS	10	2769.2	2852.3	2937.9	3026.0	3116.8	3210.3	3306.6	3405.8	3508.0	3613.2	31746.1
	Travel/car hire	40	12000.0	12360.0	12730.8	13112.7	13506.1	13911.3	14328.6	14758.5	15201.2	15657.3	137566.6
	Accom/meals	20	5000.0	5150.0	5304.5	5463.6	5627.5	5796.4	5970.3	6149.4	6333.9	6523.9	57319.4
	Materials		25000.0	25750.0	26522.5	27318.2	28137.7	28981.9	29851.3	30746.8	31669.3	32619.3	286597.0
3b: CAR Assessment	PO Desktop study	30				9969.2	10268.3	10576.4					30813.9

Recovery Action	Expense	Units (days/yr)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total (\$)
3c: Conservation covenants	PO	5	1661.5	1711.4	1762.7	1815.6	1870.1	1926.2	1984.0	2043.5	2104.8	2167.9	19047.7
3d: Develop vegetation management agreements	PO	10	3323.1	3422.8	3525.5	3631.2	3740.2	3852.4	3967.9	4087.0	4209.6	4335.9	38095.4
	AS	5	1384.6	1426.2	1468.9	1513.0	1558.4	1605.1	1653.3	1702.9	1754.0	1806.6	15873.1
3e: Assess reserve function	PO Desktop study	10				3323.1	3422.8	3525.5					10271.3
4a: Taxonomic revision	RS 1x FTE for 3 years		98400.0	101352.0	104392.6								304144.6
	Travel/car hire	10	3000.0	3090.0	3182.7								9272.7
	Accom/meals	10	3000.0	3090.0	3182.7								9272.7
	Materials		20000	20600.0	21218.0								61818.0
4b: Incorporate taxonomic revision	PO	5		1661.5	1711.4	1762.7							5135.6
4c: Prepare Tasmanian orchid field guide	Contract wages		15000.0	15450.0	15913.5	16390.9	16882.6						79637.0
5a: Mycorrhizal research	RS: .4 FTE for 4 years		34560.0	35596.8	36664.7	37764.6							144586.1
	Travel/car hire	10	3000.0	3090.0	3182.7	3278.2							12550.9
	Accom/meals	10	3000.0	3090.0	3182.7	3278.2							12550.9
	Laboratory expenses		1500.0	1545.0	1591.4	1639.1							6275.4
	Materials		5000	5150.0	5304.5	5463.6							20918.1
5b: In situ baiting	RS: .1 FTE for 4 years		9840.0	10135.2	10439.3	10752.4							41166.9
	Travel/car hire	5	1500.0	1545.0	1591.4	1639.1							6275.4
	Accom/meals	5	1500.0	1545.0	1591.4	1639.1							6275.4
	Materials		2000	2060.0	2121.8	2185.5							8367.3
5c: Pollinator research	RS: .4 FTE for 4 years		39360.0	40540.8	41757.0	43009.7							164667.6
	Travel/car hire	10	3000.0	3090.0	3182.7	3278.2							12550.9
	Accom/meals	10	3000.0	3090.0	3182.7	3278.2							12550.9
	Materials		5000	5150.0	5304.5	5463.6							20918.1
6a: Disturbance research	RS: .1 FTE for 4 years		9840.0	10135.2	10439.3	10752.4							41166.9
	Travel/car hire	5	1500.0	1545.0	1591.4	1639.1							6275.4
	Accom/meals	5	1500.0	1545.0	1591.4	1639.1							6275.4

Recovery Action	Expense	Units (days/yr)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total (\$)
	Materials		2000	2060.0	2121.8	2185.5							8367.3
6b: Incorporate disturbance research findings	PO	5		1661.5	1711.4	1762.7	1815.6						6951.3
7a: Orchid seed collection and storage	PO	10	3323.1	3422.8	3525.5	3631.2	3740.2	3852.4	3967.9	4087.0	4209.6	4335.9	38095.4
	Travel/car hire	5	1500.0	1545.0	1591.4	1639.1	1688.3	1738.9	1791.1	1844.8	1900.2	1957.2	17195.8
	Accom/meals	5	1500.0	1545.0	1591.4	1639.1	1688.3	1738.9	1791.1	1844.8	1900.2	1957.2	17195.8
	Storage costs		1500.0	1545.0	1591.4	1639.1	1688.3	1738.9	1791.1	1844.8	1900.2	1957.2	17195.8
	Materials		2000	2060.0	2121.8	2185.5	2251.0	2318.5	2388.1	2459.7	2533.5	2609.5	22927.8
7b: Orchid mycorrhizal isolation and storage	PO	10	3323.1	3422.8	3525.5	3631.2	3740.2	3852.4	3967.9	4087.0	4209.6	4335.9	38095.4
	Travel/car hire	5	1500.0	1545.0	1591.4	1639.1	1688.3	1738.9	1791.1	1844.8	1900.2	1957.2	17195.8
	Accom/meals	5	1500.0	1545.0	1591.4	1639.1	1688.3	1738.9	1791.1	1844.8	1900.2	1957.2	17195.8
	Storage costs		1500.0	1545.0	1591.4	1639.1	1688.3	1738.9	1791.1	1844.8	1900.2	1957.2	17195.8
	Materials		2000	2060.0	2121.8	2185.5	2251.0	2318.5	2388.1	2459.7	2533.5	2609.5	22927.8
7c: In vitro germination	PO	10		3323.1	3422.8	3525.5	3631.2	3740.2					17642.7
	Laboratory expenses			1500.0	1545.0	1591.4	1639.1	1688.3					7963.7
	Materials			2000.0	2060.0	2121.8	2185.5	2251.0					10618.3
8a Ex situ living collection and propagation	PO	10		3323.1	3422.8	3525.5	3631.2	3740.2					17642.7
	Glasshouse expenses			1500.0	1545.0	1591.4	1639.1	1688.3					7963.7
	Materials			2000.0	2060.0	2121.8	2185.5	2251.0					10618.3
8b: Translocation feasibility assessment	PO	5		1661.5	1711.4	1762.7	1815.6	1870.1					8821.3
8c: Undertake translocations	PO	5			1661.5	1711.4	1762.7	1815.6	1870.1				8821.3
	Travel/car hire	5			1500.0	1545.0	1591.4	1639.1	1688.3				7963.7
	Accom/meals	5			1500.0	1545.0	1591.4	1639.1	1688.3				7963.7
	Materials				2000	2060.0	2121.8	2185.5	2251.0				10618.3
9a: Advice to landowners/authorities	PO	5	1661.5	1711.4	1762.7	1815.6	1870.1	1926.2	1984.0	2043.5	2104.8	2167.9	19047.7
	AS	5	1384.6	1426.2	1468.9	1513.0	1558.4	1605.1	1653.3	1702.9	1754.0	1806.6	15873.1
9b: Encourage participation in orchid recovery	PO	5	1661.5	1711.4	1762.7	1815.6	1870.1	1926.2	1984.0	2043.5	2104.8	2167.9	19047.7
	AS	5	1384.6	1426.2	1468.9	1513.0	1558.4	1605.1	1653.3	1702.9	1754.0	1806.6	15873.1
	PO	5	1661.5	1711.4	1762.7	1815.6	1870.1	1926.2	1984.0	2043.5	2104.8	2167.9	19047.7

Recovery Action	Expense	Units (days/yr)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total (\$)
9c: Increase public awareness of TTOFRP	AS	5	1384.6	1426.2	1468.9	1513.0	1558.4	1605.1	1653.3	1702.9	1754.0	1806.6	15873.1
9d: Re-establish TTORT	PO	5	1661.5	1711.4	1762.7	1815.6	1870.1	1926.2	1984.0	2043.5	2104.8	2167.9	19047.7
	AS	5	1384.6	1426.2	1468.9	1513.0	1558.4	1605.1	1653.3	1702.9	1754.0	1806.6	15873.1
		Total	715861.5	755968.2	785308.7	686225.1	561944.0	559543.2	544058.8	552658.0	569237.8	586314.9	6317120.2

Notes: Expenses include costings of: **1 x FTE Project Officer (PO)** @ \$72,000/annum+20% on-costs pa (\$332.3/day); **1 FTE Administration Support (AS)** @ \$60,000/annum+20% on-costs (\$276.9/day); **1 x FTE Research Scientist (RS)** @ \$82,000/annum+20% on-costs (\$378.5/day); **Travel & car hire** @ \$300/day; **Accommodation & meals** @ \$250/day. A 3% CPI index has been added to each consecutive year over the Plan's duration.

Objectives of the EPBC Act and TSP Act

The *Threatened Tasmanian Orchids Flora Recovery Plan* satisfies the objectives of the EPBC Act in that it seeks to:

- provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance, viz., the nationally listed orchid species;
- promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources;
- promote the conservation of biodiversity by maintaining the conservation value of ecosystems in which threatened orchid species occur; and
- promote a co-operative approach to the protection and management of orchid species involving governments, the community, landholders and indigenous peoples.

The Plan satisfies the objectives of the TSP Act in that it seeks to:

- ensure that Tasmania's threatened orchid species can survive, flourish and retain their potential for evolutionary development in the wild;
- ensure that the genetic diversity of threatened orchid species is maintained;
- educate the community in the conservation of threatened orchid species;
- encourage co-operative management of threatened orchid species including the making of co-operative agreements for land management under the Act;
- assist landholders to enable threatened orchid species to be conserved; and
- encourage the conserving of threatened orchid species through co-operative community endeavors.

Social and economic impacts

Tasmanian threatened orchids have legal protection as listed entities at the Commonwealth and/or State level. The sites in which they occur are on reserved, unreserved and/or private land. The successful implementation of the Plan will require close consultation with, and involvement of, landowners and managers. This process is likely to lead to an increase in community awareness, involvement and skills in natural resource and conservation management. In addition, local community groups and volunteers will benefit from additional training in implementing recovery actions. Community groups will be assisted and encouraged to apply for community grants to implement actions of this Plan. The implementation of recovery actions with potential economic implications (e.g., changing agricultural practices), will be undertaken in consultation with landowners and managers, with advice and assistance provided where appropriate.

Affected interests

While recovery actions under this Plan consider the roles and interests of a range of private landowners and government land managers, some stakeholders may be affected. Affected interests, including stakeholders and those involved in implementing actions include: DPIPWE, FT, DIER (including the Forest Practices Authority, Mineral Resources Tasmania and Transport), NRM regional committees, TLC, RTBG, HO, TFGA, forestry industries, local councils, Queen Victoria Museum and Art Gallery, the Tasmanian Flora Network, and volunteer groups such as Bushcare and Wildcare's Threatened Plants Tasmania. The suite of landowner and/or land manager interests will be reflected in the membership of a recovery team, and where appropriate and practical their respective roles are identified in the actions of this Recovery Plan.

Indigenous roles and interests

In the preparation of this Plan the important role Tasmanian Aboriginal people have played in land management was recognised, and the impact of European settlement on this role acknowledged.

The following Aboriginal organisations have been consulted on the significance of threatened Tasmanian orchids in Aboriginal cultural tradition, and on their knowledge, role and interest in their management: Aboriginal Land Council of Tasmania, Tasmanian Aboriginal Centre, and Tasmanian Aboriginal Land and Sea Council.

Eighteen of the Tasmanian orchid species listed in this Plan are known to occur on land managed by Aboriginal organisations (Table 5), including the only known occurrences of *Caladenia brachyscapa* in Tasmania. Four of

these species are listed under the EPBC Act.

Implementation of this Plan will involve:

- knowledge sharing;
- participation in education and training relevant to threatened species management; and
- engagement in recovery actions where relevant to Aboriginal land management and communities.

If, during any recovery activity, suspected evidence of Aboriginal heritage significance is found, this will be reported to Aboriginal Heritage Tasmania, and, if the evidence is to be disturbed, the activity will be suspended pending appropriate follow-up.

Table 5. Threatened orchids known to occur on Aboriginal land (& year last recorded)

Species	TSP Act/ EPBC Act	Badger Island	Cape Barren Island	Clarke Island	Great Dog Island	Oyster Cove	Preminghana
<i>Caladenia brachyscapa</i>	e/EX	—	2009 *	1979 *	—	—	—
<i>Caladenia caudata</i>	v/VU	—	2007	1998	—	—	—
<i>Caladenia patersonii</i>	v/—	—	1973	—	—	—	—
<i>Caladenia pusilla</i>	r/—	—	1988	—	—	—	—
<i>Calochilus campestris</i>	e/—	—	—	1979 *	—	—	—
<i>Chiloglottis trapeziformis</i>	e/—	—	—	—	1992	—	—
<i>Corunastylis morrisii</i>	e/—	—	—	—	—	1850	—
<i>Cryptostylis leptochila</i>	e/—	—	2007	—	—	—	—
<i>Cyrtostylis robusta</i>	r/—	—	—	—	—	—	2002
<i>Hydrorchis orbicularis</i>	r/—	—	2009	1994	—	—	—
<i>Microtidium atratum</i>	r/—	—	2009	—	—	—	—
<i>Orthoceras strictum</i>	r/—	—	2007	1994	—	—	—
<i>Prasophyllum secutum</i>	e/EN	—	2007	—	—	—	—
<i>Pterostylis lustra</i>	e/—	—	—	—	—	—	2007 *
<i>Pterostylis sanguinea</i>	r/—	1973	2007 *	1980	—	—	—
<i>Pterostylis tunstallii</i>	e/—	—	—	—	1992 *	—	—
<i>Thelymitra atronitida</i>	e/—	—	2007	—	—	—	—
<i>Thelymitra jonesii</i>	e/EN	—	1973	—	—	—	—

* identified as a priority subpopulation (see Appendix 2)

International obligations

Each of the EPBC Act listed species covered by this Recovery Plan are also listed under the Convention on International Trade in Endangered Species (CITES; Appendix II). CITES has established a worldwide system of controls on international trade in threatened wildlife. The legislative basis for meeting Australia's responsibilities under CITES is now provided by Part 13A of the EPBC Act. All of the actions identified in this Recovery Plan are consistent with Australia's obligations under CITES.

Australia is a signatory to the 'Convention on Wetlands of International Importance especially as Waterfowl Habitat' (Ramsar Convention). A number of species covered by this Recovery Plan occur in wetland sites recognised as internationally important through their listing under the Ramsar Convention. The Ramsar sites in which threatened Tasmanian orchids are currently known to occur are: Logan Lagoon, Lavinia, Jocks Lagoon, Flood Plain Lower Ringarooma River and Little Waterhouse Lake. This Recovery Plan is consistent with Australia's obligations under the Ramsar Convention.

Australia is also a signatory to the Convention on Biological Diversity (CBD). The primary aims of CBD are the conservation and sustainable use of biological diversity. CBD emphasizes the need for *in situ* conservation measures, and promotes the recovery of threatened species. The main implementation tools for the Convention are national strategies, plans or programs. This Recovery Plan is consistent with Australia's obligations under the CBD.

Broader biodiversity benefits and impacts

Recovery actions for threatened Tasmanian orchids considered in this Plan will have direct and indirect benefits for a range of other threatened species and ecological communities, as well as non-threatened species and ecological communities. Reservation, monitoring and management of orchid habitats will benefit other species growing in association with threatened orchids, particularly those with similar life forms and/or flowering responses or those that thrive under similar ecological conditions.

In Tasmania, many threatened orchids occur in threatened ecosystems and isolated remnants. Orchids have the potential to be used as flagship species for highlighting the broader nature conservation and biodiversity issues of such areas and may assist in improving their reservation status and management.

In situ and *ex situ* conservation techniques developed during implementation of this Plan will benefit recovery of other orchid species, particularly terrestrial species growing in southern Australia. Improved working relationships with inter- and intra-State agencies, community groups and landowners will also be developed as a cooperative approach is adopted to achieve common conservation objectives.

Species known to occur in close association with threatened orchids and that will benefit from actions outlined in this Plan include several plants listed on the EPBC Act, viz., *Dianella amoena* (grassland flaxlily), *Glycine latrobeana* (clover glycine) and *Leucochrysum albicans* var. *tricolor* (grassland paperdaisy). Numerous plant species listed on the TSP Act will also benefit, among them *Brachyscome rigidula*, *Pultenaea prostrata*, *Scleranthus diander* and *Stackhousia subterranea*.

The habitat of several of the threatened orchids dealt with in this Plan (e.g. *Prasophyllum incorrectum*, *Prasophyllum olidum*, *Prasophyllum taphanix*, *Prasophyllum tunbridgense*, *Pterostylis commutata* and *Pterostylis wapstrorum*) includes *Lowland Native Grasslands of Tasmania*, an ecological community listed as Critically Endangered on the EPBC Act. In addition, *Prasophyllum crebriflorum* occurs within *Highland Poa labillardierei* grassland, a vegetation community considered to be threatened in Tasmania, as listed in Schedule 3a of the *Tasmanian Nature Conservation Act 2002*.

Management practices

Under the EPBC Act any person proposing to undertake actions that may have a significant impact on listed threatened orchid species must refer the action to the Minister for Environment. The Minister will determine whether the action requires EPBC Act assessment and approval. As these provisions relate to proposed (i.e. future) actions, they can include actions that may result in increased impact from existing threats or potential threats; and actions that may result in a new threat. Management practices necessary to avoid significant impacts from the following potential activities on threatened Tasmanian orchid species include:

Proposed developments and land clearing

Surveys should be undertaken to determine if threatened orchid species or their habitat may be impacted upon by proposed developments or land use changes, to satisfy relevant requirements under the following State and Commonwealth legislation: TSP Act, EPBC Act, *Tasmanian Land Use Planning and Approvals Act 1993*, *Tasmanian Forest Practices Act 1985* and the *Tasmanian Nature Conservation Act 2002* (for known or potential occurrences in threatened vegetation communities). Administrative guidelines providing overarching guidance on determining whether an action is likely to have a significant impact are available from the Australian Government Department of the Environment and Energy website. If approval under the EPBC Act (for the loss of plants or habitat) and TSP Act (for the loss of plants) is to be considered, then substantial positive outcomes for the overall conservation of the species should be secured in accordance with regulatory requirements.

Weed & disease invasion and control

Weed management plans should be developed in association with all activities (e.g. vegetation management agreements of Recovery Action 3d) in the habitats of orchid populations. The plans should include:

i) if required, only use herbicides that are licensed for the control of the target weed species; ii) minimising drift of herbicides onto native vegetation; iii) follow up weed control activities to ensure the success of the initial treatment and to prevent reinvasion of weeds; iv) inspecting populations at least once within five years; and v) minimising the risk of new weed incursions.

Any proposed development or activity that has the potential to introduce *Phytophthora cinnamomi* (root rot fungus) to the habitat of an important subpopulation is likely to have a significant impact on that species. *Phytophthora cinnamomi* hygiene guidelines (DPIWE 2004) must be implemented when visiting or using machinery in catchments supporting threatened orchid habitat.

Fire management

Fire and timing of fire has a range of effects on orchid populations, including the proliferation of flowering and vigour, the destruction of early growth, interruption of mycorrhizal interactions and change of habitat characteristics potentially impacting pollinator suitability. Fire management activities (e.g. prescribed burning and clearing firebreaks) are potential threats to some of the species in this Plan. There is need to liaise with fire management authorities to minimise, understand and study the potential deleterious impacts of fire. Any planned fire in threatened orchid habitat for fuel reduction or habitat management that will result in injury or death of an orchid plant will require a permit under the TSP Act. In considering approval or the provision of a permit to take a listed threatened orchid species, as a result of a planned burn, the following management principles should be applied:

- consider the timing of fire intervals (species-specific advice should be sought from specialists within DPIWE and members of the TTORT);
- assess the appropriateness of the fire regime on public and private land undertaken with orchids in mind;
- avoid repeating low intensity fires (fuel reduction burns) consuming < 6 tonnes/ha ground fuel in succession;
- where practicable, do not burn when droughts are predicted in the spring and summer of the following two years;
- where practicable, exclude fire from orchid populations infected with *Phytophthora cinnamomi* for at least 6–10 years after infection;
- where practicable, use natural features such as control lines, rather than bulldozed fire breaks, when conducting fuel reduction or ecological burns; if natural features are not sufficient then control lines should be cut by hand using a brush cutter and chainsaw to avoid soil disturbance and the possible introduction of weeds or *Phytophthora cinnamomi*; and
- orchid populations that are known to be infested with weeds should have a weed management plan implemented prior to any planned fire.

Roads, tracks and utility easements

While it is very difficult to predict the impact of disturbance on orchid populations, it is very likely the disturbance will have some impact (positive or negative). Orchids respond to disturbance (fire regime, slashing, old vehicle tracks) in different ways (often quite positively) depending on their biology and ecology, yet there is extremely limited to no data available that supports this anecdotal evidence. The impact of disturbance to orchid populations from the management of roads, tracks and utility easements is difficult to predict. However, until more information becomes available (Recovery Actions 6a and 6b) the following precautionary management activities should be incorporated into Vegetation Management Agreements (Recovery Action 3d): i) minimise the amount of slashing required to provide for safe road/track/utility use; ii) do not use herbicide beyond the hardened shoulder of the road; iii) minimise disturbance of habitat; do not drain water into orchid populations at the edge of roads, tracks or easements; and v) close or re-align tracks (including walking tracks) if the track is resulting in disturbance to threatened orchid populations.

Timber harvesting

Under the *Forest Practices Code* (Forest Practices Board 2000) ‘threatened species and inadequately reserved plant communities will be managed in wood production areas in accordance with procedures agreed between the FPA and DPIWE’. The ‘agreed procedures’ require consultation, where necessary, between the FPA and DPIWE (or other specialists) to develop appropriate site-specific management prescriptions where threatened species may be affected by a forestry activity.

Mineral exploration

Any mineral exploration activities should be in accord with the Tasmanian *Mineral Exploration Code of Practice* (Bacon 1999), with reference to the Mineral Exploration Working Group (MEWG). The *Code* will guide MEWG to the level of prescription required, but individual prescriptions should be developed on a case-by-case basis depending on the level of risk associated with the proposed exploration operation, with specialist advice to be provided by DPIPWE.

Grazing

Where possible, stock should be excluded from threatened orchid sites and from adjacent suitable habitat during periods of orchid growth, flowering and seed set. Fences required to protect subpopulations should be maintained, taking into account native wildlife movement, including the movement of animals to low-lying environments during drought periods.

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APPENDIX 1. Review of TTOFRP 2006–2010

Review of the 2006–2010 TTOFRP	Progress	Results/Outputs	Evaluation of Effectiveness	Comments	Recommendations
<i>Objectives and Recovery Actions from the 2006–2010 TTOFRP</i>	<i>To what extent has the overall objective been met?</i>	<i>What results have been delivered?</i>	<i>How effective were the results in achieving the overall objective?</i>	<i>Discuss any external factors which may have influenced the extent to which the overall objective has been met?</i>	<i>What modifications might be required in future?</i>
<p>The overall objective of recovery is to minimise the probability of extinction in the wild of threatened orchid species listed on the Tasmanian <i>Threatened Species Protection Act 1995</i> and the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> and to increase the probability of each species becoming self-sustaining in the long-term.</p>	<p>Some progress made. The implementation of many of the recovery actions of this plan was made possible by:</p> <ul style="list-style-type: none"> i) the appointment of a Project Officer (PO) through the NRM's Threatened Species Regional Competitive Project - 'Implement Threatened Species Recovery Plans - TSC1NHT05 (Orchids and Euphrasia)'. Project actions were completed between 2007 and 2009 (TSS 2009a). ii) managerial support and participation from DPIPWE (TSS) departmental staff during the term of the PO, and as coordinators of volunteer surveys and demographic monitoring during the 2009, 2010 and 2011 flowering seasons. iii) Orchid Seed Bank Project funded by the Australian Orchid Foundation and the appointment of the Orchid Seed Bank Collection Officer (CO) from July 2008 to June 2009. iv) a botanical consultant being contracted to undertake surveys and advise on management issues for species in 	<p>For specific results, refer to individual recovery actions</p>	<p>Partial only. Better understanding of several EPBC-listed species as a result of survey effort, as well as actions in place to enhance their chances of survival, but the status of several species was not able to be resolved in the project's two-year time-frame (partly a due to the severe drought conditions experienced in Tasmania from 2006 to 2008; see TSS 2009a).</p>	<p>Progress towards meeting the overall recovery objective has been severely hampered by the lack of resources made available for orchid recovery work in Tasmania during the period 2008 to 2011. Funding recovery programs for only a portion of their intended duration with a fraction of the intended budget is destined to reduce their effectiveness, the most serious consequence being the loss of communication with relevant landowners and managers. In this project one PO was expected to deal with up to 70 species over just two seasons (2007 & 2008), a level of support that pales into insignificance compared with the situation in other Australian States. The vagaries of orchid flowering means that at least decadal-scale programs are required to determine some species' true status and the need for recovery actions.</p>	<p>These recommendations were identified by the PO employed to undertake recovery actions of the original Plan in (TSS 2009a):</p> <ul style="list-style-type: none"> • Prioritisation of recovery actions. This recommendation has been achieved (in part) through a threatened species prioritisation project undertaken by TSS for Tasmania's three NRM regions (TSS 2010). The 'PPP' project assessed Tasmania's endangered and vulnerable species: each of the orchid-specific recovery actions identified through the PPP process has been incorporated in the recovery actions and prioritisation of actions outlined in this Plan (where still relevant). • Continued monitoring of long-term demographic studies established during this project to improve our understanding of ecology, biology and population size, and inform the management of threatened orchids. This could be done through TSS support to TPT, and would additionally engage the community in the conservation process. • Continue the seed banking and ex situ conservation (propagation) project with an aim to be capable of instigating reintroduction programs for those species facing imminent extinction in the wild. • Investigate options for securing a long-

Review of the 2006–2010 TTOFRP	Progress	Results/Outputs	Evaluation of Effectiveness	Comments	Recommendations
<i>Objectives and Recovery Actions from the 2006–2010 TTOFRP</i>	<i>To what extent has the overall objective been met?</i>	<i>What results have been delivered?</i>	<i>How effective were the results in achieving the overall objective?</i>	<i>Discuss any external factors which may have influenced the extent to which the overall objective has been met?</i>	<i>What modifications might be required in future?</i>
	northwestern Tasmania (ECOtas 2008). v) contributions from the community volunteer group Threatened Plants Tasmania (TPT; see below) vi) external grants awarded to Dr Nigel Swarts (NS) at the RTBG.				term position at TSS to undertake orchid (and other threatened flora) conservation projects to provide continuity to projects and ensure that actions arising from this type of project are followed through. • Given the lack of knowledge of mycorrhizal and pollinator interactions of Tasmania orchids and the ecological requirements to support these interactions, research is required by a dedicated Research Scientist to fill these knowledge gaps.
Specific Objective 1. Acquire accurate information for sound management decisions and conservation status assessments					
Action 1.1 Conduct baseline surveys	Excellent progress made during term of PO at DPIPWE and with additional surveys completed by TSS staff and TPT volunteers.	146 orchid population surveys representing 49 species were coordinated by the PO in the 2007 and 2008 seasons, with an additional 30 surveys representing about 15 species conducted by TSS staff and/or TPT volunteers in the 2009–2011 seasons. Significant baseline information was obtained for the following EPBC-listed species: <i>Caladenia anthracina</i> , <i>Caladenia dienema</i> , <i>Caladenia saggicola</i> , <i>Caladenia tonellii</i> , <i>Corunastylis brachystachya</i> , <i>Prasophyllum amoenum</i> , <i>Prasophyllum atratum</i> , <i>Prasophyllum crebriflorum</i> , <i>Prasophyllum incorrectum</i> , <i>Prasophyllum limnetes</i> , <i>Prasophyllum olidum</i> , <i>Prasophyllum milfordense</i> , <i>Prasophyllum stellatum</i> , <i>Prasophyllum taphanyc</i> ,	Highly effective.	The period during which the PO was employed, April 2007 to April 2009, was characterised by extreme drought conditions in Tasmania, resulting in very poor flowering for many orchid species or a complete lack of emergence. This being the case the project still exceeded expectations in regard to the verification of priority orchid populations. Ironically, the break in the drought in 2009 enabled TSS staff and TPT volunteers to determine the status of several significant, e.g., <i>Caladenia saggicola</i> , <i>Prasophyllum incorrectum</i> , <i>Prasophyllum olidum</i> ,	Baseline surveys are considered an integral part of the orchid recovery process. Surveys over the last five years have filled significant information gaps in the Tasmanian orchid flora, though the status of a number of species remains unclear. These actions have become Recovery Actions 1a and 1b, respectively, in the revised version of this Plan.

Review of the 2006–2010 TTOFRP	Progress	Results/Outputs	Evaluation of Effectiveness	Comments	Recommendations
<i>Objectives and Recovery Actions from the 2006–2010 TTOFRP</i>	<i>To what extent has the overall objective been met?</i>	<i>What results have been delivered?</i>	<i>How effective were the results in achieving the overall objective?</i>	<i>Discuss any external factors which may have influenced the extent to which the overall objective has been met?</i>	<i>What modifications might be required in future?</i>
		<i>Prasophyllum tunbridgense, Pterostylis cucullata, Pterostylis commutata, Pterostylis wapstrarum, Pterostylis siegeleri.</i>		<i>Prasophyllum milfordense, Prasophyllum taphanyx.</i>	
Action 1.2 Conduct conservation status assessments and update State and Commonwealth threatened species legislation, listing statements and databases	Partial; ongoing	At a TTORT meeting in April 2009 an expert group worked through the full list of Tasmanian orchids and arrived at a recommended conservation status and the need for listing statements (TSS 2009a). Of the then 36 EPBC-listed species, 4 were recommended to be down-listed (<i>Caladenia dienema</i> , <i>Diuris lanceolata</i> , <i>Prasophyllum amoenum</i> , <i>Prasophyllum apoxychilum</i>) and 3 to be delisted (<i>Pterostylis atriola</i> , <i>Pterostylis cucullata</i> , <i>Pterostylis pratensis</i>); <i>Caladenia dienema</i> has been down-listed as part of the ongoing SIP process, the others have yet to be progressed. Three species were nominated for listing on the EPBC Act: <i>Nematoceras dienenum</i> , <i>Prasophyllum atratum</i> and <i>Prasophyllum limnetes</i> ; they are now formally listed and have had listing statements prepared (which may be viewed on the TSS website or via a link on the EPBC website). DPIPWE databases were updated to	Partially.	Progressing a change of status on the EPBC Act requires considerable time and resources which, given the raft of other activities competing for the single PO's attention, were simply not available. Additional resources would have allowed this action to be fully completed.	Streamlining of the nomination/delisting process for the State & Commonwealth Acts is required to ensure that any proposed changes of status are progressed in a timely manner.

Review of the 2006–2010 TTOFRP	Progress	Results/Outputs	Evaluation of Effectiveness	Comments	Recommendations
<i>Objectives and Recovery Actions from the 2006–2010 TTOFRP</i>	<i>To what extent has the overall objective been met?</i>	<i>What results have been delivered?</i>	<i>How effective were the results in achieving the overall objective?</i>	<i>Discuss any external factors which may have influenced the extent to which the overall objective has been met?</i>	<i>What modifications might be required in future?</i>
		reflect the aforementioned status changes.			
Action 1.3 Keep abreast of changes in orchid taxonomy	Partial; ongoing	Taxonomic changes accepted by the botanical community have been incorporated into relevant databases, and listing statements updated accordingly. Regular discussions have been held between key orchid conservation practitioners in Tasmania, the result being a greater appreciation of taxonomic issues that have relevance to species currently listed on the EPBC and TSP Acts.	Very effective, though there are acknowledged taxonomic issues concerning several listed species.	Recent publications on Australian orchid taxonomy (refer to the revised Plan), as well as the lack of targeted taxonomic revision on Tasmanian orchids, have led to a number of 'grey areas' in relation to the genera <i>Caladenia</i> , <i>Prasophyllum</i> and <i>Thelymitra</i> .	Taxonomic revision and updating the field guide to Tasmanian orchids are listed as recovery actions in the revised Recovery Plan. A strategy for specimen identification has also been recommended in Recovery Action 9d of this Plan.
Specific Objective 2. Ensure priority populations are managed appropriately and are securely protected					
Action 2.1 Notify land owners/managers of presence of threatened orchid populations	Partial; ongoing	The presence and management requirements of 57 orchid populations have been discussed with relevant landowners (TSS 2009a).	Reasonably effective: the relationships established between the PO/TSS staff and landowners have enabled, in most instances, recovery actions to be progressed. Their long-term success, however, is dependent upon the availability of a dedicated PO to provide ongoing support and advice (see above).	Isolated instances of landowner resistance were encountered, the negative response being due in part to the perceived threat to management practices posed by the listing of the ecological community 'Lowland Grasslands of Tasmania' as Critically Endangered on the EPBC Act, and in part due to an aversion to bureaucracies of any form.	This action has remained as a recovery action in this Plan with recommendations to increase the number of landowners who are actively involved in the orchid recovery process. For details see recovery actions 9a and 9b.
Action 2.2 Undertake critical management actions	Partial; ongoing	On-ground threat mitigation or habitat maintenance was undertaken to protect 14	Reasonable, in terms of addressing the short-term threats posed by browsers,	As above, plus resourcing issues.	The implementation of recovery actions and data gained from baseline and extension surveys undertaken during the

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		threatened orchid populations (TSS 2009a). This included fencing, weeding and ecological burning: fencing was erected to protect eight priority orchid populations, weeding to protect three populations and ecological burns conducted to maintain or enhance habitat for three populations. Long term population monitoring was established at five sites.	invasive weeds or rank vegetation. However, follow-up work will be required in each instance to ensure the long-term efficacy of these actions, be it fence maintenance, ongoing weed control or simply regular contact with the land managers in question to identify any new issues.		course of the previous Plan have served to highlight the need for a number of additional critical management actions. These actions have been recorded in recovery Action 3.1 in the revised Plan, in conjunction with the actions identified as high priority from the PPP project.
Action 2.3 Manage spatial data	Complete	Information from baseline and extension surveys has been incorporated into DPIPWE's Natural Value Atlas database.	Very effective: the availability of up-to-date spatial information for Tasmania's threatened orchids is considered essential, as it facilitates the assessment of development proposals by State and Commonwealth agencies, as well as allowing the conservation status of species to be reviewed.	None	Recognising the value of this recovery action to orchid conservation and providing information to researchers, conservation practitioners, etc., this recovery action has been retained as Recovery Action 1d in the revised Plan.
Action 2.4 Identify priority populations	Partial	Priority populations for endangered and vulnerable orchid species in Tasmania were identified by the PO and key experts as part of the PPP project (TSS 2010).	Moderate: the priority populations identified through the PPP process have served as a guide to activities by TSS staff and TPT volunteers, though the extent of these activities has been limited by the lack of resources.	Adoption of the PPP process by funding bodies in Tasmania has been met with a mixed response, partly due to the lack of Commonwealth funding for threatened species in recent years.	The orchid populations identified as priority through the PPP process are included in this revised Plan. Additional priority populations have been included following discussions between TSS staff and key orchid experts in Tasmania.
Action 2.5 Identify threats and develop	Partial	Threats and management strategies for all endangered and	As above	As above	Threats identified in TSS (2009a) are recognised for each priority population

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management strategies for priority populations		vulnerable orchid species in Tasmania were identified by the PO and key experts as part of the PPP project (TSS 2010), building on experience of the PO on the ground in 2007–2009 (TSS 2009a).			in this revised version. Recommendations made were incorporated into the PPP project and many have been highlighted in Recovery Action 3b. It is recommended that an adaptive management approach be adopted to action on new threats that are identified through implementation of recovery actions in this plan. Management strategies to be incorporated in vegetation management agreements in Recovery Action 3d.
Action 2.6 Work with land owners/managers to develop and implement management plans for important threatened orchid communities	Partial	Fire management plans developed for two sites supporting 4 Critically Endangered and 1 Vulnerable species (TSS 2009a).	Successful in developing plans (2008 & 2009); implementation phase in its very early stages, so too soon to determine their effectiveness.	Number of management plans able to be developed limited by staff and funding resources.	This recovery action has been retained as an important recovery action in the revised Plan (See Recovery Action 9b)
Action 2.7 Pursue long-term protection of priority populations from detrimental changes in land management	Partial	Input into two conservation covenants (one in place, one in train) to protect important threatened orchid populations (NRM South).	As above	Capacity to deliver on this objective hampered by the lack of incentive programs in Tasmania for conservation covenants.	This recovery action has been retained as an important recovery action in the revised Plan (See Recovery Action 3c)
Specific Objective 3. Increase the number of known populations of threatened orchid taxa					
Action 3.1 Coordinate volunteer extension searches	Excellent; ongoing	Volunteers from the community group TPT provided significant assistance in field survey work, contributing at least 36 people days of volunteer time for threatened orchid surveys with the PO and CO in the 08/09 flowering season. More than 100 people TPT volunteer days	Very effective and enhanced by the commitment of skilled orchid enthusiasts and practitioners.	The relationship with TPT during the implementation of this plan has been one of the success stories of entire project (that is, during the PO's term). TPT has made orchid conservation their flagship project and have worked closely with TSS to further pursue targets of this	Well-coordinated and targeted volunteer extension surveys are considered an integral component of the orchid recovery process. Extension searches have been recommended as a Recovery Action (1b) in the revised Plan and the methodology recommends that volunteers such as the TPT community group be utilised to achieve this action.

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		were utilised in the 09/10 and 10/11 flowering seasons, with surveys for 15 target species at more than 20 sites: significant finds included <i>Prasophyllum apoxychilum</i> , <i>Prasophyllum crebriflorum</i> , <i>Prasophyllum tunbridgense</i> , <i>Pterostylis commutata</i> , <i>Pterostylis rubenachii</i> .		project beyond its completion in June 2009. TPT now works in consultation with TSS and relevant land managers to monitor and survey a range of threatened orchid sites.	
Action 3.2 Develop systems for standardising data provided by external sources	Partial; ongoing	Workshops held by TSS staff in 2009 and 2010 (in conjunction with TPT volunteers) to educate interested parties in the use of DPIPWE's Natural Values Atlas, particularly in data entry requirements.	Reasonable: increase in the quantity and quality of data being entered from external sources.	None	Significant orchid collections are held at the Tasmanian Herbarium (Hobart) and the Queen Victoria Museum and Art Gallery (Launceston). An agreement exists between DPIPWE and the former for the regular transfer of data, though not for the latter. It is recommended in Recovery Action 1c of this plan that relevant data be extracted from old database systems and incorporated into DPIPWE's Natural Value Atlas. In addition, relevant information in interstate herbaria and the Atlas of Living Australia should be linked to the current database of collections.
Specific Objective 4. Raise public awareness of orchid conservation issues and develop mechanisms to encourage and coordinate community participation in orchid recovery programs					
Action 4.1 Prepare listing statements	Excellent; ongoing	32 new and 3 updated listing statements prepared; available on the TSS website and via links on the EPBC website.	Very effective	Lack of resources.	Species requiring listing statements have been identified and prioritised in the revised Plan in Recovery Action 1d
Action 4.2 Establish and facilitate regional recovery teams	Partial.	No specific regional recovery teams were established; however the PO participated in a number of steering committees and collaborative	Moderately, in terms of the establishment of the volunteer group Threatened Plants Tasmania.	As the term of the PO position was only for two years, there was limited capacity to establish and facilitate regional recovery	No specific action related to setting up regional recovery teams is identified in this revised version, given the difficulties in maintaining the TTORT. It is recommended that all recovery actions

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		<p>projects with Tasmanian organisations. The PO joined the steering committee of the volunteer group Threatened Plants Tasmania, a collaborative program between DPIPWE and Wildcare Inc. It aims to develop and coordinate a volunteer program targeting threatened plant recovery. The PO attended TPT committee meetings providing professional orchid advice. In particular the PO was involved in establishing a specialist chapter of TPT, focusing specifically on orchid conservation. TPT has become a valuable source of skilled volunteers and has a significant focus on orchid conservation in the future (see above). The PO also worked on a collaborative project with FT, the FPA, ECO_{Tas} and the CSIRO Centre for Plant Biodiversity Research, Canberra aimed at clarifying the distribution and taxonomic concept of <i>Prasophyllum stellatum</i> (Ben Lomond leek-orchid). The project involved extensive survey work and taxonomic investigation, the results of which have recently been published in the journal <i>Tasforests</i> (Wapstra et al. 2011).</p>		<p>teams. This highlights the need for an ongoing PO position to be appointed at the commencement of the implementation of this Plan.</p>	<p>be undertaken via a collaborative approach between PO, RS, departmental staff, private landowners, public land management authorities and volunteers</p>

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Action 4.3 Prepare technical guidelines detailing in situ conservation techniques and provide training in monitoring and management	Partial	A management protocol for threatened orchid populations described. Two training workshops conducted.	Moderately: TPT and the PO worked together to bring one of Australia's leading orchid researchers, Fiona Coates, to Tasmania in 2008 to conduct workshops and seminars on monitoring threatened orchid populations. The workshops, one in the State's south and one in the north, introduced the concepts involved in orchid conservation and monitoring (i.e. why and how to monitor). These workshops were extremely beneficial to TPT members, land managers with threatened orchids on the land, and attending TSS staff.	None	Recovery Action 3d in the revised Plan details the need to develop vegetation management agreements and incorporate orchid-specific conservation recommendations in existing plans. For these actions to be effective, some training may be required. Training for volunteers who participate in surveying or demographic monitoring has been recommended in the revised Plan.
Action 4.4 Promote the Threatened Orchid Recovery Program and community participation	Partial	11 media opportunities resulting in three newspaper article, at least two online news articles, one publication foreword, one orchid society newsletter article, one book review in The Tasmanian Naturalist, one article in Australasian Plant Conservation, and two radio interviews. Seminar on Threatened Orchid Recovery	Moderately: The promotion of threatened orchid conservation is an important way of informing the public about the risk of extinction to many orchid populations, threatening processes, what is being done and how the public can participate in orchid conservation activities.	None	This action is continued in this revised Plan through Recovery Actions 9a and 9b

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		Program given to the Devonport Orchid Society.			
Specific Objective 5. Establish a network of government and non-government organisations and individuals that can provide input into recovery programs and undertake recovery actions					
Action 5.1 Maintain the Tasmanian Threatened Orchid Recovery Team	Initial progress made ... action not maintained	TTORT aimed to meet biannually with additional subcommittee working groups aimed at addressing specific tasks and on ground actions (e.g. ecological burning, <i>ex situ</i> conservation, coordinating volunteer groups, etc). TTORT was established comprising members from government and non-government organisations and community groups involved in native orchid conservation in Tasmania. Represented on the team are DPIPWE, Parks and Wildlife Service, RTBG, FPA, NRM rejoins, Midlands Biodiversity Hotspot Project, environmental consultants, private landowners and orchid enthusiasts.	The two meetings held by the TTORT were effective. A TTORT subcommittee meeting on priority setting was held in August 2007 prior to the field season commencing. Five committee members and two guest experts set priorities for the coming field season and remainder of the project.	As the term of the PO position was only for two years, there was no follow up coordination of TTORT meetings. This highlights the need for an ongoing PO position to be appointed at the commencement of the implementation of the revised Plan.	The TTORT contribution to orchid conservation is seen as very important and therefore it is recommended in this revised plan that the TTORT be re-established as the Tasmanian Native Orchid Network. (Recovery Action 9d). Tasmania is in a fortunate position of having a pool of people who are passionate about orchids and their conservation. Together this knowledge is extremely valuable and there is widespread capacity to achieve recovery actions through this Network. It is anticipated that the Network, through coordination by a PO, will ensure continuity throughout the lifetime of this Plan and generate community interest in ongoing actions. The Network will also play a facilitatory role via a subgroup in orchid identification and taxonomic discussion.
Action 5.2 Coordinate communication and exchange of knowledge between participants in regional and interstate recovery programs	Partial	The PO attended two national workshops on orchid conservation. The PO developed strong relationships with several Australian and international orchid experts from government and non-government organisations, and collaborated on research projects aimed at developing <i>ex situ</i> conservation programs in	This recovery action was effective during the term of the PO, however, since funding has ceased this has been discontinued	Further funding is required for this action to continue	It is recommended that this recovery action be carried out throughout the duration of this revised Recovery Plan through general knowledge transfer and communication (Action 9), including the publication of research findings in peer-reviewed journals.

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		Tasmania. Additionally the PO published collaborative work with researchers from Victoria, South Australia, Western Australia and Puerto Rico on conservation of threatened orchids in a special addition of the <i>Australian Journal of Botany</i> (Tremblay et al. 2009).			
Specific Objective 6. Develop a better understanding of the life history and ecological requirements of threatened orchids in Tasmania					
Action 6.1 Monitor managed sites	Good	Long term population monitoring was established at five locations for seven species: <i>Caladenia tonellii</i> at Henry Somerset Orchid Sanctuary; <i>Prasophyllum incorrectum</i> and <i>Prasophyllum olidum</i> at Campbell Town Golf Course; <i>Prasophyllum limnetes</i> at Rubicon Sanctuary; <i>Prasophyllum crebriflorum</i> at Surrey Hills; <i>Caladenia saggicola</i> and <i>Prasophyllum milfordense</i> at Milford. [Methods and results described in DPIPWE (& TPT) internal reports].	Moderate: population monitoring is a long-term process, so results to date are preliminary in nature.	The response at one site may have been compromised in the 2011 season by the inadvertent slashing of orchids following their emergence (but prior to flowering).	This action has been modified to a degree in the revised Plan (See Recovery Actions 2a and 2b) to reflect highest priority populations for demographic monitoring identified through the PPP project and discussions held by TSS staff and key orchid experts in the preparation of this Plan.
Action 6.2 Monitor pollination in selected priority populations and identify pollinators	Incomplete	An Honours student at the University of Tasmania commenced a research program funded through TTOFRP that included the Critically Endangered <i>Caladenia saggicola</i> and the Vulnerable <i>Caladenia caudata</i> , though the project was not completed. The student's supervisor provided a report to	Low-moderate	The incomplete Honours project highlights the inherent risks associated with 'subcontracting'. However, there is much to be gained from TSS – UTAS collaborations, and the results that did emerge from the project have provided valuable insights into the	This action has been considerably revised in this Plan. The conservation of existing populations will only be successful if a pollinator community remains that is capable of providing sufficient fruit set to sustain the orchid population. While a lack of knowledge on the requirements of pollinators currently limits our ability to manage vegetation specifically for their benefit, techniques are available to

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		TSS on the work conducted during the project.		ecology of the species involved that could not have been achieved by TSS for the amount of funding allocated.	determine sites likely to favour short-term persistence and reintroductions of orchids. Recovery Action 5c identifies the research required to gather this data. For this to be implemented, it is recommended that a research scientist with skills in orchid conservation techniques be appointed. In this way, focused research outcomes can be achieved during the narrow field season window by a dedicated RS and adequate supervision provided for potential UTAS student projects.
Action 6.3 Identify soil characteristics that promote orchid and fungal growth	Incomplete	No results	Ineffective	Insufficient resources available to pursue this action	This action has also been considerably revised in the current versions of this plan. Recovery Actions 5a and 5b identifies the mycorrhizal research required to obtain a better understanding of the underground requirements for orchid survival. This includes targeted <i>in situ</i> baiting to determine mycorrhizal distribution and mycorrhizal efficacy, as well as identifying habitat characteristics associated with high mycorrhizal presence. In this way critical habitat for orchid survival can be identified and the need for <i>in situ</i> habitat management actions identified.
Specific Objective 7. Increase the size of priority populations in the wild					
Action 7.1 Manage microhabitats to promote recruitment	Some progress made	An ecological burn was conducted in Cambridge in April 2008. The property supports two nationally Critically Endangered and one Vulnerable orchid species (one	Unclear at this stage: to be determined by future monitoring	Insufficient resources	Specific habitat management actions for individual populations have been identified through the PPP process and discussions with departmental staff and orchid experts in the preparation of this plan. These are included in Recovery

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		being endemic to the property). The burn was successfully conducted by the Hobart City Fire Crew and met the prescriptions outlined in the Fire Management Plan. Special Management Zones were established by Forestry Tasmania for <i>Prasophyllum stellatum</i> , <i>Pterostylis atriola</i> , <i>Thelymitra jonesii</i> and <i>Thynniorchis nothofagicola</i> in compliance with the <i>Forest Practices Code</i> .			Action 3a and detailed further in Appendices 2 & 3. Management of general threats is described in this revised Plan. Recovery Actions 6a and 6b in this plan recommend undertaking research to assess the influence of various habitat disturbances on orchid population dynamics. Outcomes of this research will better inform management practice in the future.
Action 7.2 Hand pollinate plants	Some progress made	Hand pollination was completed for 15 species to ensure sufficient seed could be collected (Janes 2010).	Hand pollination is an effective technique to ensure seed set for some species that do not set much fruit. This technique also ensures out-crossing and higher quality seed.	Seasonal difficulties (drought). Difficulties in refunding pollinated plants. Browsing of seed capsules. Not enough time and funding provided for pollination and then follow up collection	Despite the difficulties identified, this Recovery Action is one of the only ways seed can be collected for some threatened orchids due to the very low natural fruit set of many taxa Hand pollination for seed collection purposes has been retained in Recovery Action 7a in this Plan. (Hand pollination for the purpose of increasing population size is not considered a priority for action in this Plan.)
Action 7.3 Collect seed and restock populations	Good progress made with seed collection but no attempt at restocking populations. See final report from CO (DPIPWE internal report). Additional progress in seed collection made by NS at the RTBG.	During the term of the CO, <i>ex situ</i> seed collections were made for 38 threatened orchids. Another 14 collections were attempted but were unsuccessful. No populations have been restocked. Through external grant funding, NS made an additional 109 collections of Tasmanian	The Orchid Seed Bank Project through the CO aimed to: 1) collect and assess viable orchid seed; 2) determine if an optimal temperature is required for the growth of isolated Tasmanian orchid mycorrhiza; 3) conduct symbiotic and asymbiotic	Native orchid seed collection had not previously been attempted in Tasmania. At commencement other Australian states were advanced in their orchid seed banking projects, and this project was able to draw on their knowledge. Additional funding through	General recommendations identified by the CO for seed collecting include: 1) collecting species from multiple locations to account for potential genetic and mycorrhizal variation 2) collecting additional seed to from species already acquired to supplement seed used in germination trials and to account for poor seed viability. Seed collection has been retained as

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		orchids, representing 70 species. Of these, 23 were for species listed in this Plan.	germination tests and 4) lead to the development of a 'living-collection' of threatened Tasmanian orchid species at the RTBG for future research and re-introduction programs. Significant achievements were made: a list of 59 target species was developed and prioritised, of which seed collections were obtained for 20 and an additional 18 for non-target taxa. The number of species targeted during this project was substantial, a clear reflection of the proportion of Tasmanian flora and threatened species that orchids constitute.	external grants facilitated the collection of many more of Tasmania's orchid species. A long term goal of this action should be to ensure all of Tasmania's orchids are stored in perpetuity. Restocking of populations was not attempted due to a lack of resources.	Recovery Action 7a in this revised Plan. The recommendations above will be incorporated in the methods. Restocking of populations has been retained in Recovery Actions 8b and 8c in this Plan.
Specific Objective 8. Identify critical and potential habitat					
Action 8.1 Identify critical habitat	None	None	Not enough critical knowledge obtained to determine habitat critical to orchid survival	To identify critical orchid habitat, consideration must be given to orchid's key biological and ecological interactions - mycorrhizal and pollinator interactions. These are largely unknown for Tasmanian orchids and research is required to obtain a better understanding of these critical associations for orchid survival. For many	Critical research is required to obtain a better understanding of orchid mycorrhizal and pollinator interactions. These findings will better inform conservation practitioners of critical habitat for orchid survival and what factors may be limiting orchid recruitment/reproduction. This research has been incorporated into Recovery Actions 5a and 5b of this revised plan. The implementation of this research is described above.

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				species the orchid mycorrhizal and pollinator interaction is highly specific, with each organism requiring their own suite of habitat characteristics for survival. Therefore conservation of critical orchid habitat must incorporate knowledge of habitat characteristics which will support orchid mycorrhiza and orchid pollinators	
Action 8.2 Identify potential habitat	Partial	Potential habitat was identified for extension surveys for a range of species & at least some of those areas subsequently surveyed (see the habitat information in the revised Plan and also Wapstra et al 2012)	Moderately: some areas of potential habitat returned positive results (<i>Prasophyllum crebriflorum</i> at Knole Plains, <i>Pterostylis cucullata</i> in the Yellow Rock area on King Island), while others were negative (<i>Prasophyllum amoenum</i> at Morrison Creek moorlands, <i>Pterostylis commutata</i> in the Tunbridge & Ross areas).	Lack of resources.	This Action has been incorporated into Recovery Action 1b in this revised plan as suitable habitat must be identified in order to carry out extension surveys. Criteria for identifying potential habitat include previously unsurveyed habitat suitable for orchid presence, habitat experiencing a recent disturbance event and opportunistic surveys in new locations.
Specific Objective 9. Establish a genetically representative <i>ex situ</i> collection of orchid species facing imminent extinction in the wild.					
Action 9.1 Establish a threatened orchid seed bank	Good progress made. Additional progress made at the RTBG	Orchid seed bank established at the TSCC. (See the final report by the CO - DPIPWE Janes 2010). See also Appendix 3 for a list of species in this plan with existing collections.	The Orchid Seed Bank Project funded the creation of a new position, CO (2008-2009). The CO role was to coordinate The Orchid Seed Bank Project, establish the orchid seed bank and collect and store	The Orchid Seed Bank Project resulted in considerable proponent/other contribution: \$10,000 was contributed from the Millennium Seed Bank Project, to assist in	Continuing the <i>ex situ</i> conservation (propagation) with an aim to be capable of instigating reintroduction programs in order to prevent extinctions in the future is recommended. This recommendation has been adopted in Recovery Action 7a of this plan.

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<i>Objectives and Recovery Actions from the 2006–2010 TTOFRP</i>	<i>To what extent has the overall objective been met?</i>	<i>What results have been delivered?</i>	<i>How effective were the results in achieving the overall objective?</i>	<i>Discuss any external factors which may have influenced the extent to which the overall objective has been met?</i>	<i>What modifications might be required in future?</i>
			orchid seed and mycorrhizal fungi. The project involved collaboration between TSS, RTBG's TSCC, the MSB, and the BGPA. This collaboration was a step towards a national seed bank network, promoting skills and information sharing to advance a national approach to orchid seed conservation. The CO received training and technical support from NS from the BGPA, Richard Thomson (Vic. Botanical Gardens), James Wood and Lorraine Perrins (RTBG).	employing the CO, without which the project would not have got off the ground. The RTBG's TSCC housed the CO, and supplied essential laboratory space and equipment, and collecting gear. Continuing this work in this revised plan is anticipated to attract further funding contributions.	
Action 9.2 Establish and maintain <i>ex situ</i> populations	Some progress made during the term of the CO	Two living <i>ex situ</i> collections of threatened orchids have been developed: <i>Prasophyllum amoenum</i> (v/EN), and <i>Pterostylis siegeleri</i> (v/EN). 47 species have been used in germination trials. 18 species have been used in 68 symbiotic germination tests (seed and associated fungi). 243 seedlings from 4 species (two nationally listed one endemic and one non-endemic) are currently in the glasshouse at the RTBG maintained by RTBG horticulture staff, with approximately 100 to be potted	This was a difficult component of the Recovery Plan given that these methods had not previously been attempted for Tasmanian orchids. In addition, the techniques were new to the appointed CO. The BGPA through NS provided significant logistical and technical support in the early stages of the projects development and provided two weeks specific training to the CO on an in-kind	Between specialised ecological interactions and a lack of knowledge of the ecology of pollinators, orchids are expected to be among the most difficult plant species in the region to restore. However, propagation techniques now exist so that these species can readily be grown from seed and introduced into native bushland, though it remains unknown how likely new or supplemented populations are likely to	This recovery action has been maintained as Recovery Action 8a in this revised Recovery Plan. This Recovery Action is important for propagating plants for translocation and to establish a living collection at the RTBG. Establishing a living collection of threatened plants is a primary goal of a state botanic garden and collections can be used as an <i>ex situ</i> seed source for propagation programs and for orchid conservation promotion. Given the long time period from germination to maturity, this action should be commenced as early as

Review of the 2006–2010 TTOFRP	Progress	Results/Outputs	Evaluation of Effectiveness	Comments	Recommendations
<i>Objectives and Recovery Actions from the 2006–2010 TTOFRP</i>	<i>To what extent has the overall objective been met?</i>	<i>What results have been delivered?</i>	<i>How effective were the results in achieving the overall objective?</i>	<i>Discuss any external factors which may have influenced the extent to which the overall objective has been met?</i>	<i>What modifications might be required in future?</i>
		out (Janes 2010). Guidelines for orchid propagation and cultivation have been developed and are available on the DPIPWE website (Janes 2009). Follow-up germination work in 2011 at the RTBG achieved germination and transfer to potting mix of an additional 8 threatened species and 260 seedlings. These will be assessed for re-emergence this growing season.	basis. Orchids are typically very difficult to propagate and considerable time, funding and resources must be available if success is to be achieved. Orchids are also very slow to grow to maturity and require up to four years of maintenance before flowering plants are achieved. Contamination of fungal isolates hampered the propagation efforts.	persist., further highlighting the need to preserve existing populations of threatened and declining species.	possible within the life of the Recovery Plan
Action 9.3 Investigate techniques for mycorrhizal fungi isolation and storage	Good progress made. See final report from CO (DPIPWE internal report). Additional progress made by NS at the RTBG	The CO attempted isolations of many taxa. These were used in germination trials. Through external funding NS attempted another 240 isolations of threatened and common Midlands and Cradle Coast orchid species. The TSCC now holds mycorrhizal collections of approximately 50 species. NS also undertook molecular genetic analysis of fungi isolates. See Appendix 3 for a list of species with existing collections.	This was another difficult component of the recovery plan. Many isolations were attempted for a large number of threatened species yet many failed due to contamination and difficulties in identifying orchid mycorrhizal hyphae. Funding provided to NS by the TPT and NRM Cradle Coast led to the successful isolation of threatened Midland and NRM Cradle Coast orchids. Details available in final reports to DPIPWE and NRM Cradle Coast	The BGPA is storing a representative collection of successfully isolated mycorrhizal cultures in their cryo-preservation facility, as no such facilities exist (or are available) in Tasmania. This is widely believed to be the most effective storage method for orchid seed and fungi	This recovery action has been retained as Recovery Action 7b in this revised Plan. This action is considered necessary in conjunction to seed storage to securing the conservation of threatened orchids in perpetuity. This action also provides the capacity for <i>in vitro</i> propagation of orchids to supply plants for propagation and eventual translocation. Ongoing funding to support this action is essential as mycorrhizal cultures require ongoing maintenance and re-subculturing to prevent contamination.

APPENDIX 2. List of species covered by this Plan, habitat descriptions and priority populations

Tenure: * = covered by a conservation covenant under the Tasmanian *Nature Conservation Act 2002*

Species/status	Habitat	Priority populations	Last seen	Threats	Tenure	NRM	Recovery actions relevant to subpopulation
<i>Caladenia anthracina</i> (e/CR) end	Grassy eucalypt woodland with <i>Acacia dealbata</i> and <i>Pteridium esculentum</i> on well-drained sandy soil; areas of low rainfall areas in Northern Midlands	Beaufront	2007	Over-grazing by stock, inappropriate fire regime, weeds, clearance	Private	North	1a: Surveys, 2a: Subpopulation size, 3a: Fencing, weed control, provision of suitable fire regime, 3c: Conservation covenant, 3d: Management planning, 7a and 7b: Collect seed and mycorrhizal fungi
		Greenhill	2007	Over-grazing by stock, inappropriate fire regime, weeds, clearance	Private	North	1a: Surveys, 2a: Subpopulation size, 3a: Fencing, weed control, provision of suitable fire regime, 3c: Conservation covenant, 3d: Management planning, 7a and 7b: Collect seed and mycorrhizal fungi
		Fosterville	2010	Over-grazing by stock, inappropriate fire regime, weeds, clearance	Private	North	1a: Surveys, 2a: Subpopulation size, 3a: Fencing, weed control, provision of suitable fire regime, 3c: Conservation covenant, 3d: Management planning, 7a and 7b: Collect seed and mycorrhizal fungi
		Campbell Town Golf Course	2011	Inappropriate slashing & fire regimes, weed invasion	Private *	North	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Weed control and provision of suitable slashing/fire regime, 3c: Covenant compliance, 3d: Management planning
		Vaocluse	2002	Inappropriate fire regime	Private *	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3c: Covenant compliance, 3d: Management planning
		Annandale	2002	Over-grazing by stock, inappropriate fire regimes, weeds, clearance	Private*	North	1a: Surveys, 2a: Subpopulation size, 3a: Fencing, weed control, provision of suitable fire regime, 3c: Conservation compliance, 3d: Management planning, 7a and 7b: Collect seed and mycorrhizal fungi
<i>Caladenia aurantiaca</i> (e/-)	<i>Allocasuarina verticillata</i> forest, sometimes on the edge of <i>Eucalyptus nitida</i> woodland, with an understorey composed of <i>Poa labillardierei</i> and <i>Pteridium esculentum</i>	Deal Island	2008	Inappropriate fire regime	National Park	North	1a and 1b: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
<i>Caladenia australis</i> (e/-)	Probably coastal heath/scrub/woodland; no detailed information	Lady Barron, Flinders Island	1968	Track construction?	Crown Land	North	1a and 1b: Surveys, 2a: Subpopulation size, 3a: markers/signs (if rediscovered), 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi (if rediscovered)

Species/status	Habitat	Priority populations	Last seen	Threats	Tenure	NRM	Recovery actions relevant to subpopulation
	on the solitary recorded site in Tasmania						
<i>Caladenia brachyscapa</i> (e/EX)	Heathland and sparse coastal scrub on well-drained sandy loam	Clarke Island	1979	Inappropriate fire regime	Aboriginal Land Council of Tasmania	North	1a and 1b: 2a: Subpopulation size, 3a: Provision of suitable fire regime,
		Cape Barren Island	2009	Inappropriate fire regime	Aboriginal Land Council of Tasmania	North	1a and 1b: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 7a and b: Collect seed and mycorrhizal fungi
<i>Caladenia campbellii</i> (e/CR) end	Slopes and ridges on rolling hills among shrubs in stunted coastal and near-coastal scrub and forest on well-drained sandy loam and gravelly loam over clay at low elevations	Devils Elbow Road, Rocky Cape	2010	Clearance, recreational motorbike use, inappropriate fire regime	Private/Crown	Cradle Coast	1a: Surveys, 2a and 2b: Demographic monitoring, 3a: Provision of suitable fire regime, fencing, 3d: Management planning
		Anthonys Beach	2007	Clearance, inappropriate fire regime	Private	Cradle Coast	1a and 1b: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3c: Conservation covenant, 3d: Management planning
		Newhaven Road	2006	Clearance, inappropriate fire regime	State Forest	Cradle Coast	1a and 1b: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning
<i>Caladenia cardiochila</i> (x/-)	No detailed information on solitary Tasmanian collection; on the mainland the species occurs in a wide range of forested and shrubby habitats on well-drained soils	Flinders Island	1947	Unknown	Conservation Area?	North	1a and 1b: Surveys, 2a: Subpopulation size, 7a and b: Collect seed and mycorrhizal fungi
<i>Caladenia caudata</i> (v/VU) end	Heathy eucalypt forest and woodland, often with sheoaks, and heathland on sandy and loamy soils; often found on sunny north-facing sites	Bellingham	2008	Subdivision, inappropriate fire regime	Crown Land	North	1a: Surveys, 2a: Subpopulation size, 3a: Weed control, provision of suitable fire regime, 3d: Management planning, 7a and 7b: Collect seed and mycorrhizal fungi
		Waverly Park	2012	Inappropriate fire regime, weeds	Council	South	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Weed control, provision of suitable fire regime,
		Beechford	2004	Clearance, grazing	Private	North	1a and 1b: Surveys, 2a: Subpopulation size, 3a: Fencing, 3d: Management planning, 7a and 7b: Collect seed and mycorrhizal fungi
		Austins Ferry	2011	Weeds, inappropriate fire regime	Private	South	1a: Surveys, 2a: Subpopulation size, 3a: Weed control, provision of suitable fire regime, 3d: Management planning
		Henry Somerset	2011	Inappropriate fire regime, weeds	Private Sanctuary	Cradle Coast	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Weed control, provision of suitable fire regime, 3d: Management planning

Species/status	Habitat	Priority populations	Last seen	Threats	Tenure	NRM	Recovery actions relevant to subpopulation
<i>Caladenia congesta</i> (e/-)	Heathy/shrubby woodland and open forest, usually in dry sites on sandy and loamy, often gravelly, soils and among grass tussocks on slopes	West Point Road	2007	Inappropriate fire regime	Conservation Area	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime
		Rubicon Sanctuary	2011	Inappropriate fire regime	Private*	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3c: Covenant compliance, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
<i>Caladenia dienema</i> (e/EN) end	Windswept low heathland, growing among dwarfed shrubs and sedges on moist to well-drained sandy and clay loams; usually associated with rocky outcrops but may also extend into shrubby forests, usually dominated by <i>Eucalyptus obliqua</i>	Arthur-Pieman meta-population	2012	Small population size	Conservation Area	Cradle Coast	1a and 1b: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Provision of suitable disturbance, 7a and 7b: Collect seed and mycorrhizal fungi
<i>Caladenia filamentosa</i> (r/-)	Lowland heathy and sedgy open eucalypt forest and woodland on sandy soils	Coles Bay	1988	Inappropriate fire regime	Public Reserve	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime
		Lime Bay	1993	Inappropriate fire regime	State Forest	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime
		Boronia Hill	2007	Inappropriate fire regime, walker disturbance	Council Reserve	South	1a: Surveys, 2a: Subpopulation size, 3a: Fencing, signage, provision of suitable fire regime, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
<i>Caladenia lindleyana</i> (e/CR) end	Lowland open eucalypt forest and woodland. The species' potential habitat is poorly understood	Anthony's Beach	2006	Clearance, inappropriate fire regime	Private	Cradle Coast	1a and 1b: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: provision of suitable fire regime, 3c. Conservation covenant, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi (if rediscovered)
<i>Caladenia pallida</i> (e/CR) end	Open eucalypt forest in lowland areas with annual rainfall less than 1000 mm; the species' historical distribution may have included a	Henry Somerset	1987	Inappropriate fire regime, weeds	Private Sanctuary	Cradle Coast	1a and b: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Weed control, provision of suitable fire regime,, 3d: Management planning
		Epping Forest	1979	Clearance, inappropriate fire regime	Private?	North	1a and b: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: provision of suitable fire regime, 3d: Management

Species/status	Habitat	Priority populations	Last seen	Threats	Tenure	NRM	Recovery actions relevant to subpopulation
	more diverse range of habitats						planning, 7a and 7b: Collect seed and mycorrhizal fungi (if rediscovered)
<i>Caladenia patersonii</i> (v/)	Low shrubby heathland and open heathy forest/woodland in coastal and near-coastal areas, growing in moist to well-drained sandy and clay loams	West Point Road	2007	Small population size	Conservation Area	Cradle Coast	1a and b: Surveys, 2a: Subpopulation size, 7a and 7b: Collect seed and mycorrhizal fungi
		Anthony's Beach	2006	Clearance, inappropriate fire regime	Private	Cradle Coast	1a and b: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3c: Conservation covenant, 3d: Management planning, 7a and 7b: Collect seed and mycorrhizal fungi
		Bellingham Road	2008	Inappropriate fire regime	Crown Land	North	1a and b: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning, 7a and 7b: Collect seed and mycorrhizal fungi
<i>Caladenia prolata</i> (e/-)	On Flinders Island restricted to the surface of granite boulders; on Deal Island occurs on slopes of gully systems dominated by <i>Allocasuarina verticillata</i> (with sparse <i>Eucalyptus nitida</i>) and a <i>Poa labillardierei</i> and light <i>Pteridium esculentum</i> understorey	Strzelecki Range, Flinders Island	2001	Feral pigs, inappropriate fire regime	National Park	North	1a and b: Surveys, 2a: Subpopulation size, 3a: Feral animal control, provision of suitable fire regime, 7a and b: Collect seed and mycorrhizal fungi
		Deal Island	2004	Inappropriate fire regime, weeds	National Park	North	1a and b: Surveys, 2a: Subpopulation size, 3a: Weed control, provision of suitable fire regime, 7a and b: Collect seed and mycorrhizal fungi
<i>Caladenia pusilla</i> (r/-)	Coastal and near-coastal areas up to 200 m elevation in heathland, shrubland, woodland and open eucalypt forest on sandy loam, sandy peat, granite gravel and rocky ground; can occur in quite poorly-drained sites but is most frequent on well-drained soils	West Point Road	2007	Inappropriate fire regime	Conservation Area	Cradle Coast	1a and b: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime,
		South of Rebecca Creek	2007	Inappropriate fire regime	Conservation Area	Cradle Coast	1a and b: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 7a and b: Collect seed and mycorrhizal fungi
		Counsel Hill, King Island	2007	Inappropriate fire regime	Conservation Area	Cradle Coast	1a and b: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime,

Species/status	Habitat	Priority populations	Last seen	Threats	Tenure	NRM	Recovery actions relevant to subpopulation
<i>Caladenia saggicola</i> (e/CR) end	<i>Eucalyptus viminalis</i> woodland with a ground layer dominated by <i>Lomandra longifolia</i> on well-drained, grey sandy loams; also <i>Allocasuarina verticillata</i> and <i>Eucalyptus viminalis</i> woodland on yellow to grey sandy loams over sandstone	Milford	2012	Woody weeds, rabbits, inappropriate fire regime	Private	South	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Fencing, weed control, provision of suitable fire regime, 3c: Conservation covenant, 3d: Management planning
		Parnella	2012	Clearance, small population size	Public Reserve	South	1a: Surveys, 2a: Subpopulation size, 3d: Management planning
<i>Caladenia sylvicola</i> (e/CR) end	Heathy <i>Eucalyptus tenuiramis</i> forest on a highly insulated hillside and also in open damp <i>Eucalyptus obliqua</i> forest on a moist, south-facing slope, both with well-drained gravelly loam overlying mudstone; elevation range 160 to 240 m	Waterworks Reserve	2009	Small population size	Council Reserve	South	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
<i>Caladenia tonellii</i> (e/CR) end	<i>Eucalyptus amygdalina</i> dominated forest with a shrubby understorey on shallow clay loam and shallow gravelly loam over clay; topography varies from flats to slopes up to about 80 m elevation	Henry Somerset	2011	Inappropriate fire regime, weeds	Private Sanctuary	Cradle Coast	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Provision of suitable fire regime, weed control, 3d: Management planning
<i>Calochilus campestris</i> (e/-)	Habitat in Tasmania poorly understood; on mainland Australia, occurs on ridges and slopes in forest and woodland and can also be found in coastal heath and headlands (&	Clarke Island	1979	Inappropriate fire regime, clearance	Aboriginal Land Council of Tasmania	North	1a and b: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi

Species/status	Habitat	Priority populations	Last seen	Threats	Tenure	NRM	Recovery actions relevant to subpopulation
	known to colonise embankments and road verges)						
<i>Chiloglottis trapeziformis</i> (e/-)	Teatree and sheoak scrub on sandy humus overlying granite, dry open eucalypt forest and on moderately drained soils in relatively dense shrubby eucalypt forest	West Wynyard	2010	Clearance, small population size	Council Reserve	Cradle Coast	1a and 1b: Surveys, 2a: Subpopulation size, 3a: Fencing, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
		Sawyers Bay Road, Flinders Island	2002	Inappropriate fire regime, small population size	State Reserve	North	1a and 1b: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning
<i>Corunastylis brachystachya</i> (e/EN) end	Near-coastal lowland habitats (generally below 50 m elevation) in heathland and heathy woodland among low shrubs, boulders and rock plates on well-drained soils	Arthur-Pieman meta-population	2011	None identified	Conservation Area	Cradle Coast	1a and 1b: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 7a and b: Collect seed and mycorrhizal fungi
<i>Corunastylis firthii</i> (e/CR) end	Recorded on an almost bare roadside strip on sandy soil and in the Friendly Beaches area, it was found in tall open <i>Banksia</i> shrubland with heathy and sedgy ground cover, growing on a well-drained rise in sand derived from granite	Coles Bay	1999	Small population size	Council	South	1a and 1b: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 7a and b: Collect seed and mycorrhizal fungi
		Friendly Beaches	1973	Inappropriate fire regime	National Park	South	1a and b: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Provision of suitable fire regime
<i>Corunastylis morrisii</i> (e/-)	Buttongrass moorland and sedgy open eucalypt woodland on moderately-drained sites in near-coastal areas, including raised clay pans in poorly drained peaty sedgeland	Coles Bay	2013	Inappropriate fire regime, track proliferation	Public Reserve	South	1a: Surveys, 2a: Subpopulation size, 3a: Signage, provision of suitable fire regime, 3d: Management planning; 7a and b: Collect seed and mycorrhizal fungi
		Kellevie	2011	Clearance, inappropriate fire regime	Private	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi

Species/status	Habitat	Priority populations	Last seen	Threats	Tenure	NRM	Recovery actions relevant to subpopulation
<i>Corunastylis nuda</i> (r/-)	Scrub, subalpine grassland, heathy open forest, open rock plates among forest, shrubby dry sclerophyll forest and open wet sclerophyll forest, from near sea level to 1000 m elevation on a range of different soil types and parent geologies	Wielangta	2011	Clearance, inappropriate fire regime	State Forest	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
		Old Farm Road	2011	Clearance, weeds	Private	South	1a: Surveys, 2a: Subpopulation size, 3a: Weed control, 3c: Conservation covenant, 3d: Management planning
		Egan Creek, Stacks Bluff	2011	Clearance	State Forest	North	1a: Surveys, 2a: Subpopulation size, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
<i>Corunastylis nudiscapa</i> (e/-) end	Open forests and woodlands dominated by <i>Eucalyptus tenuiramis</i> and occasionally <i>Eucalyptus obliqua</i> or <i>Eucalyptus amygdalina</i> , with a heathy ground layer of varying density; substrate mostly Permian mudstones	Huon Road, South Hobart	2013	Weeds, track proliferation	Private/Council Reserve	South	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Weed control, signage, 3c: Conservation covenant, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
		Old Farm Road, South Hobart	2011	Track proliferation	Private	South	1a: Surveys, 2a: Subpopulation size, 3c: Conservation covenant, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
		Manuka Hills, Oyster Cove	2012	Tracks, clearance	Private/Council Reserve	South	1a: Surveys, 2a: Subpopulation size, 3a: Signage, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
<i>Corybas jordhamii</i> (e/-)	Grows in association with <i>Melaleuca squarrosa</i> at the only known site in Tasmania. Occurs in naturally clear areas at the edges of runnels and where vegetation is kept short by browsing.	Darling Range	2009	Inappropriate fire regime	Conservation Area	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
<i>Cryptostylis leptochila</i> (e/-)	Open eucalypt forest with a paperbark and tea-tree shrubby understorey and in heathland on clay loams	Memana Road, Leventhorpe	2001	Inappropriate fire regime	Conservation Area	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 7a and b: Collect seed and mycorrhizal fungi
		Logan Lagoon	2000	Clearance, inappropriate fire regime	Private	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning
		Furneaux Pistol Club	1994	Clearance, inappropriate fire regime	Private	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning

Species/status	Habitat	Priority populations	Last seen	Threats	Tenure	NRM	Recovery actions relevant to subpopulation
<i>Cyrtostylis robusta</i> (e/-)	Coastal or near-coastal sites in forest and heathland on well-drained soils; sometimes a strong correlation with sheoaks on coastal dolerite cliffs	West Head	1996	Inappropriate fire regime	National Park	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning
		Bellingham	2008	Subdivision	Crown Land	North	1a: Surveys, 2a: Subpopulation size, 3d: Management planning
		Red Bluff Point, Flinders Island	2010	Inappropriate fire regime	Conservation Area	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime
		Trousers Point	2010	Inappropriate fire regime	National Park	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime
		Cape Desclacs	2009	None identified	Conservation Area	South	1a: Surveys, 2a: Subpopulation size
		Goat Bluff	2009	None identified	Nature Recreation Area	South	1a: Surveys, 2a: Subpopulation size
		Coningham	2009	Inappropriate fire regime	Conservation Area	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 7a and b: Collect seed and mycorrhizal fungi
		Bluff Hill Point	2008	Inappropriate fire regime	Conservation Area	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 7a and b: Collect seed and mycorrhizal fungi
		Cowper Point, King Island	2011	Inappropriate fire regime	State Reserve	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime
<i>Diuris lanceolata</i> (e/EN) end	Coastal scrub and windswept coastal grassland and heathland among dwarfed shrubs and sedges on moist to well-drained sandy and clay loam, sometimes on rocky outcrops	South of Rebecca Creek	2010	Inappropriate fire regime	Conservation Area	Cradle Coast	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Provision of suitable fire regime, 7a and b: Collect seed and mycorrhizal fungi
		Anthony Beach	1997	Clearance, inappropriate fire regime	Private	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3c. Conservation covenant, 3d: Management planning
		Nelson Bay	1992	Inappropriate fire regime	Conservation Area	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime
<i>Diuris palustris</i> (e/-)	Near-coastal areas in grassy open eucalypt forest, sedgy grassland or heathland with tea-tree and paperbark on poorly to moderately-	Bluff Hill Point	2010	Vehicular disturbance	Conservation Area	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Signage, 7a and b: Collect seed and mycorrhizal fungi
		Calm Bay	2004	None identified	Conservation Area	Cradle Coast	1a: Surveys, 2a: Subpopulation size
		Possum Banks	2004	Vehicular disturbance	Conservation Area	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Signage

Species/status	Habitat	Priority populations	Last seen	Threats	Tenure	NRM	Recovery actions relevant to subpopulation
	drained sandy peat and loams, usually in sites that are wet in winter	Petal Point	1992	None identified	Conservation Area	North	1a: Surveys, 2a: Subpopulation size
<i>Hydorchis orbicularis</i> (e/-)	Coastal and near-coastal areas in areas subject to periodic inundation such as swamps and depressions: habitat includes herbfield, sedgeland, grassland and heathland on peats and sandy loams. The plant base is usually immersed in water and plants can be wholly submerged in wet years	Tomahawk Recreation Ground	2007	Inappropriate disturbance	Crown	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable disturbance, 7a and b: Collect seed and mycorrhizal fungi
		Long Flat north of Aerodrome Road	2005	Clearance	Private	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable disturbance, 3d: Management planning
		Waterhouse	1993	Inappropriate fire regime	Conservation Area	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime
<i>Microtidium atratum</i> (e/-)	Coastal and near-coastal areas in areas subject to periodic inundation such as swamps and depressions: habitat includes herbfield, sedgeland, grassland and heathland on peats and sandy loams; the plant base is usually immersed in water and plants can be wholly submerged in wet years; it has also been recorded from roadside drains and winter-wet pastures	Bluff Hill Road	2008	Inappropriate fire regime	Conservation Area	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 7a and b: Collect seed and mycorrhizal fungi
		Black Bull Scrub	2007	Inappropriate fire regime	Conservation Area	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime
		Round Hill	2004	Inappropriate fire regime	Conservation Area	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime
		Sloop Lagoon	2004	Inappropriate fire regime	Conservation Area	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime
<i>Nematoceras dienemum</i> (v/CR) end	Restricted to Macquarie Island where it grows in mire vegetation in flat low-lying areas of peat	Macquarie Island	2009	Small population size	Nature Reserve	South	1a and 1b: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 7a and 7b: Collect seed and mycorrhizal fungi

Species/status	Habitat	Priority populations	Last seen	Threats	Tenure	NRM	Recovery actions relevant to subpopulation
	subject to water-logging; vegetation dominated by sedges, small herbs, cushion plants and bryophytes; may also occur on the boundary of mire and herbfield, where it grows beneath the megaherb <i>Stilbocarpa polaris</i>						
<i>Nematoceras sulcatum</i> (c/CR) end	Restricted to Macquarie Island where it grows in wet grassy seepage areas beside drainage lines; vegetation consists of short herbfield-grassland with a mixture of bryophytes; the water table is close to the surface at known sites	Macquarie Island	2011	Small population size	Nature Reserve	South	1a and 1b: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 7a and 7b: Collect seed and mycorrhizal fungi
<i>Orthoceras strictum</i> (r/-)	Coastal and near-coastal areas in a wide range of habitat types including buttongrass moorland, sedgy and scrubby heathland, sedgy eucalypt shrubland and open forest, usually on poorly to moderately drained peaty, sandy and clay soils that are at least seasonally moist; it can also occur on thin mossy soils at soaks on and below rock faces	Memana Road, Flinders Island	1993	Inappropriate fire regime	Conservation Area	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime
		Blue Lake	2007	Clearance, cattle grazing	Private	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable grazing regime, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
		Apsley Link Road	2008	Inappropriate fire regime	Forest Reserve	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 7a and b: Collect seed and mycorrhizal fungi
		Sleepy Bay	1992	Inappropriate fire regime	National Park	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime
		Cooks Beach	2006	Inappropriate fire regime	National Park	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime
		Irby Flats, Sisters Beach	1991	Inappropriate fire regime	National Park	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime,

Species/status	Habitat	Priority populations	Last seen	Threats	Tenure	NRM	Recovery actions relevant to subpopulation
		Mt Read Road	2003	Inappropriate fire regime	State Forest	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime
<i>Prasophyllum amoenum</i> (v/EN) end	Buttongrass moorland habitat on damp stony loam; in and near cushion plants in alpine moorland	Snug Tiers	2011	Inappropriate fire regime; 4WD disturbance	Nature Recreation Area	South	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Provision of suitable fire regime, signage, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
		Mt Wellington	2013	Climate change	Wellington Park	South	1a: Surveys, 2a: Subpopulation size, 7a and b: Collect seed and mycorrhizal fungi
<i>Prasophyllum apoxychilum</i> (v/EN) end	Coastal heathland or grassy and scrubby open eucalypt forest on sandy and clay loams, often among rocks; occurs at a range of elevations and seems to be strongly associated with dolerite in the east/southeast of its range	Tree Point Heaths	2008	Inappropriate fire regime	Private	North	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Provision of suitable fire regime,, 3c: Conservation covenant, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
		Cape Labillardiere	2010	Inappropriate fire regime	National Park	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning
		Murdunna	1996	Inappropriate fire regime	State Forest	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning
<i>Prasophyllum atratum</i> (e/EN) end	Sedgy heathland on grey sandy loam beside an airstrip; single known population	Three Hummock Island	2010	Air strip maintenance, inappropriate fire regime	State Reserve	Cradle Coast	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Provision of suitable fire regime, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
<i>Prasophyllum castaneum</i> (e/CR) end	Coastal areas in damp shrubby and sedgy heath on sandy loam or skeletal rocky soils; subject to exposure by strong sea winds	Labillardiere Peninsula	1995	Inappropriate fire regime	National Park	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning
		Mt Brown, Tasman Peninsula	2000	Small population size	National Park	South	1a: Surveys, 2a: Subpopulation size, 3d: Management planning
		Ellerway Valley, Tasman Peninsula	2010	Small population size, inappropriate fire regime	National Park	South	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Provision of suitable fire regime, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
<i>Prasophyllum crebriflorum</i>	Montane tussock grassland dominated by	Surrey Hills (3 sites)	2013	Inappropriate fire regime, clearance	Private*	Cradle Coast	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Provision of suitable fire regime, 3c: Covenant

Species/status	Habitat	Priority populations	Last seen	Threats	Tenure	NRM	Recovery actions relevant to subpopulation
(e/EN) end	<i>Poa labillardieri</i> , with scattered patches of the woody shrub <i>Hakea microcarpa</i> ; native grassland dominated by <i>Poa gunnii</i> and grassy woodland with a sparse overstorey of <i>Eucalyptus gunnii</i>						compliance, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
		St Patricks Plains north of Wihareja Lagoon	2009	Inappropriate fire regime, clearance	Private	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3c: Conservation covenant, 3d: Management planning
		Knole Plains	2011	Inappropriate fire regime, clearance	State Forest & private	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
		Lake Echo	2010	Over-grazing by stock, clearance	Private*	South	1a: Surveys, 2a: Subpopulation size, 3a: Suitable grazing regime, 3c: Covenant compliance, 3d: Management planning
<i>Prasophyllum favonium</i> (e/CR) end	Windswept dense low heathland on moderately drained dark grey to black sandy peaty loams	Arthur-Pieman meta-population	2010	Inappropriate fire regime	Conservation Area	Cradle Coast	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Provision of suitable fire regime, 7a and b: Collect seed and mycorrhizal fungi
<i>Prasophyllum incorrectum</i> (e/CR) end	Damp native grassland and grassy eucalypt and banksia woodland on sandy loam	Campbell Town Golf Course	2012	Inappropriate slashing & fire regimes, weed invasion	Private*	North	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Weed control, provision of suitable slashing and fire regimes, 3c: Covenant compliance, 3d: Management planning
		Wanstead	1999	Small population size, stock levels	Private	North	1a: Surveys, 2a: Subpopulation size, 3a: Suitable grazing regime, 3c: Conservation covenant, 3d: Management planning
		Buffalo Plains	2005	Small population size, stock levels	Private*	North	1a: Surveys, 2a: Subpopulation size, 3a: Suitable grazing regime, 3c: Covenant compliance, 3d: Management planning
<i>Prasophyllum limnetes</i> (e/CR) end	Ecotone between low-lying marshy heath/sedgeland dominated by rushes and sedges with scattered patches of <i>Lomandra longifolia</i> and <i>Themeda triandra</i> , and coastal <i>Eucalyptus amygdalina</i> woodland with a heathy/grassy understorey; single known population	Rubicon Sanctuary	2012	Small population size, inappropriate fire regime	Private*	Cradle Coast	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Provision of suitable fire regime, 3c: Covenant compliance, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi

Species/status	Habitat	Priority populations	Last seen	Threats	Tenure	NRM	Recovery actions relevant to subpopulation
<i>Prasophyllum milfordense</i> (e/CR) end	<i>Eucalyptus viminalis</i> woodland with sagg-dominated ground layer on well-drained, grey sandy loams; single known population	Milford	2012	Clearance, weeds, inappropriate fire regime, rabbits	Private	South	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Weed control, fencing, rabbit control, provision of suitable fire regime, 3c: Conservation covenant, 3d: Management planning, 7a and b: Collect mycorrhizal fungi
<i>Prasophyllum olidum</i> (e/CR) end	Native grassland 'roughs' at Campbell Town Golf Course, growing in relatively damp conditions on sandy loam; single known population	Campbell Town Golf Club	2012	Inappropriate slashing & fire regimes, weed invasion, small population size	Private*	North	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Weed control provision of suitable slashing and fire regimes, 3c: Covenant compliance, 3d: Management planning
<i>Prasophyllum perangustum</i> (e/CR) end	Grassy <i>Eucalyptus pulchella</i> forest on well-drained clay loam and skeletal clay loam derived from dolerite; single known population in the foothills of Mt Wellington at an altitude of about 350 m	Knocklofty	2009	Small population size, weeds	Council Reserve	South	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Weed control, 7a and b: Collect seed and mycorrhizal fungi
<i>Prasophyllum pulchellum</i> (e/CR) end	Dense low sedgy heath with pockets of paperbark or tea-tree on poorly to moderately-drained sandy or peaty loam; widely scattered coastal and near-coastal sites in the north, northwest and southeast	South of Rebecca Creek	2010	Inappropriate fire regime	Conservation Area	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 7a and 7b: Collect seed and mycorrhizal fungi
		Rubicon Sanctuary	2011	Inappropriate fire regime	Private*	Cradle Coast	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Provision of suitable fire regime, 3c: Covenant compliance, 3d: Management planning
		Road to Bluff Hill Point	2010	Inappropriate fire regime	Conservation Area	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 7a and 7b: Collect seed and mycorrhizal fungi
<i>Prasophyllum robustum</i> (e/CR) end	Grassy and shrubby <i>Eucalyptus amygdalina</i> forest on well-drained brown loam derived from basalt	Dooleys Hill, Latrobe	2008	Small population size, inappropriate fire regime, clearance	Private	Cradle Coast	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Fencing, provision of suitable fire regime, 3d: Management planning

Species/status	Habitat	Priority populations	Last seen	Threats	Tenure	NRM	Recovery actions relevant to subpopulation
<i>Prasophyllum secutum</i> (e/EN) end	Dense coastal scrub in the swales of stabilised sand dunes on white to grey sands and sandy loam; the species has only ever been detected in the first few flowering seasons after high intensity summer fires	Logan Lagoon	1992	Small population size, inappropriate fire regime	Conservation Area	North	1a and b: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime
		Anthony's Beach	2006	Clearance, inappropriate fire regime	Private	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning
		Robbins Island	2008	Clearance, inappropriate fire regime	Private	Cradle Coast	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Provision of suitable fire regime, 3d: Management planning
<i>Prasophyllum</i> sp. Arthurs Lake (R.Smith DLJ11363) Tas Herbarium (e/-)	Ecotone between wet grassland and eucalypt woodland on moraines; grows in black loams c. 700 m in altitude	Woods Lake	1993	Inappropriate fire regime, fire	State Forest	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning
		Mt Roland	1983	Inappropriate fire regime	Regional Reserve	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 7a and b: Collect seed and mycorrhizal fungi
		Racecourse Plain	2000	Inappropriate fire regime	Private*	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3c: Covenant compliance, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
<i>Prasophyllum stellatum</i> (e/CR) end	<i>Eucalyptus delegatensis</i> forest (with <i>Eucalyptus dalrympleana</i> as a minor canopy component), with a shrubby to grassy understorey; most sites have a relatively high surface rock cover with deep clay-loam soils; elevation range 555 to 960 m	Cluan Tiers	2013	Inappropriate fire regime	State Forest	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
		Storeys Creek	2013	Inappropriate fire regime	State Forest	North	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Provision of suitable fire regime, 3d: Management planning
<i>Prasophyllum tadgellianum</i> (r/-)	Subalpine grassland and grassy woodland on well-drained loam, often in moist places near streams and bogs	Vale of Belvoir	2009	Inappropriate fire regime	Private*	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3c: Covenant compliance, 3d: Management planning
		Skullbone Plains	2012	Inappropriate fire regime	Private*	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3c: Covenant compliance, 3d: Management planning
<i>Prasophyllum taphanyx</i> (e/CR) end	Native grassland on well-drained basaltic	Campbell Town Cemetery	2012	Grave construction, inappropriate management (timing of slashing)	Private	North	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Signage, provision of suitable slashing regime, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi

Species/status	Habitat	Priority populations	Last seen	Threats	Tenure	NRM	Recovery actions relevant to subpopulation
	soils; single known population						
<i>Prasophyllum tunbridgense</i> (e/EN) end	Native grassland on well-drained loams derived from basalt	Wetmore	2007	Inappropriate grazing regime	Private*	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable grazing regime, 3c: Covenant compliance, 3d: Management planning
		Township Lagoon	2012	Inappropriate fire regime, weeds	Nature Reserve	South	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Provision of suitable fire regime, weed control, 7b: Collect mycorrhizal fungi
<i>Pterostylis atriola</i> (r/-) end	Dry to damp sclerophyll forest on generally stony soils, typically with an open understorey; the species occurs at a range of elevations but is most strongly associated with 'winter-cold' sites (e.g. Snug Tiers) or areas receiving a moderately consistent rainfall (e.g. Wielangta, Railton)	Mount Montgomery	2009	Track disturbance, small population size	State Reserve	North	1a: Surveys, 2a: Subpopulation size, 3a: Signage, 7a and b: Collect seed and mycorrhizal fungi
		Snug Tiers	2009	Track disturbance (minor)	Nature Recreation Area	South	1a: Surveys, 2a: Subpopulation size, 3a: Signage, 7a and b: Collect seed and mycorrhizal fungi
		Bluff River	2009	Inappropriate disturbance	State Forest	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable disturbance, 3d: Management planning,
		Wielangta	2008	Inappropriate disturbance	State Forest	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable disturbance, 3d: Management planning,
		Railton	2008	Forestry operations?	State Forest	North	1a: Surveys, 2a: Subpopulation size, 3a: Signage, Provision of suitable disturbance, 3d: Management planning,
<i>Pterostylis commutata</i> (e/CR) end	Native grassland and <i>Eucalyptus pauciflora</i> grassy woodland on well-drained sandy soils and basalt loams; occurs in small, loose colonies	Township Lagoon	2012	Inappropriate fire, weeds	Nature Reserve	South	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Provision of suitable fire regime, weed control, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
		Ross Cemetery	2010	Inappropriate slashing regime, grave construction	Private	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable slashing regime, 3d: Management planning
		Charlton	2002	Grazing, clearance	Private	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable grazing regime, 3d: Management planning
		Upper Kelvin Grove	2011	Grazing, clearance	Private	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable grazing regime, 3d: Management planning
		Nile	2000	Grazing, clearance	Private	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable grazing regime, 3d: Management planning
		Tunbridge Tier Road	2010	Roadside maintenance	Council	North	1a: Surveys, 2a: Subpopulation size, 3a: Signage, provision of suitable slashing regime, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi

Species/status	Habitat	Priority populations	Last seen	Threats	Tenure	NRM	Recovery actions relevant to subpopulation
<i>Pterostylis cucullata</i> subsp. <i>cucullata</i> (e/VU)	Calcareous dunes and sand-sheets in near-coastal areas, within closed scrubs dominated by either <i>Leptospermum laevigatum</i> or <i>Beyeria lechenaultii</i> var. <i>latifolia</i> ; sites are typically sheltered, facing south or south-easterly to westerly, with seasonally damp but well-drained humus-rich sandy loams, often with moss and deep leaf litter	Possum Banks	2010	Dune destabilisation, inappropriate fire regime	Conservation Area	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, erosion control, 7a and b: Collect seed and mycorrhizal fungi
		Yellow Rock, King Island	2010	Clearance, cattle grazing	Private	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Fencing, suitable grazing regime, 3c: Conservation covenant, 3d: Management planning
		Cape Wickham, King Island	2007	Clearance, cattle grazing	Private	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Fencing, suitable grazing regime, provision of suitable disturbance, 3c: Conservation covenant, 3d: Management planning
		Three Hummock Island	2008	Inappropriate fire regime	State Reserve	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime
		Hunter Island	2009	Inappropriate fire, cattle grazing	Conservation Area	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire and grazing regimes
		Palana Road, Flinders Island	2008	Small population size, inappropriate fire regime, clearance	Private	North	1a: Surveys, 2a: Subpopulation size, 3a: Fencing, provision of suitable fire regime, 3c: Conservation covenant, 3d: Management planning
<i>Pterostylis falcata</i> (e/-)	Moist areas such as swamps, depressions and stream banks in heavy moist to wet clay and peat	Exeter	1972	Clearance, inappropriate fire regime	Private	North	1a: Surveys, 2a: Subpopulation size, 3a: Fencing, provision of suitable fire regime, 3c: Conservation covenant, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
<i>Pterostylis grandiflora</i> (r/-)	Heathy and shrubby open eucalypt forests and in grassy coastal sheoak woodland on moderately to well-drained sandy and loamy soils; most often associated with moist shaded sites, and can be absent from sites after fire until the understorey has become well established	Mt Cameron	2011	Inappropriate fire regime	Regional Reserve	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 7a and b: Collect seed and mycorrhizal fungi
		Mt Allen	2007	Inappropriate fire regime	Private*	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3c: Covenant compliance, 3d: Management planning
		Coles Bay	2004	Inappropriate fire regime	Conservation Area	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime
		Fisheries	2007	Inappropriate fire regime	National Park	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 7a and b: Collect seed and mycorrhizal fungi

Species/status	Habitat	Priority populations	Last seen	Threats	Tenure	NRM	Recovery actions relevant to subpopulation
<i>Pterostylis lustra</i> (e/-)	Swampy areas under dense teatree thickets	Preminghana	2007	None identified	Aboriginal Land Council of Tasmania	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 7a and b: Collect seed and mycorrhizal fungi
		Tiger Flats, Arthur-Pieman	2005	Inappropriate fire regime	Conservation Area	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime
<i>Pterostylis pratensis</i> (v/VU) end	Subalpine <i>Poa labillardierei</i> tussock grassland with patches of often stunted <i>Olearia algida</i> and <i>Hakea microcarpa</i> scrub on red-brown loamy to clay soils derived from basalt; grows in very exposed conditions at altitude of 850 to 1100 m above sea level	Liawenee Moor	2010	Grazing levels, clearance	Private	South	1a: Surveys, 2a: Subpopulation size, 3a: Fencing, suitable grazing regime, provision of suitable disturbance, 3c. Conservation covenant, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
		St Patricks Plains	2010	Grazing levels, clearance	Private	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable grazing regime, provision of suitable disturbance, 3c. Conservation covenant, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
		Lake Echo	2010	Grazing levels, clearance	Private*	South	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Provision of suitable grazing regime, provision of suitable disturbance, 3c: Covenant compliance, 3d: Management planning
<i>Pterostylis rubenachii</i> (e/EN) end	Dry sandy slopes of sparsely vegetated stabilised sand dunes, and also in permanently wet to moist scrubby and sedgy coastal heath converted to semi-improved pasture by regular slashing	Tiger Flats - Bullocky Hills - Prickly Wattle Lagoon	2012	Inappropriate fire regimes (loss of habitat through native scrub invasion)	Conservation Area	Cradle Coast	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Provision of suitable fire regime, 3d: Management planning
		Bluff Hill Point	2011	Vehicle disturbance	Conservation Area	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Signage, 3d: Management planning
<i>Pterostylis sanguinea</i> (r/-)	Coastal eucalypt and sheoak woodland, teatree scrub and scrubby heathland on well-drained gravelly peat and sandy & clay loams	Lady Barron, Flinders Island	2010	Inappropriate fire regime, habitat loss, weeds	Crown land	North	1a: Surveys, 2a: Subpopulation size, 3a: Weed control, provision of suitable fire regime, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
		Cape Barren Island	2007	Inappropriate fire regime	Aboriginal Land Council of Tasmania	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning
		Stockyard Creek,	1993	Inappropriate fire regime	Conservation Area	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime

Species/status	Habitat	Priority populations	Last seen	Threats	Tenure	NRM	Recovery actions relevant to subpopulation
		Flinders Island					
<i>Pterostylis squamata</i> (v/-)	Heathy and grassy open eucalypt forest, woodland and heathland on well-drained sandy and loamy soils; so far recorded only in lowland areas	Boronia Hill	2009	Inappropriate disturbance fire regime, trampling by walkers	Council Reserve	South	1a: Surveys, 2a: Subpopulation size, 3a: Signage, provision of suitable fire regime, 3d: Management planning
		Snug Point	2010	Inappropriate fire regime	Nature Recreation Area	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
		Coles Bay	1992	Inappropriate fire regime	Public Reserve	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning
		Rajah Rock	2012	None identified	Regional Reserve	North	1a: Surveys, 2a: Subpopulation size
		Vaocluse	1993	Inappropriate fire regime, weeds	Private*	North	1a: Surveys, 2a: Subpopulation size, 3a: Weed control, provision of suitable fire regime, 3c: Covenant compliance, 3d: Management planning
<i>Pterostylis tunstallii</i> (r/-)	Open forest and woodland, often in accumulated litter, on granite-derived gravelly and loamy soils	Strzelecki	2010	Inappropriate fire regime, trampling by walkers (minor)	National Park	North	1a: Surveys, 2a: Subpopulation size, 3a: Signage, provision of suitable fire regime, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
		Vinegar Hill	2010	Clearance, inappropriate fire regime	Private	North	1a: Surveys, 2a: Subpopulation size, 3a: Signage, provision of suitable fire regime, 3d: Management planning
		Great Dog Island	1992	Inappropriate fire regime	Aboriginal Land Council of Tasmania	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning
<i>Pterostylis wapstrorum</i> (e/CR) end	Native grassland and grassy woodland (<i>Eucalyptus pauciflora</i> and <i>Eucalyptus viminalis</i>) on basalt and dolerite soils	Pontville	2007	Inappropriate fire and grazing regimes, weeds	Commonwealth	South	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Provision of suitable fire and grazing regimes, weed control, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
		Wetmore	2008	Inappropriate grazing regime	Private	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable grazing regime, 3c: Conservation covenant, 3d: Management planning
		Bothwell	2009	Clearance, inappropriate grazing regime	Private	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable grazing regime, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
		Quoin Ridge	2008	Clearance, inappropriate grazing regime	Private	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable grazing regime, 3d: Management planning

Species/status	Habitat	Priority populations	Last seen	Threats	Tenure	NRM	Recovery actions relevant to subpopulation
<i>Pterostylis siegeleri</i> (v/VU) end	Slopes of low stabilised sand dunes and in grassy dune swales in coastal areas, while in the Midlands it grows in native grassland or grassy woodland on well-drained clay loams derived from basalt	Brighton	2009	Inappropriate fire and grazing regimes, weeds	Private	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire and grazing regimes, weed control, 3d: Management planning
		Pontville	2011	Inappropriate fire and grazing regimes, red-legged earth mite	Commonwealth	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire and grazing regime, weed and pest control, 3d: Management planning
		Merton Vale – Fosterville	2010	Inappropriate grazing regime, weeds, red-legged earth mite	Private	North	1a: Surveys, 2a: Subpopulation size, 3a: Suitable grazing regime, weed and pest control, provision of suitable disturbance, 3c: Conservation covenant, 3d: Management planning
		Campbell Town Golf Course	2012	Inappropriate slashing and fire regimes, weeds	Private*	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable slashing and fire regimes, weed control, 3c: Covenant compliance, 3d: Management planning
		Swan River Road	2009	Clearance, sand quarry, inappropriate fire regime	Private	South	1a: Surveys, 2a: Subpopulation size, 3a: Fencing, signage, provision of suitable fire regime, 3d: Management planning
		Nettley Bay	2011	Inappropriate fire regime	Conservation Area	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning
<i>Thelymitra antennifera</i> (e/-)	Near-coastal heathland on poorly to moderately-drained peaty and sandy soils, sometimes in mossy skeletal soils on granite bedrock	Tree Point Heaths, Cape Portland	2009	Clearance, inappropriate fire regime	Private	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3c: Conservation covenant, 3d: Management planning
		Narawntapu	2008	Inappropriate fire regime	National Park	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 7a and b: Collect seed and mycorrhizal fungi
<i>Thelymitra atronitida</i> (e/-)	Near-coastal heathland, sedgeland and open heathy/sedgy eucalypt woodland on well-drained sandy loams	Coles Bay	2012	Inappropriate fire regime	Public Reserve	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning
		Denison Street, Kingston	2012	Inappropriate fire regime, weeds	Council Reserve	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, weed control, 7a and b: Collect seed and mycorrhizal fungi
		Hawthorn Drive, Kingston	2012	Inappropriate fire and slashing regimes, weeds	Council Reserve	South	1a: Surveys, 2a: Subpopulation size, 3a: Signage, provision of suitable slashing and fire regimes, weed control, 3c: Conservation covenant, 3d: Management planning
<i>Thelymitra benthamiana</i> (e/-)	Slopes and hill tops associated with areas of heathy eucalypt woodland, open heathy/scrubby vegetation, bare ground	Mulligans Hill, Flinders Island	2005	Clearance, inappropriate fire regime	Private	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable disturbance, 3c: Conservation covenant, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
		Centre Hill, Flinders Island	2005	Clearance, inappropriate fire and grazing regimes	Private	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire and grazing regimes, 3c: Conservation covenant, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi

Species/status	Habitat	Priority populations	Last seen	Threats	Tenure	NRM	Recovery actions relevant to subpopulation
	and exposed sedimentary rock	Melrose Road	2001	Clearance, inappropriate fire regimes	Private	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3c: Conservation covenant, 3d: Management planning
<i>Thelymitra bracteata</i> (e/-)	Open grassy and heathy forest/woodland on sedimentary substrates such as mudstone and sandstone	Rosny Hill	2009	Inappropriate fire regime, weeds	Nature Recreation Area	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, weed control, 7a and b: Collect seed and mycorrhizal fungi
		Coningham	2004	Clearance, inappropriate fire regime	Private	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning
<i>Thelymitra holmesii</i> (r/-)	Moist areas of grassland, heathy open forest and heathland in water-retentive soils such as clay loam and peaty loam, in soaks, beside streams and around swamp margins, usually below about 200 m elevation	Rubicon Sanctuary	2011	Small population size, inappropriate fire regime	Private*	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3c: Covenant compliance, 3d: Management planning, 7b: Collect mycorrhizal fungi
		Coles Bay	2003	Inappropriate fire regime	Public Reserve	North	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime
		Leprena Track	2006	Inappropriate fire regime	State Forest	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime
		Lavinia Plains	2009	Inappropriate fire regime	State Reserve	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime
<i>Thelymitra jonesii</i> (e/EN) end	Moist coastal heath on sandy to peaty soils and <i>Eucalyptus obliqua</i> forest in deep loam soils over dolerite	Pirates Road	2002	Inappropriate fire regime, small population size	State Forest	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning
		Masons Point	1996	Inappropriate fire regime, small population size	Crown Land	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime
		Schouten Island	2005	None identified	National Park	South	1a and b: Surveys, 2a: Subpopulation size
		Cape Portland	2008	Clearance, inappropriate fire regime, small population size	Private	North	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Provision of suitable fire regime, 3c: Conservation covenant, 3d: Management planning
<i>Thelymitra malvina</i> (e/-)	Coastal heath and sedgeland on sandy loams or clay loams	Coles Bay	2008	Inappropriate fire regime	Public Reserve	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
		Sisters Beach	2009	Inappropriate slashing or fire regime	Council Reserve	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable slashing or fire regime, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi
		Coles Bay (west)	2008	Inappropriate fire regime	Conservation Area	South	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning

Species/status	Habitat	Priority populations	Last seen	Threats	Tenure	NRM	Recovery actions relevant to subpopulation
		Rocky Cape – Leearcher Cave area	2008	Inappropriate fire regime	National Park	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, 3d: Management planning
<i>Thelymitra mucida</i> (r/-)	Winter-wet sedgy heathlands and woodlands in near-coastal sites	Callaghans Scrub	2010	Inappropriate fire regime, vehicular disturbance	Conservation Area	Cradle Coast	1a: Surveys, 2a: Subpopulation size, 3a: Provision of suitable fire regime, vehicle barriers, 7a and b: Collect seed and mycorrhizal fungi
		Reddins Creek, Flinders Island	1992	Unknown	Private	North	1a and b: Surveys, 2a: Subpopulation size
<i>Thynniorchis huntiana</i> (x/-)	Only known occurrence in Tasmania was in a remnant patch of scrub on soils derived from granite (now presumed extinct)	Bob Smiths Gully, Flinders Island	1972	Presumed extinct	Private	North	1a and b: Surveys, 2a: Subpopulation size, 7a and b: Collect seed and mycorrhizal fungi
<i>Thynniorchis nothofagicola</i> (e/CR) end	Tall open <i>Eucalyptus delegatensis</i> forest with a rainforest understorey of <i>Nothofagus cunninghamii</i> , <i>Atherosperma moschatum</i> and <i>Dicksonia antarctica</i> ; grows in leaf litter; single known site	Needles	2003	Small population size, disturbance by lyre birds	National Park	South	1a: Surveys, 2a and 2b: Subpopulation size & demographic monitoring, 3a: Fencing, pest control, 3d: Management planning, 7a and b: Collect seed and mycorrhizal fungi

APPENDIX 3. Prioritisation schedule of recovery actions for species included in this Plan

Actions for all species or general species: 1c, 3b, 3e, 4b, 4c, 6b, 7c, 9a, 9b, 9c, 9d.

Species	TSP Act	EPBC Act	Endemic	Original RP	1a. Presence-absence surveys	1b. Extension surveys	1d. Listing statement (LS)	2a. Monitoring	2b. Demographics	3a. Critical management actions	3c. Conservation covenants (CC) and compliance assessment (CA)	3d. Management planning
<i>Caladenia anthracina</i>	e	CR	end		Medium	Medium	High (2001, revision required)	High	Medium	High	High (CC & CA)	High
<i>Caladenia aurantiaca</i>	e				Medium	High	n.a. (2013)	High		High		High
<i>Caladenia australis</i>	e				Low	Low	n.a. (2013)	High *				
<i>Caladenia brachyscapa</i>	e	EX			High	High	n.a. (2013)	High *		Low		
<i>Caladenia campbellii</i>	e	CR	end		High	High	n.a. (2013)	High	Medium	High	Medium (CC)	High
<i>Caladenia cardiochila</i>	x				Low	Low	n.a. (2013)	High *				
<i>Caladenia candata</i>	v	VU	end	r under TSP Act	Low	Low	n.a. (2013)	Low	Low	Medium		Medium
<i>Caladenia congesta</i>	e				Low	Low	High (no LS)	Medium		Medium	Medium (CC)	Medium
<i>Caladenia dienema</i>	e	EN	end	CR under EPBC Act	Low	Low	n.a. (2010)	Low	Low	Low		
<i>Caladenia filamentosa</i>	r				Low	Low	High (no LS)	Low		Medium		Medium
<i>Caladenia lindleyana</i>	e	CR	end		High	High	Medium (2001, revision required)	High *	High *		Medium (CC)	Low
<i>Caladenia pallida</i>	e	CR	end		Low	Low	n.a. (2013)	High *	High *	Low		Low
<i>Caladenia patersonii</i>	v				Low	Low	Medium (2001, revision required)	Low		Medium	Medium (CC)	Medium
<i>Caladenia prolata</i>	e				Medium	High	n.a. (2013)	High		High		
<i>Caladenia pusilla</i>	r				Low	Low	Low (no LS)	Low		Low		
<i>Caladenia saggicola</i>	e	CR	end		Medium	Medium	n.a. (2013)	High	Medium	High	High (CC)	High

Species	TSP Act	EPBC Act	Endemic	Original RP	1a. Presence-absence surveys	1b. Extension surveys	1d. Listing statement (LS)	2a. Monitoring	2b. Demographics	3a. Critical management actions	3c. Conservation covenants (CC) and compliance assessment (CA)	3d. Management planning
<i>Caladenia sylvicola</i>	e	CR	end		High	High	n.a. (2010)	High*	Medium*			Low
<i>Caladenia tonellii</i>	e	CR	end		Medium	Medium	n.a. (2010)	High	Medium	High		High
<i>Calochilus campestris</i>	e				Low	Low	n.a. (2010)	Medium		Medium		Medium
<i>Chiloglottis trapeziformis</i>	e				Medium	Medium	n.a. (2013)	High		High		Low
<i>Corunastylis brachystachya</i>	e	EN	end	<i>Genoplesium brachystachyum</i> on EPBC Act	Medium	Medium	n.a. (2011)	Medium	Low			
<i>Corunastylis firthii</i>	e	CR	end	<i>Genoplesium firthii</i> on EPBC Act	Low	Low	Medium (2001, revision required)	Medium (pending taxonomy)	Medium (pending taxonomy)	Low		
<i>Corunastylis morrisii</i>	e				High	High	n.a. (2013)	High		High		Medium
<i>Corunastylis nuda</i>	r				Low	Low	n.a. (2013)	Low		Medium	High (CC)	Medium
<i>Corunastylis nudiscapa</i>	e		end	x on TSP Act	Medium	Medium	n.a. (2013)	High	Medium	High	High (CC)	High
<i>Corybas fordhamii</i>	e			<i>Anzybas fordhamii</i> on TSP Act	High	High	n.a. (2011)	Medium		Medium		Medium
<i>Cryptostylis leptochila</i>	e				Medium	Medium	Medium (2001, revision required)	High		Medium		Medium
<i>Cyrtostylis robusta</i>	r				Low	Low	Low (no LS)	Low		Low		Low
<i>Diuris lanceolata</i>	e	EN	end		Medium	Medium	High (2000, revision required)	Low	Low	Low	Low (CC)	Low
<i>Diuris palustris</i>	e				Low	Low	High (2000, revision required)	Low		Low		

Species	TSP Act	EPBC Act	Endemic	Original RP	1a. Presence-absence surveys	1b. Extension surveys	1d. Listing statement (LS)	2a. Monitoring	2b. Demographics	3a. Critical management actions	3c. Conservation covenants (CC) and compliance assessment (CA)	3d. Management planning
<i>Hydrorchis orbicularis</i>	r				Low	Low	n.a. (2013)	Low		Low		Low
<i>Microtidium atratum</i>	r				Low	Low	n.a. (2013)	Low		Medium		Low
<i>Nematoceras dienemum</i>	v	CR	end	Not listed	High	High	n.a. (2011)	High	Medium	High		
<i>Nematoceras sulcatum</i>	e	CR	end	Not listed	High	High	n.a. (2011)	High	Medium	High		
<i>Orthoceras strictum</i>	r				Low	Low	n.a. (2013)	Low				
<i>Prasophyllum amoenum</i>	v	EN	end		Medium	Medium	n.a. (2013)	Low	Low	Low		Medium
<i>Prasophyllum apoxychilum</i>	v	EN	end		Medium	Medium	n.a. (2013)	High	Medium	High	Medium (CC)	High
<i>Prasophyllum atratum</i>	e	CR	end	Not listed	High	High	n.a. (2010)	High	Medium	High		Medium
<i>Prasophyllum castaneum</i>	e	CR	end		High	High	Medium (200, revision required)	High	Medium	High		Medium
<i>Prasophyllum crebriiflorum</i>	e	EN	end	Not listed	Medium	Medium	High (2010, revision required)	High	Medium	High	Medium (CC & CA)	High
<i>Prasophyllum favonium</i>	e	CR	end		Medium	Medium	High (2000, revision required)	Low	Low	Low		
<i>Prasophyllum incorrectum</i>	e	CR	end	Listed as <i>P. correctum</i>	Medium	Medium	n.a. (2013)	High	Medium	High	High (CA)	High
<i>Prasophyllum limnetes</i>	e	CR	end	Not listed	Medium	Medium	n.a. (2010)	High	Medium	High	High (CA)	High
<i>Prasophyllum milfordense</i>	e	CR	end		Medium	Medium	n.a. (2013)	High	Medium	High	High (CA)	High
<i>Prasophyllum olidum</i>	e	CR	end		Medium	Medium	n.a. (2013)	High	High	High	High (CA)	High
<i>Prasophyllum perangustum</i>	e	CR	end		High	High	Medium (2000, revision required)	Medium	Medium	Medium		

Species	TSP Act	EPBC Act	Endemic	Original RP	1a. Presence-absence surveys	1b. Extension surveys	1d. Listing statement (LS)	2a. Monitoring	2b. Demographics	3a. Critical management actions	3c. Conservation covenants (CC) and compliance assessment (CA)	3d. Management planning
<i>Prasophyllum pulchellum</i>	c	CR	end		Low	Low	n.a. (2013)	Low	Low	Low	Medium (CA)	Low
<i>Prasophyllum robustum</i>	c	CR	end		High	High	Medium (2000, revision required)	Medium	Medium	Medium		Medium
<i>Prasophyllum secutum</i>	c	EN	end		Medium	High	n.a. (2013)	High	Medium	High		High
<i>Prasophyllum</i> sp. Arthurs Lake (R.Smith DLJ11363) Tas Herbarium	c		end		High	High	Medium (2000, revision required)	Medium		Medium	Medium (CA)	Medium
<i>Prasophyllum stellatum</i>	c	CR	end		Medium	Medium	n.a. (2010)	Low	Low	Low		Low
<i>Prasophyllum tadgellianum</i>	r				Low	Low	Medium (2000, revision required)	Low		Low		Low
<i>Prasophyllum taphanox</i>	c	CR	end	Not listed	High	High	n.a. (2010)	High	High	High		High
<i>Prasophyllum tunbridgensae</i>	c	EN	end		Medium	Medium	n.a. (2010)	High	Medium	High	High (CA)	High
<i>Pterostylis atriola</i>	r		end	e on TSP Act	Low	Low	n.a. (2011)	Low		Low		
<i>Pterostylis commutata</i>	c	CR	end		High	High	High (200, revision required)	High	High	High		High
<i>Pterostylis cucullata</i> subsp. <i>cucullata</i>	c	VU			Low	Low	n.a. (2010)	Low		Medium	Low (CC)	Medium
<i>Pterostylis falcata</i>	c				Low	Low	n.a. (2013)	Low		Medium		Medium

Species	TSP Act	EPBC Act	Endemic	Original RP	1a. Presence-absence surveys	1b. Extension surveys	1d. Listing statement (LS)	2a. Monitoring	2b. Demographics	3a. Critical management actions	3c. Conservation covenants (CC) and compliance assessment (CA)	3d. Management planning
<i>Pterostylis grandiflora</i>	r				Low	Low	Medium (2002, revision required)	Low		Medium	Low (CA)	Low
<i>Pterostylis lustra</i>	e				Medium	Medium	n.a. (2013)	Medium		Medium		Medium
<i>Pterostylis pratensis</i>	v	VU	end	r on TSP Act	Low	Low	Low (2008, revision required)	Low	Low	Low	Medium (CC)	Medium
<i>Pterostylis rubenachii</i>	e	EN	end		Medium	Medium	High (2000 revision required)	High	Medium	High		High
<i>Pterostylis sanguinea</i>	r				Low	Low	High (no LS)	Low		Medium		Low
<i>Pterostylis squamata</i>	v				Low	Low	Medium (no LS)	Low		Low	Low (CA)	Low
<i>Pterostylis tunstallii</i>	e				Low	Low	Medium (2000, revision required)	Medium		Low		Low
<i>Pterostylis wapstrarum</i>	e	CR	end		High	High	n.a. (2013)	High	Medium	High	High (CC)	High
<i>Pterostylis zigeleri</i>	v	VU	end		Low	Low	n.a. (2009)	Low		Medium	Medium (CA)	High
<i>Thelymitra antennifera</i>	e				Low	Low	n.a. (2010)	Low		Low	Low (CC)	Low
<i>Thelymitra atronitida</i>	e			Not listed	Medium	Medium	n.a. (2013)	High		High	Medium (CC)	Low
<i>Thelymitra benthamiana</i>	e				High	High	n.a. (2010)	High		Medium	Medium (CC)	Medium
<i>Thelymitra bracteata</i>	e				High	High	n.a. (2010)	Medium		Medium		Low
<i>Thelymitra holmesii</i>	r				Low	Low	n.a. (2011)	Low		Medium	Low (CA)	Medium
<i>Thelymitra jonesii</i>	e	EN	end	CR on EPBC Act	Medium	Medium	High (2002, revision required)	High	Medium	High	Medium (CC)	High
<i>Thelymitra malvina</i>	e				Medium	Medium	n.a. (2013)	High		High		Medium

Species	TSP Act	EPBC Act	Endemic	Original RP	1a. Presence-absence surveys	1b. Extension surveys	1d. Listing statement (LS)	2a. Monitoring	2b. Demographics	3a. Critical management actions	3c. Conservation covenants (CC) and compliance assessment (CA)	3d. Management planning
<i>Thelymitra mucida</i>	r				Low	Low	n.a. (2013)	Medium		Medium		
<i>Thynniorchis buntiana</i>	x			e on TSP Act	Low	Low	n.a. (2011)	Low				
<i>Thynniorchis nothofagicola</i>	e	CR	end		High	High	n.a. (2009)	High	Medium	High		Low
					PPP & DG Refer to Appendix 2 for more details	PPP & DG Refer to Appendix 2 for more details	DG Revision of LS is required after 10 years or if important new information becomes available	PPP & DG Refer to Appendix 2 for which populations this action applies	PPP & DG Refer to Appendix 2 for which populations this action applies	PPP & DG Specific actions identified for each subpopulation in Appendix 2	PPP and DG Refer to Appendix 2 for subpopulations identified for this action	DG Refer to Appendix 2 for subpopulations requiring Management planning

Note: * = if rediscovered; **PP & DG** = priorities from PPP process & discussion group; **DG** = priorities from discussion group;

Listing statement (LS): year of preparation or last revision provided, n.a. = not applicable; Blank cells indicate that the action is not required for that species.

Species	TSP Act	EPBC Act	4a. Taxonomic research	5a. Mycorrhizal research	5b. In situ baiting	5c. Pollinator research	6a. Disturbance trials	7a. Seed collections	7b. Mycorrhizal isolation	8a. Propagation	8b. Translocation feasibility	8c. Translocation
<i>Caladenia anthracina</i>	e	CR	Medium (CC)	High	High	High	High	n.a. (Banked) High (CPop)	n.a. (Banked) High (CPop)	High	Medium	Medium
<i>Caladenia aurantiaca</i>	e							Medium	Medium			
<i>Caladenia australis</i>	e			Low	Low	Low		Low	Low	Low		
<i>Caladenia brachyscapa</i>	e	EX		Low	Low	Low		Low	Low	Low		
<i>Caladenia campbellii</i>	e	CR	Medium (CA)	Low	Low	Low	Low	n.a. (Banked)	n.a. (Banked)			
<i>Caladenia cardiochila</i>	x							Low	Low			
<i>Caladenia candata</i>	v	VU	Medium (CC)	High	High	High	High	n.a. (Banked) High (CPop)	n.a. (Banked) High (CPop)	High		
<i>Caladenia congesta</i>	e							Medium	Medium			
<i>Caladenia dienema</i>	e	EN	Medium (CC)	High	High	High	High	n.a. (Banked) High (CPop)	n.a. (Banked) High (CPop)	High		
<i>Caladenia filamentosa</i>	r							Low	Low			
<i>Caladenia lindleyana</i>	e	CR	Medium (CC)	High *	High *	High *		High *	High *	High *	High *	High *
<i>Caladenia pallida</i>	e	CR		High *	High *	High *		High *	High *	High *	High *	High *
<i>Caladenia patersonii</i>	v		Medium (CC)	High	High	High		n.a. (Banked) High (CPop)	n.a. (Banked) High (CPop)	High		
<i>Caladenia prolata</i>	e							Medium	Medium			
<i>Caladenia pusilla</i>	r							Low	Low			
<i>Caladenia saggicola</i>	e	CR		High	High	High		n.a. (Banked)	n.a. (Banked)		Medium	Medium
<i>Caladenia sylvicola</i>	e	CR						High	High	Low	Low*	Low*
<i>Caladenia tonellii</i>	e	CR	Medium (CA)	High	High			n.a. (Banked)	n.a. (Banked)	Low	Low	Low
<i>Calochilus campestris</i>	e			Low	Low			Medium	Medium	Low		
<i>Chiloglottis trapeziformis</i>	e			Low	Low	High		Low	High	High	Medium	Medium
<i>Corunastylis brachystachya</i>	e	EN		Low	Low			High	High	High		

Species	TSP Act	EPBC Act	4a. Taxonomic research	5a. Mycorrhizal research	5b. In situ baiting	5c. Pollinator research	6a. Disturbance trials	7a. Seed collections	7b. Mycorrhizal isolation	8a. Propagation	8b. Translocation feasibility	8c. Translocation
<i>Corunastylis firthii</i>	e	CR	Low (CFT)					High	High			
<i>Corunastylis morrisii</i>	e							Medium	Medium			
<i>Corunastylis nuda</i>	r							Low	Low			
<i>Corunastylis nudiscapa</i>	e							Medium	Medium			
<i>Corybas fordhamii</i>	e			Low	Low	High		Medium	Medium	High		
<i>Cryptostylis leptochila</i>	e			Low	Low	High		Medium	Medium	High		
<i>Cyrtostylis robusta</i>	r							n.a. (Banked)	Low			
<i>Diuris lanceolata</i>	e	EN		High	High			n.a. (Banked)	High	High		
<i>Diuris palustris</i>	e							Medium	Medium			
<i>Hydrorchis orbicularis</i>	r			High	High			Low	Low	High		
<i>Microtidium atratum</i>	r							Low	Low			
<i>Nematoceras dienemum</i>	v	CR		High	High			High	High			
<i>Nematoceras sulcatum</i>	e	CR						High	High			
<i>Orthoceras strictum</i>	r			Low	Low			Low	Low			
<i>Prasophyllum amoenum</i>	v	EN						High	High			
<i>Prasophyllum apoxychilum</i>	v	EN	High (PT)					High	High			
<i>Prasophyllum atratum</i>	e	CR						High	High			
<i>Prasophyllum castaneum</i>	e	CR						High	High			
<i>Prasophyllum crebriflorum</i>	e	EN	High (PG)					High	High			
<i>Prasophyllum favonium</i>	e	CR						High	High			
<i>Prasophyllum incorrectum</i>	e	CR		High	High		High	n.a. (Banked)	High	High	Medium	Medium
<i>Prasophyllum linnetes</i>	e	CR		High	High			High	High	High		
<i>Prasophyllum milfordense</i>	e	CR		High	High		High	n.a. (Banked)	High		Medium	Medium
<i>Prasophyllum olidum</i>	e	CR		High	High		High	n.a. (Banked)	High	High	High	High
<i>Prasophyllum perangustum</i>	e	CR	High (PT)					High	High			

Species	TSP Act	EPBC Act	4a. Taxonomic research	5a. Mycorrhizal research	5b. In situ baiting	5c. Pollinator research	6a. Disturbance trials	7a. Seed collections	7b. Mycorrhizal isolation	8a. Propagation	8b. Translocation feasibility	8c. Translocation
<i>Prasophyllum pulchellum</i>	e	CR	High (PT)					n.a. (Banked) High (CPop)	n.a. (Banked) High (CPop)			
<i>Prasophyllum robustum</i>	e	CR	High (PT)					High	High			
<i>Prasophyllum secutum</i>	e	EN						High	High			
<i>Prasophyllum</i> sp. Arthurs Lake (R.Smith DLJ11363) Tas Herbarium	e		High (PT)					Medium	Medium			
<i>Prasophyllum stellatum</i>	e	CR	High (PT))					High	High			
<i>Prasophyllum tadgellianum</i>	r		High (PG)					Low	Low			
<i>Prasophyllum taphanyc</i>	e	CR		High	High		High	High	High	High	High	High
<i>Prasophyllum tunbridgense</i>	e	EN		High	High		High	n.a. (Banked)	High	High	Medium	Medium
<i>Pterostylis atriola</i>	r							Low	Low			
<i>Pterostylis commutata</i>	e	CR		High	High		High	High	n.a. (Banked)	High	Medium	Medium
<i>Pterostylis cucullata</i> subsp. <i>cucullata</i>	e	VU					High	n.a. (Banked)	High			
<i>Pterostylis falcata</i>	e							Low	Low			
<i>Pterostylis grandiflora</i>	r							Low	Low			
<i>Pterostylis lustra</i>	e							Medium	Medium			
<i>Pterostylis pratensis</i>	v	VU						High	High			
<i>Pterostylis rubenachii</i>	e	EN		High	High		High	n.a. (Banked)	n.a. (Banked)	High		
<i>Pterostylis sanguinea</i>	r							Low	Low			
<i>Pterostylis squamata</i>	v							Low	Low			
<i>Pterostylis tunstallii</i>	e							Medium	Medium			
<i>Pterostylis napstrorum</i>	e	CR		High	High			High	High	High		
<i>Pterostylis ziegeleri</i>	v	VU		High	High		High	n.a. (Banked)	n.a. (Banked)	High		
<i>Thelymitra antennifera</i>	e							Medium	Medium			

Species	TSP Act	EPBC Act	4a. Taxonomic research	5a. Mycorrhizal research	5b. In situ baiting	5c. Pollinator research	6a. Disturbance trials	7a. Seed collections	7b. Mycorrhizal isolation	8a. Propagation	8b. Translocation feasibility	8c. Translocation
<i>Thelymitra atronitida</i>	e							Medium	Medium			
<i>Thelymitra benthamiana</i>	e							Medium	Medium			
<i>Thelymitra bracteata</i>	e							Medium	Medium			
<i>Thelymitra holmesii</i>	r			High	High		High	n.a. (Banked)	Low	High		
<i>Thelymitra jonesii</i>	e	EN		High	High		High	High	High	High	Medium	Medium
<i>Thelymitra malvina</i>	e							n.a. (Banked)	Medium			
<i>Thelymitra mucida</i>	r							Low	Low			
<i>Thynniorchis huntiana</i>	x			Low	Low	Low		Low	Low	Low		
<i>Thynniorchis nothofagicola</i>	e	CR		High	High	High		High	High	High	High	High
			Key species identified for revision	Priorities based on existing collections, representation of different genera.	Priorities as per 5a	Priorities given to sexually deceptive species.	Priorities to species in the genera <i>Caladenia</i> , <i>Pterostylis</i> , <i>Prasophyllum</i> , <i>Thelymitra</i> .	'Banked' indicates existing collections for species, so action not necessarily applicable (n.a.). Priorities for collection (CPop) are based on endemism & conservation status. Refer to Appendix 2 for target populations.	Priorities based on existing collections, conservation status and representation of different genera.			

Taxonomy: CC = *Caladenia caudata* – *C. dienema* – *C. patersonii* complex; CA = *Caladenia alata* – *C. campbellii* complex; CN = *Caladenia 'carnea'* complex; CFT = *Corunastylis firthii* – *tasmanica*; PGB = *Prasophyllum* 'green-brown subalpine' complex; PT = *Prasophyllum truncatum* complex.

Notes: * = if rediscovered; **PPP & DG** = priorities from PPP process & discussion group; blank cells indicate that the action is not required for that species.