Threatened Tasmanian Orchids



Flora Recovery Plan 2006 - 2010



Australian Government



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 1995* (TSP Act). There are 68 orchid species covered by this plan, of which 34 are listed as threatened under both State and Commonwealth legislation, the remaining listed as rare or threatened under the TSP Act only. Twenty of the orchid species covered by this plan are endemic to Tasmania. For those species that also occur in other states this plan addresses the Tasmanian populations only. Adoption as a national recovery plan under the EPBC Act refers only to species listed under the EPBC Act.

The taxonomy of orchids is constantly being revised. Should a species covered by this plan be split into several taxa all populations will remain covered by this plan under the original listing of the species. In the event of new orchid species being listed the content and actions of this plan will also be relevant to those new species, however this plan will then require revision to include the new species.

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This plan draws on the data collected by David Ziegeler and collated in the Orchid Atlas of Tasmania, and the information put together by David Jones, Hans Wapstra, Peter Tonelli and Stephen Harris in The Orchids of Tasmania. It also draws heavily on knowledge accumulated as part of Victorian orchid recovery programs, in particular on advice from Andrew Pritchard and Fiona Coates.

Cover photo by H&A Wapstra

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Abbreviations

ANH	Australian National Herbarium (Canberra)
AOF	Australian Orchid Foundation
BGPA	Botanic Gardens and Parks Authority (Western Australia)
BCB	Biodiversity Conservation Branch, DPIW (Tasmania)
CHAH	Council of Heads of Australian Herbaria
CPBR	Centre for Plant Biodiversity Research (Canberra)
DIER	Department of Infrastructure, Energy and Resources (Tasmania)
DPIW	Department of Primary Industries and Water (Tasmania)
DPIWE	Department of Primary Industries, Water and Environment (Tasmania)
DSE	Department of Sustainability and Environment (Victoria)
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
FPA	Forest Practices Authority (Tasmania)
NCB	Nature Conservation Branch, DPIWE (Tasmania)
NOGN	Native Orchid Growers Network
NRM	Natural Resource Management
ORG	Orchid Research Group (Canberra)
PAPL	Protected Areas on Private Land Program, DPIW
PFRP	Private Forest Reserve Program, DPIW
PV	Parks Victoria
PWS	Parks and Wildlife Service (Tasmania)
RBG	Royal Botanic Gardens (Melbourne)
RMIT	Royal Melbourne Institute of Technology
RTBG	Royal Tasmanian Botanic Gardens
TFGA	Tasmanian Farmers and Graziers Association
TSN	Tasmanian Threatened Species Network
TSP Act	Threatened Species Protection Act 1995
TSS	Threatened Species Section, BCB/DPIW (Tasmania)
TTORT	Tasmanian Threatened Orchid Recovery Team

Orchid taxonomy follows the Australian Plant Census (CHAH 2005 & 2006); other flora taxonomy follows Buchanan (2005).

The listing status of all threatened species referred to in this recovery plan was correct at the time of publication.

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SUMMARY

This plan provides a framework for the recovery of threatened orchid species and for orchid conservation more generally in Tasmania. There are 68 species covered by this plan. Recent investigation into the distribution and conservation status of Tasmania's orchids has highlighted the need for improved baseline data and management intervention to ensure the survival of many species (Ziegeler *et al.* 1996, Jones *et al.* 1999). Twenty orchids endemic to Tasmania are currently listed as Critically Endangered on the EPBC Act and a further 7 are listed as endangered on the TSP Act in Tasmania. In total, sixty-eight threatened Tasmanian orchid species are listed on Commonwealth and/or Tasmanian legislation as being threatened with extinction.

In the past, Tasmania's threatened orchids have been managed on an *ad hoc* basis when funding has been available. Such an approach has had limited success and has drawn attention to the need for a long-term commitment to orchid conservation in this state. The long-term objectives of this plan are to minimise the risk of extinction in the wild to threatened orchids of Tasmania and to increase the probability of each taxon becoming self-maintaining through the staged implementation of recovery actions. However, a commitment to management of threatened orchids beyond the life of this plan is needed if long-term objectives are to be realised. The plan also seeks to address short-term management issues relating to specific orchid populations.

Actio	ns	Cost	TimeFrame
1.1	Conduct baseline surveys	40 250	Year 1–5
1.2 1.3	Conduct conservation status assessments, update Listing Statements and databases, keep abreast of changes in orchid taxonomy	8 600	Year 1–5
2.1	Notify land owners/managers of presence of threatened orchid populations	10 750	Year 1–5
2.2	Undertake critical management actions	88 500	Year 1–5
2.3	Manage spatial data	50 500	Year 1–5
2.4	Identify priority populations	64 500	Year 1–5
2.5	Identify threats and develop management strategies for priority populations		
2.6	Work with land owners/managers to develop and implement management plans for important threatened orchid communities	81 750	Year 1–5
2.7	Pursue long-term protection of priority populations from detrimental changes in land management	78 250	Year 1–5
3.1	Coordinate volunteer extension searches	10 750	Year 1–5
3.2	Develop systems for standardising data provided by external sources	9 300	Year 1–5
4.1	Prepare Listing Statements	32 250	Year 1–5
4.2	Establish and facilitate regional recovery teams	25 800	Year 1–5
4.3	Prepare technical guidelines detailing <i>in situ</i> conservation techniques and provide training in monitoring and management	35 250	Year 1–5
4.4	Promote the Threatened Orchid Recovery Program and community participation	8 600	Year 1–5
5.1	Maintain the Tasmanian Threatened Orchid Recovery Team	27 300	Year 1–5
5.2	Coordinate communication and exchange of knowledge between participants in regional and interstate recovery programs	16 100	Year 1–5
6.1	Monitor managed sites	62 875	Year 1–5
6.2	Monitor pollination in selected priority populations and identify pollinators	50 625	Year 1–5
6.3	Identify soil characteristics that promote orchid and fungal growth	50 625	Year 1–5
7.1	Manage microhabitats to promote recruitment	45 250	Year 1–5
7.2	Hand pollinate plants	17 625	Year 1–5
7.3	Collect seed and restock populations	18 625	Year 1–5
8.1	Identify critical habitat	10 750	Year 1–5
8.2	Identify potential habitat	4 300	Year 1–5
9.1	Establish a threatened orchid seed bank	27 625	Year 1–5
9.2	Establish and maintain ex situ populations	40 250	Year 1–5

Actions Needed and Estimated Cost of Recovery

9.3	Investigate techniques for mycorrhizal fungi isolation and storage	34 300	Year 1–5
Total		951 300	Year 1–5

BACKGROUND INFORMATION

Taxonomy and Nomenclature

Fifty-nine orchid taxa were described from collections made during early botanical explorations of Tasmania during the late 18th and early 19th centuries (Jones *et al.* 1999). Brown, Labillardière, Hooker, Rupp and Rodway made significant contributions to orchid taxonomy in Tasmania at this time. A more detailed account of these contributions can be found in *The Orchids of Tasmania* in Jones *et al.* 1999.

In 1965, Firth produced the first book on Tasmanian orchids. Entitled *Native Orchids of Australia* (Firth 1965), it described over 130 species and, for a long time, remained the basic reference for amateur and field botanists (Jones *et al.* 1999). Dr. Winifred Curtis released the first major review of Tasmania's orchid flora, Part 4A of *The Students Flora of Tasmania*, in 1979.

In 1991/92 the Australian Heritage Commission funded DPIWE to prepare an orchid atlas documenting the past and present distributions of Tasmania's orchid taxa and their conservation status. The numerous collections made during the orchid atlas project provided David Jones of the Centre for Plant Biodiversity Research (CPBR) at the Australian National Herbarium (ANH) with specimens for a taxonomic review of Tasmania's major orchid genera (Banks 1998). The results of this review were published in *Australian Orchid Research* Volume 3 1998.

In 1999, David Jones, Hans Wapstra, Peter Tonelli and Steve Harris, in collaboration with David Ziegeler and other Tasmanian orchid enthusiasts, produced *The Orchids of Tasmania*. It is the most up-to-date field guide currently available providing a key, descriptions, distribution maps and habitat information for 195 orchid taxa occurring in Tasmania.

Orchidaceae is a taxonomically complex family. More than a third of Australia's native orchids have undergone name changes or reclassification in the past fifty years (Jones 1988; Banks 1998). In recent years the study of Australia's native orchids has largely become centralised at the Orchid Research Group (ORG) within the Australian National Herbarium (ANH) in Canberra, and is strongly supported by the Australian Orchid Foundation (AOF). The Melbourne Royal Botanic Gardens (RBG) has also played an important role, particularly with respect to the taxonomy of the genus *Thelymitra*. Tasmanian orchids are now studied more systematically and within a national context; a number of taxa recognised previously in Tasmania have proven to be distinct from their mainland allies (Jones et al. 1999; Orthia et al. 2003; Jones 2003), while additional taxa continue to be described (Jones 2004).

Reclassification of the Orchidaceae continues at a rapid pace, as evidenced by the publication in 2001 of three major accounts of *Caladenia* and allied genera (Szlachetko 2001; Hopper & Brown 2001; Jones et al. 2001). Hopper and Brown (2004) have called into question many of the recently erected taxa, arguing on the grounds of molecular phylogenetic analyses that the original broad sense of *Caladenia* should be retained (mostly), thereby achieving maximum nomenclatural stability. Similar arguments are likely to be propounded for other large genera that have been subject to recent reclassification (e.g., *Pterostylis*).

Orchid nomenclature used in this Plan follows the deliberations of the Council of Heads of Australian Herbaria, as published in the Australian Plant Census (CHAH 2005 & 2006), which in turn mirror the views of Hooper and Brown (2004). Outstanding nomenclatural differences between the Australian Plant Census and the current listings on the TSP and EPBC Acts — as identified in Appendix 1 — are to be resolved as soon as is practicable.

Conservation Status

A total of 195 native orchids have been recorded in Tasmania. Of these, 68 are listed as threatened on Tasmania's TSP Act and 32 are listed on the Commonwealth EPBC Act. 64 taxa are endemic to Tasmania (Jones *et al.* 1999); 31 of these are listed as threatened.

Taxa are nominated for listing as endangered, vulnerable or rare at risk under Tasmanian legislation if they

meet the criteria for the respective threat categories as defined by the 'Guidelines for Listing of Species Under the Tasmanian *Threatened Species Protection Act 1995*', published in 2002. Species are nominated for listing as Critically Endangered, Endangered or Vulnerable under the Commonwealth legislation (EPBC Act) if they meet the criteria as defined by the IUCN Red List Categories and Criteria Guidelines published in 2000.

Appendix 1 identifies the species covered by this plan and their current listings under Tasmanian and Commonwealth threatened species legislation. 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 taxa covered by this plan may change after the plan is produced. Should a species covered by this plan be split into several taxa all populations will remain covered by this plan under the original listing of the species. In the event of new orchid species being listed the content and actions of this plan will also be relevant to those new species, however this plan will then require revision to include the new species.

Habitat Requirements, Distribution and Decline

Detailed descriptions of known habitats and threats specific to the taxa covered by this plan are addressed in relevant Listing Statements. Habitat details can be found in Jones *et al.* (1999) for those species without Listing Statements.

Threatened orchids occur across Tasmania. **Appendix 2** shows the locations of records for threatened orchid populations in Tasmania. Populations of 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 heath and coastal and inland grasslands. The majority of threatened orchid populations are located in dry forests and woodlands, grasslands and coastal ecosystems. It is no coincidence that these ecosystems occur in the most heavily populated regions of Tasmania and have been subject to significant decline in Tasmania since European settlement.

Assessment of decline in Tasmanian orchids since European settlement is fraught with difficulties. There has been limited formal monitoring of orchid populations in Tasmania to date. Changes in species distribution and populations over time have not been systematically documented and have largely been observed and reported by orchid enthusiasts. Records provided by enthusiasts and professional botanists and specimens lodged at herbariums provide insight into the extent of occurrence of taxa and current land use provides an indication as to populations that are likely to have become extinct. However, as a consequence of patchy and ephemeral occurrences and the lack of permanent monitoring, knowledge of the distribution of threatened orchid populations in Tasmania at any given time is generally incomplete.

A summary of the current knowledge of the past and present distributions for the taxa covered by this plan is provided in their respective Listing Statements. Some Listing Statements are still under preparation. **Appendix 1** identifies the species that have Listing Statements and the current status of the statements. Completed Listing Statements can be viewed on the DPIW web site at <u>http://www.dpiw.tas.gov.au</u>. Follow the links to Natural Environment, Threatened Species and then Threatened Species Lists. They can also be viewed at http://www.gisparks.tas.gov.au/ThreatenedFloraCD. Distribution maps are provided in Listing Statements and in Jones *et al.* (1999).

Threats, Limiting Factors and Management Issues

All species have experienced a range of threats since European settlement including habitat clearance, land improvement practices, altered fire regimes, habitat fragmentation and degradation and the spread of pest plants and animals.

Fire is a natural part of many ecosystems that support threatened orchids in Tasmania. However, fire regimes in many of these ecosystems have been altered since European settlement. Aboriginal firestick farming practices have ceased; wild fires 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.

Many taxa are known from only a few sites. These taxa 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 (eg. ploughing), and application of fertiliser have the potential to eliminate taxa from a site in a single event.

Many taxa are only known from small populations. These populations are particularly susceptible to environmental fluctuations or stochasticity. Loss of a few plants due to localised drought, fire, browsing etc. 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 populations is accentuated in the absence of significant recruitment. Seed production can be limited. It is common knowledge amongst orchid enthusiasts that flowering events are 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). There is also some evidence to suggest that pollination rates in some orchid taxa may be low, particularly those that use sexual deception to attract pollinators (Peakall & Beattie 1996). In addition, orchids require the presence of particular mycorrhizal fungi in the soil to germinate and establish. If the ecosystem does not support the fungi, recruitment will not take place. Factors that have the potential to influence soil microflora will therefore pose additional, indirect threats to orchids, increasing their susceptibility to environmental and land use changes.

The factors mentioned above have the potential to contribute to the gradual attrition of threatened orchid populations by limiting recruitment.

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 increase with the implementation of this plan, pressures from illegal collection may also increase.

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

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 and to identify potential habitat for threatened orchids. This information needs to be readily available so that it can be incorporated into the assessment process.

Reservation Status

Representation of threatened orchids in statutory conservation reserves ranges from well represented to unreserved. Taxa are considered reserved on public land if they are contained within reserves established with a primary aim of nature conservation as defined by the *National Parks and Reserves Management Act 2002*, the *Crown Lands Act 1976* and the *Regional Forest Agreement (Land Classification) Act 1998*. Reserves qualifying under this definition include Nature Reserves, State Reserves, National Parks and Game Reserves. Forest Reserves, Nature Recreation Areas and Conservation Areas offer a level of protection; however, their primary aim may not be conservation.

Taxa within local government reserves are considered reserved if the reserve in question has the primary aim of nature conservation and there is a current agreement between local and State governments referring to conservation and management of the taxa. Species on private land protected by a conservation covenant prepared under the *Nature Conservation Act 2002* are also considered reserved. This is in keeping with biodiversity conservation philosophy that suggests a range of tenures and protection measures are required to adequately address reservation objectives across bioregions (Bedward *et al.* 1992).

Taxa in State Forest that occur in Special Management Zones are not considered reserved. However, it is recognised that management prescriptions specific to the conservation of taxa within the zone can offer adequate protection from forestry activities.

Information on the reservation status of taxa is detailed in their respective Listing Statements or in Jones *et al.* 1999.

Habitat Critical to the Survival of Species

Appendix 3 lists priority populations identified in 2002. They were selected from species listed as endangered or vulnerable on the TSP Act or Critically Endangered or Endangered on the EPBC Act. They have been selected as priority populations because they are considered critical for the survival of their respective taxa based on information that is currently available. The conservation status of the taxa, population size, habitat condition, practicalities of management and conservation security were considered in their selection. The list of priority populations is incomplete. Some taxa covered by this plan are not represented due to lack of sufficient information. 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.

Existing Conservation Measures

Previous to this plan, conservation measures for threatened Tasmanian orchids have been undertaken on an *ad hoc* basis. Conservation measures to date have included searches for new populations, collation of distribution and population data if available, 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 under State and Commonwealth threatened species legislation as appropriate.

Traditionally, local orchid enthusiasts have been responsible for identifying sites and monitoring populations. In more recent years, specific orchid projects have been implemented resulting in the preparation of 'The Orchids of Tasmania' (Jones et al. 1999), Listing Statements, this Recovery Plan as well as some survey and monitoring activities and on-ground protection measures.

Conservation of orchids on mainland Australia is further advanced. Conservation activities including detailed monitoring of populations; hand pollination; seed collection; seed germination trials; mycorrhizal fungal baiting and culture trials have been ongoing in some areas for up to ten years (pers. comm. Andrew Pritchard, Coates *et al.* 2002, Todd 2002, Phillimore *et al.* 1999).

RECOVERY PLAN

Recovery Objectives, Actions and Performance Criteria

The **overall objective** of recovery is to minimise the probability of extinction in the wild of threatened orchid species listed on the Tasmanian TSP Act and the Commonwealth EPBC Act and to increase the probability of each taxon becoming self-sustaining in the long-term.

Within the life span of the plan (five years), the **specific objectives** for recovery for Tasmania's threatened orchids are:

- 1. Acquire accurate information for sound management decisions and conservation status assessments
- 2. Ensure priority populations are managed appropriately and are securely protected
- 3. Increase the number of known populations of threatened orchid taxa
- 4. Raise public awareness of orchid conservation issues and develop mechanisms to encourage and coordinate community participation in orchid recovery programs
- 5. Establish a network of government and non-government organisations and individuals that can provide input into recovery programs and undertake recovery actions
- 6. Develop a better understanding of the life history and ecological requirements of threatened orchids in Tasmania
- 7. Increase the size of priority populations in the wild
- 8. Identify critical and potential habitat
- 9. Establish a genetically representative *ex situ* collection of orchid taxa facing imminent extinction in the wild

SO	Action	Priority
1.1	Conduct baseline surveys	High
1.2	Conduct conservation status assessments and update State and Commonwealth threatened species legislation, Listing Statements and databases	High
1.3	Keep abreast of changes in orchid taxonomy	High
2.1	Notify land owners/managers of presence of threatened orchid populations	High
2.2	Undertake critical management actions	High
2.3	Manage spatial data	High
2.4	Identify priority populations	High
2.5	Identify threats and develop management strategies for priority populations	High
2.6	Work with land owners/managers to develop and implement management plans for important threatened orchid communities	High
2.7	Pursue long-term protection of priority populations from detrimental changes in land management	High
3.1	Coordinate volunteer extension searches	Moderate
3.2	Develop systems for standardising data provided by external sources	Moderate
4.1	Prepare Listing Statements	High
4.2	Establish and facilitate regional recovery teams	Moderate
4.3	Prepare technical guidelines detailing <i>in situ</i> conservation techniques and provide training in monitoring and management	Moderate
4.4	Promote the Threatened Orchid Recovery Program and community participation	Moderate
5.1	Maintain the Tasmanian Threatened Orchid Recovery Team	High
5.2	Coordinate communication and exchange of knowledge between participants in regional and interstate recovery programs	Moderate
6.1	Monitor managed sites	High
6.2	Monitor pollination in selected priority populations and identify pollinators	Low
6.3	Identify soil characteristics that promote orchid and fungal growth	Low
7.1	Manage microhabitats to promote recruitment	Moderate
7.2	Hand pollinate plants	Moderate
7.3	Collect seed and restock populations	Moderate
8.1	Identify critical habitat	Moderate
8.2	Identify potential habitat	Low
9.1	Establish a threatened orchid seed bank	Moderate
9.2	Establish and maintain <i>ex situ</i> populations	Low
9.3	Investigate techniques for mycorrhizal fungi isolation and storage	Low

The **actions** (A) that will be undertaken to achieve the specific objectives (SO) are:

The **criteria** that will be used to determine the progress of the actions are:

Action	Performance criteria
1.1	Baseline surveys have been conducted for priority populations.
1.2 & 1.3	The conservation status of listed taxa has been reviewed as new information became available and amendments have been made to State and Commonwealth threatened species lists and Listing Statements as required.
2.1	Landowners and managers have been notified of the presence of threatened orchid populations on their respective properties.
2.2	Critical management actions have been identified and undertaken where possible.
2.3	Information gathered during implementation of this plan is stored electronically and can be accessed efficiently.
2.4	A minimum of five populations (where 5 are known to exist) for each taxon have been identified as priority populations and their location and associated information has been stored on a spatial database.
2.5	Landowners and managers of priority populations have been met personally on site, informed of their responsibilities under the TSP and EPBC Acts and provided with recommendations for management of the site.
2.6	Management plans or guidelines have been prepared for sites identified in Appendix 10.
2.7	Options for securing long-term protection for priority populations have been pursued.
3.1	The information provided by orchid enthusiasts, botanical consultants, landowners, regional staff and volunteers has been filed and entered into a spatial database following verification.
3.2	A standardised record sheet is freely available to regional staff, landowners and the public and a web page where orchid records can be lodged for verification is operational.
4.1	Listing Statements have been prepared for the listed taxa and are readily available via the Internet. Updates to Listing Statements have been made as required.
4.2	NRM regions are coordinating and undertaking recovery actions.
4.3	Technical guidelines are available, including via the Internet. Regional staff, landowners, community groups and volunteers have received on site training where required.
4.4	The recovery program has been promoted where possible.
5.1	At least 5 recovery team meetings have been held.
5.2	The minutes of Recovery team meetings detail updates from regional recovery teams. A Tasmanian representative has attended and/or provided papers for Australian and International orchid conservation conferences.
6.1	Permanent monitoring plots have been established to monitor the success or failure of management actions.
6.2	Pollination and seedpod development is being monitored at priority populations deemed to be at risk of pollination failure.
6.3	Soil characteristics have been recorded during baseline surveys and monitoring.
7.1, 7.2 & 7.3	Actions have been undertaken to encourage recruitment in priority populations where population size has been identified as a threat. Monitoring is in place to assess the success of actions.
8.1	Critical habitats have been identified and stored on a spatial database and the information is readily available to land planning and management bodies. Critical habitats have been listed on land titles where appropriate.
8.2	Potential habitat has been identified and stored on a spatial database.
9.1	Seed from priority populations of taxa deemed to be at risk of immanent extinction in the wild is in long-term liquid nitrogen storage.
9.2	<i>Ex situ</i> populations of at least 10 plants exist for taxa at risk of imminent extinction in the wild. Guidelines for propagation and cultivation of taxa at risk of imminent extinction in the wild are available to appropriate orchid growers.
9.3	Effective means of isolating and storing mycorrhizal fungi have been investigated for taxa facing imminent extinction.

Strategy for Recovery and Progress Evaluation

Conservation of orchids in other states is further advanced. Consequently this plan has drawn on the knowledge of mainland recovery programs.

Preparation and implementation of this plan will allow orchid conservation in Tasmania to take on a more strategic and pro-active approach. Full implementation of this plan will ensure that gaps in knowledge are identified and addressed, available resources are used more efficiently and future conservation actions are in line with State and regional strategies and the overall objectives of orchid recovery.

A three-tiered approach is needed to achieve recovery of threatened orchids in Tasmania (currently 68 are listed). Specific management actions will be implemented to ensure protection and expansion of priority populations whilst broader systems will be developed to manage orchid conservation as a whole. *Ex situ* conservation measures will be investigated and adopted where such an approach is considered essential to the survival of the taxa.

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

Systems will be developed to manage orchid conservation as a whole. The Threatened Species Section of the Biodiversity Conservation Branch has developed a database to store information on threatened plant populations. Further development and maintenance of the database will ensure landowners and managers have ready access to distributional data and information regarding conservation and management of threatened orchid populations. 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.

In addition to management, investigation into the ecology and life history of threatened orchids in Tasmania is essential to recovery. Successful *in situ* conservation will be founded on understanding the relationships between orchids and mycorrhizal fungi, pollinators and associated flora, and the response of orchids to environmental processes. Seed production, recruitment and regeneration are directly related to these relationships and processes. Demographic census is required to gather this information and to monitor management activities.

Ex situ conservation measures will be investigated where taxa are deemed to be at risk of imminent extinction in the wild. **Appendix 4** lists taxa at risk of imminent extinction. The list has been created based on the information available at the time this plan was prepared. The list is likely to change, as more information becomes available with the implementation of this plan. *Ex situ* conservation measures may include establishment of a seed bank for threatened orchids and cultivation of plants for *ex situ* populations. The feasibility of isolating and storing fungal endophytes may also be investigated.

This plan identifies a range of actions necessary for the recovery of threatened orchids in Tasmania. However, the level of and type of threat faced by individual species and populations varies widely, as does the quality of distributional and site specific information. Consequently not all actions are necessary or possible for each taxon or population and the significance of required actions will differ between populations. **Appendix 5** identifies the procedure that should be followed when determining management for a threatened population.

The feasibility of undertaking actions is dependent upon funding. To facilitate applications for funding and implementation, actions have been prioritised. Actions that are rated as high priority are essential for maintaining populations and minimising the likelihood of further decline. Moderate priority actions are short-term, low cost actions that may assist in decreasing the risk of extinction of threatened taxa. Low priority actions are those that require a high investment of time and/or money and focus on increasing knowledge of

threatened taxa for future management. The success of this recovery will obviously be increased if all actions are undertaken, however it should be noted that in the event of limited funding, actions with a high priority rating should be not be neglected.

Implementation of the plan will be overseen by the Tasmanian Orchid Recovery Team and coordinated by a project officer. Funding for the project officer is essential for successful implementation of the plan. The plan will be reviewed at the end of the implementation phase at which time the merit of recovery actions will be measured against the criteria detailed in the plan.

Many of the actions in this plan will benefit from the participation of regional Natural Resource Management 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 under the new NRM system, the Natural Resource Management regions containing priority populations have been identified in **Appendix 3**.

This plan is consistent with the aims of the *Threatened Species for Tasmania* (2000) and *Tasmania's Nature Conservation Strategy* 2002-2006.

Estimated Cost of Recovery

The plan is fully costed to meet recovery objectives. Costs have been estimated using 2006 prices. See **Appendix 6** for budget details. Further funds will be required to continue management of threatened populations beyond the life of this plan.

Social and Economic Impacts and Affected Interests

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. Reserved land is maintained for its natural values. Recovery plan actions include liaison with landowners and managers to inform them of their responsibilities under the TSP and EPBC Acts and to develop and implement management plans for significant sites occurring on their land.

Some occurrences are on Aboriginal land and actions will be undertaken by or in collaboration with the relevant indigenous communities. For other occurrences, opportunities may exist for the involvement of indigenous communities through cultural interpretation and awareness of the species covered by the plan.

Broader Biodiversity Benefits

Implementation of this plan has a number of potential biodiversity benefits for other native species and vegetation communities in Tasmania. 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. For example slashing of an old track to maintain an open habitat in the Tasman National Park has been timed to encourage expansion of populations of the orchid *Prasophyllum apoxychilum* as well as the Critically Endangered eyebright *Euphrasia fragosa*.

In Tasmania the majority of 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.

RECOVERY ACTIONS

This section describes actions to achieve Specific Objective 1:

Acquire accurate information for sound management decisions and conservation status assessments

Action 1.1 Conduct baseline surveys (high priority)

Accurate baseline data is essential for identifying populations for priority action, making sound management decisions and monitoring the effects of management. It is also required to determine the current conservation status for appropriate listing of taxa on the TSP and EPBC Acts. Improving baseline data will help to develop a better understanding of the ecological requirements of taxa and allow more accurate determination of potential habitat for extension searches.

Currently the quality of information pertaining to the location of populations, population demographics, habitats and threats varies greatly between taxa and populations. The location of most populations has been recorded as a point with a radius of accuracy of 100m or more. Habitat, threat descriptions and population parameters are unavailable or brief for many taxa. More precise location details and detailed habitat and threat descriptions are required to provide sound management advice to landowners and managers. Baseline surveys will provide opportunities to accurately map the location of populations and describe habitats and threats.

Accurate population data is lacking for the majority of threatened populations. Orchid enthusiasts, amateur botanists, or professionals have generally provided existing population data. Whilst information from such sources is invaluable, in most cases, a detailed population survey has not been conducted. Therefore it must be assumed that data received from such sources has been estimated unless information to the contrary is provided. Accurate population counts will be a key component of baseline surveys.

Determination of declines in geographic range, the size and number of known populations 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. However, long term monitoring of permanently marked populations is required to improve accuracy and determine causes of decline. Baseline surveys will provide opportunities to permanently mark populations and year 1 data for monitoring.

The project officer will coordinate collection of baseline data for populations where current data is deemed insufficient for management purposes. Botanical contractors, regional staff, orchid enthusiasts and volunteers will be engaged to collect baseline data where appropriate. **Appendix 7** lists populations requiring baseline surveys and identifies when surveys should be conducted and which surveys are of highest priority. The orchid record sheet (**Appendix 8**) details the minimum data that should be collected during baseline surveys. In addition to an accurate point, a polygon should be mapped as accurately as possible with a GPS. A specimen to be lodged at the Tasmanian Herbarium should be collected if the population has more than 10 plants and a specimen from the population is not held in the collection. The project officer will ensure baseline data is readily available to the landowners, conservation and land management bodies.

Cost estimate to complete all high priority sites (Action 1.1)	
Salary year 1-5 @ \$245/day (10 days/yr)	\$12 250
Travel and car hire year 1-5 @ \$275/day (10 days/yr)	\$13 750
Office/admin support year 1-5 @ \$185/day (10 days/yr)	\$9 250
Survey costs	\$5 000
Total year 1-5	\$40 250

Performance criteria for Action 1.1;

• Baseline surveys have been conducted for priority populations.

Action 1.2 Conduct conservation status assessments and update State and Commonwealth threatened species legislation, Listing Statements and databases (high priority)

As new information becomes available the conservation status of taxa may change. The project officer will conduct conservation status assessments for each taxa following completion of baseline surveys and as new information becomes available from other sources. New taxa will also be assessed for their conservation status after surveys are conducted. State and Commonwealth threatened species legislation, Listing Statements and databases will be updated and circulated as required.

Action 1.3 Keep abreast of changes in orchid taxonomy (high priority)

Orchids are a taxonomically complex family. In 1998, reviews of the major Tasmanian genera were published in Australian Orchid Research Volume 3 (Banks 1998). This work dealt with many of the inconsistencies known to Tasmanian orchid enthusiasts, however taxonomic work continues. Recently significant changes to the *Caladenia* and *Corybas* genera were published and a number of new genera were created and old genera reinstated (Jones *et al.* 2001, Jones *et al.* 2002). Recent collections have also unearthed specimens that are not adequately represented by previously described taxa. Further changes in taxonomy are likely throughout implementation of the plan.

The project officer will review and update conservation status, threatened species lists and databases as the botanical community accepts taxonomic changes. In addition new taxa and inconsistencies in taxonomy that are identified through implementation of the plan will be recorded and brought to the attention of taxonomists working at the CPBR Canberra, and the National Herbarium of Victoria (for *Thelymitra*).

Cost estimate (Actions 1.2 & 1.3)	
Salary year 1-5 @ \$245/day (4 days/yr)	\$4 900
Office/admin support year 1-5 @ \$185/day (4 days/yr)	\$3 700
Total year 1-5	\$ 8 600

Performance criteria for Actions 1.2 and 1.3;

• The conservation status of listed taxa has been reviewed as new information became available and amendments have been made to State and Commonwealth threatened species lists and Listing Statements as required.

This section describes actions to achieve Specific Objective 2:

Ensure populations are managed appropriately and are securely protected

Action 2.1 Notify land owners/managers of presence of threatened orchid populations (high priority)

Land owners/managers should be notified of the presence of threatened populations as soon as they are located. Even if identification of the population has not been verified, land owners/managers should be notified that a threatened population potentially exists on their property and permission should be sought to collect a specimen and conduct a more detailed survey. Land owners/managers should be notified of their responsibilities under the TSP Act and the EPBC Act once the taxon of the population has been verified.

Cost estimate (Action 2.1)	
Salary year 1-5 @ \$245/day (5 days/yr)	\$6 125
Office/admin support year 1-5 @ \$185/day (5 days/yr)	\$4 625
Total year 1-5	\$10 750

Performance criteria for Action 2.1;

• Landowners and managers have been notified of the presence of threatened orchid populations on their respective properties.

Action 2.2 Undertake critical management actions (high priority)

Survey work conducted during preparation of this plan identified a number of actions that should be undertaken as soon as possible. These actions have been detailed in **Appendix 9** and are considered critical to the recovery of the respective species. The project officer will coordinate regional staff, landowners and volunteers to implement critical actions. Further critical management actions are likely to be identified as baseline surveys are conducted.

Cost estimate (Action 2.2)	
Salary year 1-5 @ \$245/day (20 days/yr)	\$24 500
Office/admin support year 1-5 @ \$185/day (20 days/yr)	\$18 500
Travel and car hire year 1-5 @ \$275/day (20 days/yr)	\$27 500
Materials and equipment for critical actions	\$ 18 000
Total year 1-5	\$88 500

Taxon	Population	Action	
Caladenia anthracina	Greenhill	Mark and map location of plants.	\$1 000
Caladenia anthracina	Merton vale	Remove gorse at site and paint cut stems with herbicide.	\$1 000
Caladenia anthracina	Beaufront	Erect new cage. Erect fence.	\$3 000
Caladenia saggicola Prasophyllum milfordense	Milford	Patch burn and monitoring. Rabbit exclusion fence and monitoring.	\$1 000
Caladenia sylvicola	Ridgeway Park	Relocate population and map and mark plants.	\$500
Prasophyllum perangustum	Knocklofty Reserve	Relocate population and map and mark plants.	\$500
Pterostylis cucullata	Possum Banks - Arthur Pieman Conservation Area	Monitoring.	\$2 000
Pterostylis rubenachii	Arthur-Pieman Conservation Area	Ensure suitable cattle exclusion fences and monitoring in place.	\$1 000
Arthrochilus huntianus subsp nothofagicola	Needles Picnic Ground	Extend lyrebird exclusion fence.	\$1 000
Various	Various	Identify populations occurring in priority communities for RFA Private Reserves Program and PAPL program.	-
Various	Henry Somerset Private Sanctuary	Pursue prescribed burn of reserve and development of a formal management plan.	\$5 000
Various	Dorothy Reeves Reserve	Survey and map populations on the Dorothy Reeves Reserve. Implement management plan.	\$1 000
		Total	\$18 000

Performance criteria for Action 2.2

• Critical management actions have been identified and undertaken where possible.

Action 2.3 Manage spatial data (high priority)

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. To this end, the project officer will coordinate entry of verified data into the TSS Threatened Flora Database and coordinate further development of systems to store and access threatened orchid data. Currently the database enables the user to display and query spatial information using a Geographical Information System (GIS) and directs the user to where more detailed information can be found. Selected information will be made available to land management and planning authorities in read only format. Paper records will also be maintained.

Cost estimate (Action 2.3)	
Salary year 1-5 @ \$245/day (20 days/yr)	\$24 500
Office/admin support year 1-5 @ \$185/day (20 days/yr)	\$18 500
Hardware and software (including database)	\$7 500
Total year 1-5	\$50 500

Performance criteria for Action 2.3

• Information gathered during implementation of this plan is stored electronically and can be accessed efficiently.

Action 2.4 Identify priority populations (high priority)

Appendix 4 lists priority populations identified in 2002. They have been selected as priority populations because they are considered critical for the survival of their respective taxa based on the population size and condition. Additional consideration will be given to populations that are at the extremes of population distributions or those that display unique characteristics. Priority populations and their associated habitats will be the focus of management and protection throughout implementation of this plan. The list of priority populations is incomplete. Many taxa covered by this plan are not represented due to lack of sufficient information.

At least five priority populations (where five are known to exist) will be identified for each taxa listed as endangered or vulnerable on the TSP Act or as Critically Endangered or Endangered on the EPBC Act (five populations being an important threshold in many criteria and rule sets ie. TSPA and IUCN). Population size, habitat condition, practicality of management and conservation security should be considered when determining priority populations. New populations will be assessed as baseline surveys are conducted. It is important to recognise that this list is dynamic and will require revision, as new information becomes available, as the status of threatening processes change and as negotiations with landowners and managers progress.

The project officer will identify priority populations based on information provided from baseline surveys, regional staff, orchid enthusiasts, landowners and volunteers. Priority populations will be identified on a spatial database and landowners and management authorities will be informed of their location and provided with recommendations for management where appropriate.

Performance criteria for Action 2.4;

• A minimum of five populations (where 5 are known to exist) for each taxon have been identified as priority populations and their location and associated information has been stored on a spatial database.

Action 2.5 Identify threats and develop management strategies for priority populations (high priority)

Potential threats to populations will be identified during baseline surveys or may be reported by landowners/managers, professionals, orchid enthusiasts or concerned community members. Using available information the project officer should work with landowners and managers to develop management strategies to control and where possible eliminate threats. Strategies may include broad scale habitat management and small-scale plant and colony protection. Key threatening processes that will need to be considered include: habitat clearance/degradation, weed invasion, native and introduced grazing, inappropriate fire and slashing regimes, decline in pollination and recruitment, accidental damage, and collection. An adaptive management approach including implementation, monitoring and review phases will be recommended. Where possible, the strategies adopted will aim to compliment other nature conservation objectives defined in current reserve or property management plans.

The project officer will visit with landowners/managers when threats are identified to develop threat abatement strategies and recommendations for management. Monitoring and disturbance regimes may be included in management recommendations. The project officer will train and assist land owners/managers with implementation of recommendations where appropriate. The project officer will also assist land owners/managers to contact volunteers interested in assisting with orchid conservation works.

Cost estimate (Actions 2.4 & 2.5)	
Salary year 1-5 @ \$245/day (30 days/yr)	\$36 750
Office/admin support year 1-5 @ \$185/day (30 days/yr)	\$27 750
Total year 1-5	\$64 500

Performance criteria for Action 2.5;

• Landowners and managers of priority populations have been met personally on site, informed of their responsibilities under the TSP and EPBC Acts and provided with recommendations for management of the site.

Action 2.6 Work with land owners/managers to develop and implement management plans for important threatened orchid communities (moderate priority)

Sites of significant size, of particular importance or providing habitat for multiple threatened orchid taxa may require management plans to ensure the orchids and associated communities are managed appropriately. The project officer will work with land owners/managers to develop and implement management plans that address the needs of the population and associated vegetation communities. Development of plans may require outside expertise in which case appropriate consultants will be engaged where resources permit. **Appendix 10** identifies sites urgently requiring management plans or management guidelines. Additional sites will be identified as this plan is implemented.

Cost estimate (Action 2.6)	
Salary year 1-5 @ \$245/day (20 days/yr)	\$24 500
Office/admin support year 1-5 @ \$185/day (20 days/yr)	\$18 500
Travel and car hire year 1-5 @ \$275/day (10 days/yr)	\$13 750
Consultancy fees	\$25 000
Total year 1-5	\$81 750

Performance criteria for Action 2.6;

• Management plans or guidelines have been prepared for sites identified in Appendix 10.

Action 2.7 Pursue long-term protection of priority populations from detrimental changes in land management (high priority)

Many priority populations occur on private land, unallocated Crown land or Public Reserves managed for purposes other than nature conservation. These populations are potentially threatened by current or future land management practices. Agreements between managing bodies and the Tasmanian Government will be sought to ensure long-term protection against detrimental land management practices.

Long-term protection for priority populations on private land will be sought through conservation covenants or private reserves. The project officer will identify populations on private land that occur in priority vegetation communities targeted by the RFA Private Reserves and Protected Areas on Private Land Programs and assist these programs with covenant negotiations where appropriate. Where populations do not meet the criteria of these programs the project officer in conjunction with extension officers will pursue other types of covenants or voluntary non-binding management agreements independently.

Priority populations occurring within State and private forests managed for timber production will be brought to the attention of the appropriate managing authority and the Forest Practices Board. Management prescriptions will be developed and implemented under the Forest Practices System and where appropriate Special Management Zones will be established. Exclusion zones will be negotiated with the Forest Practices Board and the appropriate management authority where long-term protection cannot be achieved through management prescriptions. The respective management authorities will be informed of the location and management requirements of priority populations along roadsides, railway lines, in cemeteries (although some are not Crown land) and other managed Crown land. A commitment to manage the site for conservation of the population will be sought and where possible, management agreements will be negotiated (e.g. Public Authority Management Agreement under TSP Act).

Cost estimate (Action 2.7)	
Salary year 1-5 @ \$245/day (30 days/yr)	\$36 750
Office/admin support year 1-5 @ \$185/day (30 days/yr)	\$27 750
Travel and car hire year 1-5 @ \$275/day (10 days/yr)	\$13 750
Total year 1-5	\$ 78 250

Performance criteria for Action 2.7;

• Options for securing long-term protection for priority populations have been pursued.

This section describes actions to achieve Specific Objective 3:

Increase the number of populations of threatened orchid taxa

Action 3.1 Coordinate volunteer extension searches (moderate priority)

As a result of work conducted to complete The Orchid Atlas (Ziegeler *et al.* 1996) and The Orchids of Tasmania (Jones *et al.* 1999) distributional data on most threatened taxa is available. However, information for newly described taxa is generally limited and many recorded populations have not been observed in recent years. It is also likely that there are still undiscovered populations in Tasmania. It is important that the current status of recorded populations is determined and that undiscovered populations are located so that managing authorities can be advised as to appropriate management. Discovery of new populations may reduce risk of extinction and subsequently improve the conservation status of the taxa. Ongoing extension searches and continued observation of recorded populations are essential to recovery of threatened orchids in Tasmania.

Orchid enthusiasts and volunteers will be encouraged to conduct extension searches and to monitor known populations. The project officer will coordinate collection and verification of new information. Landowners, botanical consultants and regional staff will also be encouraged to record and report on orchid populations. When new populations are located the procedure detailed in **Appendix 5** should be followed.

Cost estimate (Action 3.1)	
Salary year 1-5 @ \$245/day (5 days/yr)	\$6 125
Office/admin support year 1-5 @ \$185/day (5 days/yr)	\$4 625
Total year 1-5	\$10 750

Performance criteria for Action 3.1;

• The information provided by orchid enthusiasts, botanical consultants, landowners, regional staff and volunteers has been filed and entered into a spatial database following verification.

Action 3.2 Develop systems for standardising data provided by external sources (low priority)

There is a significant network of native orchid enthusiasts throughout Tasmania. Records supplied by enthusiasts and other external sources have been instrumental in understanding the distribution of threatened orchids in Tasmania. However the type and quality of information gathered by orchid enthusiasts varies widely and collection of the data can be difficult and time consuming. In an attempt to address this problem, a standardised record sheet (**Appendix 8**) has been developed and is available on the Internet (**http://www.gisparks.tas.gov.au/ThreatenedFloraCD**). A web-based record system where enthusiasts, landowners and managers can lodge orchid records for verification might also be developed.

Cost estimate (Action 3.2)	
Salary year 1-5 @ \$245/day (2 days/yr)	\$2 45 0
Office/admin support year 1-5 @ \$185/day (2 days/yr)	\$1 850
Consultant to set up record system	\$5 000
Total year 1-5	\$9 300

Performance criteria for Action 3.2;

• A standardised record sheet is freely available to regional staff, landowners and the public and a web page where orchid records can be lodged for verification is operational.

This section describes actions to achieve 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 (high priority)

Listing Statements provide information on ecology and management requirements and general information on known populations. They are the primary source of information for land management authorities, landowners, community groups and individuals participating in orchid recovery projects.

The project officer will coordinate preparation of Listing Statements covered by this plan where they do not already exist and ensure that updates are made as required. The appropriate Listing Statements will be circulated to parties involved in orchid management. The project officer will also ensure they are readily available to the general public via the Internet or by request from the Biodiversity Conservation Branch.

Cost estimate (Action 4.1)	
Salary year 1-5 @ \$245/day (15 days/yr)	\$18 375
Office/admin support year 1-5 @ \$185/day (15 days/yr)	\$13 875
Total year 1-5	\$32 250

Performance criteria for Action 4.1;

- Listing Statements have been prepared for the listed taxa and are readily available via the Internet.
- Updates to Listing Statements have been made as required.

Action 4.2 Establish and facilitate NRM region recovery teams (moderate priority)

The implementation of many of the actions in this plan would benefit from support and assistance from regional staff, landowners, community groups and volunteers. The project officer will encourage and assist formation of NRM recovery teams that will be responsible for supporting the recovery process on a regional scale. The project officer will provide direction, support and technical advice to the NRM recovery teams.

Cost estimate (Action 4.2)	
Salary year 1-5 @ \$245/day (12 days/yr)	\$14 700
Office/admin support year 1-5 @ \$185/day (12 days/yr)	\$11 100
Total year 1-5	\$25 800

Performance criteria for Action 4.2;

• NRM regions are coordinating and undertaking recovery actions.

Action 4.3 Prepare technical guidelines detailing *in situ* conservation techniques and provide training in monitoring and management (moderate priority)

It is essential that participants in recovery activities develop skills in monitoring populations and habitat management that are consistent, repeatable and comparable across the State. To this end, the project officer will collect and collate the latest information on monitoring and management of native terrestrial orchids and present the information as technical guidelines. The project officer will use the technical guidelines in conjunction with field-based demonstrations and workshops to educate landowners, regional staff, community groups and volunteers. The guidelines will be made available to the public over the Internet.

Cost estimate (Action 4.3)	
Salary year 1-5 @ \$245/day (10 days/yr)	\$12 250
Travel and car hire year 1-5 @ \$275/day (10 days/yr)	\$13 750
Office/admin support year 1-5 @ \$185/day (10 days/yr)	\$9 250
Total year 1-5	\$35 250

Performance criteria for Action 4.3;

- Technical guidelines are available, including via the Internet.
- Regional staff, landowners, community groups and volunteers have received on site training where required.

Action 4.4 Promote the Threatened Orchid Recovery Program and community participation (moderate priority)

Wherever possible regional and state recovery teams will promote orchid recovery projects and community participation through local newsletters, newspapers, radio, television and community events.

Cost estimate (Action 4.4)	
Salary year 1-5 @ \$245/day (4 days/yr)	\$4 900
Office/admin support year 1-5 @ \$185/day (4 days/yr)	\$3 700
Total year 1-5	\$ 8 600

Performance criteria for Action 4.4;

• The recovery program has been promoted where possible.

This section describes actions to achieve 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 (high priority)

Recovery of threatened orchids in Tasmania will be achieved through a coordinated effort from government agencies; public and private land managers, botanists, ecologists, horticulturalists, orchid enthusiasts and community groups and volunteers. It is essential that information and skills be shared between all parties. 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.

TSS established the Tasmanian Threatened Orchid Recovery Team in 2003 to oversee orchid recovery in Tasmania. The team is made up of representatives from key organisations including; the Biodiversity Conservation Branch; the Forest Practices Authority; the Department of Infrastructure, Energy and Resources; the Tasmanian Farmers and Graziers Association; the Parks and Wildlife Service; the Threatened Species Network; The Royal Tasmanian Botanical Gardens, the Australian Native Orchid Society and community members that play an active role in orchid conservation. The group will aim to meet biannually to set priorities for orchid conservation and report on progress of recovery actions. Members of the team will provide their time as in-kind contribution, however travel costs and accommodation should be covered by program funds.

Cost estimate (Action 5.1)	
Salary year 1-5 @ \$245/day (2 days/yr)	\$2 450
Office/admin support year 1-5 @ \$185/day (2 days/yr)	\$1 850
Travel costs for recovery team members @ \$250/member (2 meetings/yr)	\$22 500
Minute taker for recovery team meetings @ \$100/meeting (1 meeting/yr)	\$500
Total year 1-5	\$27 300

Performance criteria for Action 5.1;

• At least 5 recovery team meetings have been held.

Action 5.2 Coordinate communication and exchange of knowledge between participants in regional and interstate recovery programs (moderate priority)

The Orchid Recovery Program will benefit from sharing of knowledge between regional and interstate orchid recovery teams. The project officer will report to Tasmanian Threatened Orchid Recovery Team on the activities of regional programs. Where possible the project officer will attend and/or provide papers for Australian and International orchid conservation conferences. The project officer will maintain a database of contacts.

Cost estimate (Action 5.2)	
Salary year 1-5 @ \$245/day (4 days/yr)	\$4 900
Office/admin support year 1-5 @ \$185/day (4 days/yr)	\$3 700
Travel and conference fees	\$7 500
Total year 1-5	\$16 100

Performance criteria for Action 5.2;

- The minutes of Recovery team meetings detail updates from regional recovery teams.
- A Tasmanian representative has attended and/or provided papers for Australian and International orchid conservation conferences.

This section describes actions to achieve 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 (moderate priority)

Where possible, management prescriptions and recovery actions should be based on an understanding of the population biology and ecological requirements of the taxa. Whilst it is known that reproduction in many terrestrial native orchids is dependent on relationships with soil fungi and invertebrates, reliable data is limited. Similarly, understanding of the response of species to disturbance regimes like fire, slashing and grazing is almost entirely based on anecdotal evidence. Even the most basic life cycle parameters including the life expectancy of individual plants and the age at which they reach reproductive maturity are largely unknown. Long-term population monitoring is required to determine these parameters.

However, demographic studies in Victoria have shown that monitoring is required for at least 5-10 years before reliable data becomes available (Coates 2001). No formal monitoring has been conducted in Tasmania to date. Consequently, data from monitoring to guide management is unlikely to be available during the life of this plan. Therefore an adaptive management approach including implementation, monitoring and review phases will be adopted.

Permanent monitoring plots should be established to monitor population responses to management actions. Additional monitoring plots should also be established where specific information is required to guide long-term management. The design of monitoring plots and the parameters measured will be dependent on the site and the purpose of investigation. However, **Appendix 11** details some issues that need to be considered when monitoring orchids and provides a set of basic parameters to be measured. Regional staff, landowners, orchid enthusiasts and volunteers will undertake monitoring under guidance from the project officer. The project officer will provide technical guidelines and assistance and will coordinate analysis and circulation of data.

Cost estimate (Action 6.1)	
Salary year 1-5 @ \$245/day (15 days/yr)	\$18 375
Office/admin support year 1-5 @ \$185/day (15 days/yr)	\$13 875
Travel and car hire @ 275/day (15 days/yr)	\$20 625
Monitoring equipment	\$10 000
Total year 1-5	\$62 875

Performance criteria for Action 6.1;

• Permanent monitoring plots have been established to monitor the success or failure of management actions.

Action 6.2 Monitor pollination in selected priority populations and identify pollinators (low priority)

A decline or failure in pollination represents a potential threat to orchid populations. Pollination failure has been observed in a number of threatened orchid populations in Victoria (Todd 2000). Whilst the reasons for pollination failure have not been established it is widely believed by orchid enthusiasts that the pollinators are no longer present in the ecosystem (Coates *et al.* 2002) Small populations occurring in small remnants are likely to be most at risk. Small remnants are less likely to support pollinators and small populations may not flower in densities required to attract pollinators. Other factors may also contribute to pollination failure.

Pollination of flowers and development of seedpods should be monitored for priority populations deemed to be at risk from pollination failure. These parameters will be recorded as part of monitoring programs. The project officer may recommend hand pollination where pollination rates are considered dangerously low.

Orchids have adopted a diverse range of methods to attract pollinators. Sexual deception, food mimicry, flower mimicry, food rewards and trap pollination syndromes have all been described for Australian terrestrial orchids (Adams & Lawson 1993). A high degree of pollinator specificity has been observed in orchid taxa that use sexual deception to attract pollinators (Bower 2000). Reliable data on pollination syndromes and pollinators is limited for threatened taxa in Tasmania.

Pollinators and pollination syndromes are an important consideration in management of threatened orchid habitats. Post-graduate research into pollinators, pollination syndromes and declines in pollination will be encouraged through the University system.

Cost estimate (Action 6.2)	
Salary year 1-5 @ \$245/day (5 days/yr)	\$6 125
Office/admin support year 1-5 @ \$185/day (5 days/yr)	\$4 625
Travel and car hire @275/day (5 days/yr)	\$6 875
Monitoring equipment	\$3 000
Research grants	\$30 000
Total year 1-5	\$50 625

Performance criteria for Action 6.2;

Pollination and seedpod development is being monitored at priority populations deemed to be at risk of
pollination failure.

Action 6.3 Identify soil characteristics that promote orchid and fungal symbiont growth (low priority)

In the wild, orchids require infection by mycorrhizal fungi to germinate and establish. The presence of associated mycorrhizal fungi is essential for expansion of existing populations and establishment of new populations from seed or cultivated plants. Therefore maintenance of conditions that promote the appropriate mycorrhizal fungi is a vital component of threatened orchid habitat management. However, currently there is little information available on fungal habitat requirements or conditions that promote fungal activity. Anecdotal evidence from Victorian recovery programs suggest that fungal growth may be correlated with increased organic matter, soil moisture and bryophyte cover (pers. com. Andrew Pritchard and Gary French). Rasmussen and Whigham (1988) made similar observations.

Soil characteristics including soil texture, soil moisture, depth of organic matter and non-vascular plant cover should be recorded during baseline surveys and monitoring. Soil characteristics will be correlated with the presence of mature plants and seedlings and increases or declines in populations. Research into orchid/fungi associations and the habitat requirements of mycorrhizal fungi will be encouraged through the University system. Results of research conducted on the mainland will also be followed.

Cost estimate (Action 6.3)	
Salary year 1-5 @ \$245/day (5 days/yr)	\$6 125
Office/admin support year 1-5 @ \$185/day (5 days/yr)	\$4 625
Travel and car hire @ 275/day (5 days/yr)	\$6 875
Monitoring equipment	\$3 000
Research grants	\$30 000
Total year 1-5	\$50 625

Performance criteria for Action 6.3;

• Soil characteristics have been recorded during baseline surveys and monitoring.

This section describes actions to achieve Specific Objective 7:

Increase the number of plants in priority populations in the wild

Action 7.1 Manage microhabitats to promote recruitment (moderate priority)

Mainland recovery programs have trialed various microhabitat management techniques to promote seedling recruitment in small populations (Mutual Gains Orchid Symposium 2002). Techniques like caging, hand weeding, seedbed preparation, mulching and watering during dry months have proved to be effective (pers. com. Andrew Pritchard, Gary French & Brendon Sullivan). Enclosing a small patch of *Caladenia anthracina* has been effective at protecting the plants from grazing by deer, cattle and other browsers on a property in the Midlands.

The project officer will identify priority populations that may benefit from microhabitat management using information from baseline surveys and provided by regional staff, orchid enthusiasts and volunteers. Regional staff and landowners will be encouraged to implement recommended actions with technical advice, training and assistance from the project officer. An adaptive management approach will be adopted including implementation, monitoring and review phases.

Cost estimate (Action 7.1)	
Salary year 1-5 @ \$245/day (10 days/yr)	\$12 250
Office/admin support year 1-5 @ \$185/day (10 days/yr)	\$9 250
Travel and car hire @ 275/day (10 days/yr)	\$13 750
Tools and equipment	\$10 000
Total year 1-5	\$45 250

Action 7.2 Hand pollinate plants (moderate priority)

Seed is required for natural seed set, redistribution to augment *in situ* populations and the establishment of *ex situ* populations. However it is difficult to reliably predict seed production because the propensity of orchid populations to flower from year to year varies with environmental conditions and habitat structure and the factors influencing natural pollination are not well understood. Therefore it is important that seed production is maximised when populations are in flower, particularly for critically small populations. Hand pollination has proven to be an effective means of increasing seed production where natural pollination rates are low (pers. com. Andrew Pritchard & Gary French).

Where baseline surveys identify critically small priority populations or it is observed that natural pollination and/or recruitment are not taking place, the project officer may recommend hand pollination be undertaken by landowners and/or regional staff in conjunction with orchid enthusiasts and volunteers. Hand pollination protocols under development in Victoria will be adopted. The project officer will provide technical assistance and training in hand pollination techniques.

Cost estimate (Action 7.2)	
Salary year 1-5 @ \$245/day (5 days/yr)	\$6 125
Office/admin support year 1-5 @ \$185/day (5 days/yr)	\$4 625
Travel and car hire @ 275/day (5 days/yr)	\$6 875
Total year 1-5	\$17 625

Action 7.3 Collect seed and restock populations (moderate priority)

An increase in seedling recruitment has been observed in *Arachnorchis hastata* following collection of seed and redistribution around existing plants during late summer and early autumn (pers. comm. Andrew Pritchard). This technique minimises the loss of seed to predation and increases the likelihood that it will fall on a suitable site for germination.

The project officer may recommend trial of this technique for critically small populations and will provide technical assistance and support to regional staff and landowners. An adaptive management approach will be adopted. Timing of collection and redistribution will be adjusted for specific taxa and populations where appropriate. Seed should be dried for storage and redistributed towards the end of the dormant period.

Cost estimate (Action 7.3)	
Salary year 1-5 @ \$245/day (5 days/yr)	\$6 125
Office/admin support year 1-5 @ \$185/day (5 days/yr)	\$4 625
Travel and car hire @275/day (5 days/yr)	\$6 875
Equipment	\$1 000
Total year 1-5	\$18 625

Performance criteria for Actions 7.1, 7.2 and 7.3;

- Actions have been undertaken to encourage recruitment in priority populations where population size has been identified as a threat.
- Monitoring is in place to assess the success of actions.

This section describes actions to achieve Specific Objective 8:

Identify critical and potential habitat

Action 8.1 Identify critical habitat (moderate priority)

The TSP Act enables critical habitat to be recorded on land titles, thereby providing a permanent reference to the conservation significance of the specified area of land. Listing of critical habitat will ensure that the conservation significance of the defined area is recognised when decisions are made with respect to current and future land use across all land tenures.

SAC (2001) suggests that critical habitat will usually include all known sites for taxa listed as endangered or vulnerable on the *Threatened Species Protection Act 1995*.

In terms of the orchids covered by this plan, habitat considered critical to the survival of taxa includes all known populations of taxon that are listed as vulnerable or endangered on the TSP Act. It also includes all populations of taxa listed as Critically Endangered or Endangered on the EPBC Act, and it should also include priority populations of taxon that are listed as rare (TSP Act) or Vulnerable (EPBC Act) respectively.

Cost estimate (Action 8.1)	
Salary year 1-5 @ \$245/day (5 days/yr)	\$6 125
Office/admin support year 1-5 @ \$185/day (5 days/yr)	\$4 625
Total year 1-5	\$10 750

Performance criteria for Action 8.1;

- Critical habitats have been identified and stored on a spatial database and the information is readily available to land planning and management bodies.
- Critical habitats have been listed on land titles where appropriate.

Action 8.2 Identify potential habitat (low priority)

Baseline surveys and information provided by orchid enthusiasts, landowners, regional staff and volunteers, will assist in defining ecological parameters most likely to support threatened orchid taxa. A Geographic Information System (GIS) will be used to analyse data and to predict potential habitat for the respective taxa. Potential habitat will be stored on a spatial database and become the focus of future extension searches. This will also provide necessary data to aid planners in the development assessment process in considering possible impacts on species that do not emerge or flower every year or can only be identified during a brief period when not in flower. The project officer will encourage volunteers with knowledge of GIS to assist with analysis.

Cost estimate (Action 8.2)	
Salary year 1-5 @ \$245/day (2 days/yr)	\$2 450
Office/admin support year 1-5@ \$185/day (2 days/yr)	\$1 850
Total year 1-5	\$4 300

Performance criteria for Action 8.2;

• Potential habitat has been identified and stored on a spatial database.

This section describes actions to achieve Specific Objective 9:

Establish a genetically representative ex situ collection of orchid taxa facing imminent extinction in the wild

Action 9.1 Establish a threatened orchid seed bank (moderate priority)

It has been demonstrated that seed of some native terrestrial orchids is not stored in the soil beyond one season (Andrew Batty, Mutual Gains Orchid Symposium 2002). If this is true for all taxa an *ex situ* seed bank is important as a safe guard against loss of taxa in the wild. Tests have demonstrated that common taxa from *Caladenia, Diuris, Pterostylis* and *Thelymitra* can be successfully stored in liquid nitrogen (Andrew Batty, Mutual Gains Orchid Symposium 2002) providing seed is dried first. The advantage of liquid nitrogen storage is that seed viability does not decrease over time. This is important when seed is limited as is likely to be the case with populations facing imminent extinction in the wild.

The project officer may coordinate collection of seed from priority populations of taxa deemed to be at risk of imminent extinction in the wild (**Appendix 6**). Seed collection protocols will be developed in conjunction with mainland orchid recovery teams. The seed from each population will be dried and stored separately in liquid nitrogen by a suitable seed storage company. Although liquid nitrogen storage has proved to be successful with some orchid taxa, post liquid nitrogen immersion germination tests should be performed for each taxon before committing significant quantities of seed to storage.

Cost estimate (Action 9.1)	
Salary year 1-5 @ \$245/day (5 days/yr)	\$6 125
Office/admin support year 1-5 @ \$185/day (5 days/yr)	\$4 625
Travel and car hire year 1-5 @ \$275/day (5days/year)	\$6 875
Cryo-storage costs	\$10 000
Total year 1-5	\$27 625

Performance criteria for Action 9.1;

 Seed from priority populations of taxa deemed to be at risk of immanent extinction in the wild is in longterm liquid nitrogen storage.

Action 9.2 Establish and maintain *ex situ* populations (low priority)

Ex situ populations may be required to safeguard taxa at risk of imminent extinction in the wild (**Appendix 6**). They could be used to provide a seed source for restocking of existing *in situ* populations. *Ex situ* populations may also provide seed and plants for restoration of taxa extinct in the wild or establishment of new populations in the wild. Restoration of extinct populations or establishment of new populations in the wild other avenues have been explored and a suitable and secure site has been located.

The Royal Botanic Gardens Melbourne, the Melbourne Zoo, Royal Melbourne Institute of Technology (RMIT), the Native Orchid Growers Network (NOGN) and other professional and amateur growers as part of recovery programs in Victoria, Western Australia and South Australia have undertaken cultivation of native terrestrial orchids. The expertise of native orchid growers in Tasmania and the Royal Tasmanian Botanic Gardens will be sought to adapt these techniques to Tasmanian taxa.

The NOGN has established a central database of threatened orchids in cultivation. The database stores records of cultivated plants including seed source, location, numbers and movements of plants, growing conditions and other information. Growers contribute their own records to the database. The information is available to other organisations and agencies on request.

The project officer will work with volunteer native orchid growers and the RTBG to develop effective techniques for propagation and cultivation of threatened orchids facing imminent extinction in the wild. Guidelines for propagation and cultivation for taxa will be prepared. *Ex situ* populations will be split up between recognised growers and the Royal Tasmanian Botanic Gardens to minimise the risk of loss due to disease or similar catastrophic event. *Ex situ* populations will be recorded on the NOGN database.

Cost estimate (Action 9.2)	
Salary year 1-5 @ \$245/day (10 days/yr)	\$12 250
Office/admin support year 1-5 @ \$185/day (10 days/yr)	\$ 9 2 50
Travel and car hire @ 275/day (10 days/yr)	\$13 750
Resources and equipment	\$5 000
Total year 1-5	\$40 250

Performance criteria for Action 9.2;

- *Ex situ* populations of at least 10 plants exist for taxa at risk of imminent extinction in the wild.
- Guidelines for propagation and cultivation of taxa at risk of imminent extinction in the wild are available to appropriate orchid growers.

Action 9.3 Investigate techniques for mycorrhizal fungi isolation and storage (low priority)

Orchid seeds cannot utilise their own lipid reserves, break down starch and photosynthesise (Arditti 1992). Under natural conditions, mycorrhizal fungi infect orchid seeds following initial uptake of water before germination can occur (Jones 1988). The fungal association provides nutrients for germination and seedling development (Jones 1988). Dependence on mycorrhizal fungi beyond seedling development is not well understood for Tasmanian taxa. Fungi are generally not present in the dormant tubers of terrestrial orchids. However, it seems that plants are reinfected each year (Jones 1988).

A better understanding of the relationships between mycorrhizal fungi and threatened orchids in Tasmania will improve the chances of successful recovery. Fungi isolated from plants may 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 populations from propagated plants.

Techniques have been developed for isolating and culturing mycorrhizal fungi associated with *Diuris, Prasophyllum, Pterostylis* and *Arachnorchis* as part of mainland recovery programs (Coates 2002). Work to improve techniques is continuing, however little work has been done on Tasmanian taxa. The Tasmanian Orchid Recovery Team will encourage research through the University system into Tasmanian taxa and investigate the most effective way of isolating and storing mycorrhizal fungi of taxa facing imminent extinction in the wild (**Appendix 6**).

Cost estimate (Action 9.3)	
Salary year 1-5 @ \$245/day (2 days/yr)	\$2 450
Office/admin support year 1-5 @ \$185/day (2 days/yr)	\$1 850
Research grants	\$30 000
Total year 1-5	\$34 300

Performance criteria for Action 9.3;

• Effective means of isolating and storing mycorrhizal fungi have been investigated for taxa facing imminent extinction.
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APPENDIX 1.

Orchid Summary (June 2006)

Species name as per the Australian Plant Census (CHAH 2005 & 2006)	Species name as listed under the TSP Act schedules (June 2006)	Species name as listed under the EPBC Act schedules (June 2006)	Species name as per <i>The Orchids</i> <i>of Tasmania</i> (Jones et al. 1999)	Common Name (as per the TSP Act)	TSP Act status	EPBC Act status	Endemic Status	Listing Statement	Priorities
Anzybas fordhamii	Anzybas fordhamii		Corybas fordhamii	Banded helmet orchid	e				Requires survey
Arthrochilus huntianus subsp. huntianus	Thynninorchis huntiana		Arthrochilus huntianus subsp. huntianus	Elbow orchid	e				
Arthrochilus huntianus subsp. nothofagicola	Thynninorchis nothofagicola	Arthrochilus huntianus subsp. nothofagicola	Arthrochilus huntianus subsp. nothofagicola	Myrtle elbow orchid	e	CR	endemic		
Caladenia anthracina	Caladenia anthracina	Caladenia anthracina	Caladenia anthracina	Black-tipped spider orchid	e	CR	endemic	2001	
Caladenia aurantiaca	Caladenia aurantiaca		Caladenia aurantiaca	Orange-tip caladenia	e				
Caladenia australis	Caladenia australis		Caladenia australis	Southern spider orchid	e				
Caladenia brachyscapa	Caladenia brachyscapa		Caladenia brachyscapa	Short spider orchid	e				
Caladenia campbellii	Caladenia campbellii	Caladenia campbellii	Caladenia campbellii	Thick-stem caladenia	e	CR	endemic		
Caladenia cardiochila	Caladenia cardiochila		Caladenia cardiochila	Heart-lip spider orchid	х				
Caladenia caudata	Caladenia caudata	Caladenia caudata	Caladenia caudata	Tailed spider orchid	r	VU	endemic		Requires survey
Caladenia congesta	Caladenia congesta		Caladenia congesta	Black-tongue caladenia	e				

Species name as per the Australian Plant Census (CHAH 2005 & 2006)	Species name as listed under the TSP Act schedules (June 2006)	Species name as listed under the EPBC Act schedules (June 2006)	Species name as per <i>The Orchids</i> <i>of Tasmania</i> (Jones et al. 1999)	Common Name (as per the TSP Act)	TSP Act status	EPBC Act status	Endemic Status	Listing Statement	Priorities
Caladenia dienema	Caladenia dienema	Caladenia dienema	Caladenia dienema	Windswept spider orchid	V	CR	endemic	2001	Requires survey
<i>Caladenia filamentosa</i> var. filamentosa	Caladenia filamentosa		Caladenia filamentosa var. filamentosa	Daddy long- legs	r				
Caladenia lindleyana	Caladenia lindleyana	Caladenia lindleyana	Caladenia lindleyana	Lindley's spider orchid	e	CR	endemic	2001	Requires survey
Caladenia pallida	Caladenia pallida	Caladenia pallida	Caladenia pallida	Rosy spider orchid	e	CR	endemic		Needs to be relocated
Caladenia patersonii	Caladenia patersonii		Caladenia patersonii	Paterson's spider orchid	v			2001	Requires survey
Caladenia prolata	Caladenia prolata		Caladenia prolata	Long-leaved caladenia	e				
Caladenia pusilla	Caladenia pusilla		Caladenia pusilla	Tiny caladenia	r				
Caladenia saggicola	Caladenia saggicola	Caladenia saggicola	Caladenia saggicola	Sagg spider orchid	е	CR	endemic	2001	Needs to be accurately mapped owners; management plan being developed
Caladenia sylvicola	Caladenia sylvicola	Caladenia sylvicola	Caladenia sylvicola	Forest fingers	е	CR	endemic	2003	
Caladenia tonellii	Caladenia tonellii	Caladenia tonellii	Caladenia tonellii	Robust fingers	e	CR	endemic		
Calochilus campestris	Calochilus campestris		Calochilus campestris	Copper beard orchid	e				
Chiloglottis trapeziformis	Chiloglottis trapeziformis		Chiloglottis trapeziformis	Broad-lip bird orchid	e				
	Corunastylis morrisii		Genoplesium morrisii	Bearded midge orchid	e				
Corunastylis nuda	Corunastylis nuda		Genoplesium nudum	Tiny midge orchid	r				

Species name as per the Australian Plant Census (CHAH 2005 & 2006)	Species name as listed under the TSP Act schedules (June 2006)	Species name as listed under the EPBC Act schedules (June 2006)	Species name as per <i>The Orchids</i> <i>of Tasmania</i> (Jones et al. 1999)	Common Name (as per the TSP Act)	TSP Act status	EPBC Act status	Endemic Status	Listing Statement	Priorities
Corunastylis nudiscapa	Corunastylis nudiscapa		Genoplesium nudiscapum	Dense midge orchid	х				
Cryptostylis leptochila	Cryptostylis leptochila		Cryptostylis leptochila	Small tongue orchid	е			2002	Requires surveys and accurate mapping
Cyrtostylis robusta	Cyrtostylis robusta		Cyrtostylis robusta	Large gnat orchid	r				
Diuris lanceolata	Diuris lanceolata	Diuris lanceolata	Diuris lanceolata	Large golden moths	е	EN	endemic	2001	Requires surveys and accurate mapping
Diuris palustris	Diuris palustris		Diuris palustris	Swamp diuris	е			2001	Requires surveys and accurate mapping
Genoplesium brachystachyum	Genoplesium brachystachyum	Genoplesium brachystachyum	Genoplesium brachystachyum	Short-spiked midge orchid	е	EN	endemic		
Genoplesium firthii	Corunastylis firthii	Genoplesium firthii	Genoplesium firthii	Firth's midge orchid	е	CR	endemic	2002	Relocate site and develop methods for protection and management
Microtis atrata	Microtidium atratum		Microtis atrata	Yellow onion orchid	r				
Microtis orbicularis	Hydrorchis orbicularis		Microtis orbicularis	Swamp onion orchid	r				
Oligochaetochilus squamatus	Pterostylis squamata		Pterostylis squamata	Ruddy greenhood	r				
Orthoceras strictum	Orthoceras strictum		Orthoceras strictum	Horned orchid	r				

Species name as per the Australian Plant Census (CHAH 2005 & 2006)	Species name as listed under the TSP Act schedules (June 2006)	Species name as listed under the EPBC Act schedules (June 2006)	Species name as per <i>The Orchids</i> <i>of Tasmania</i> (Jones et al. 1999)	Common Name (as per the TSP Act)	TSP Act status	EPBC Act status	Endemic Status	Listing Statement	Priorities
Prasophyllum amoenum	Prasophyllum amoenum	Prasophyllum amoenum	Prasophyllum amoenum	Dainty leek orchid	e	EN	endemic	2001	Needs to be accurately mapped and management guidelines developed in conjunction with land manager
Prasophyllum apoxychilum	Prasophyllum apoxychilum	Prasophyllum apoxychilum	Prasophyllum apoxychilum	Tapered leek orchid	e	EN	endemic	2001	Requires surveys and accurate mapping
Prasophyllum castaneum	Prasophyllum castaneum	Prasophyllum castaneum	Prasophyllum castaneum	Chestnut leek orchid	e	CR	endemic	2001	Requires surveys and accurate mapping
Prasophyllum favonium	Prasophyllum favonium	Prasophyllum favonium	Prasophyllum favonium	Western leek orchid	e	CR	endemic	2001	Requires surveys and accurate mapping
Prasophyllum incorrectum	Prasophyllum incorrectum	Prasophyllum correctum	Prasophyllum correctum	Golfers leek orchid	е	EN	endemic	2001	Requires surveys of smaller populations
Prasophyllum milfordense	Prasophyllum milfordense	Prasophyllum milfordense	Prasophyllum milfordense	Milford leek orchid	e	CR	endemic	2001	Needs to be accurately mapped owners, management plan being developed
	Prasophyllum montanum		Prasophyllum montanum	Mountain leek orchid	е			2001	Requires surveys and accurate mapping
Prasophyllum olidum	Prasophyllum olidum	Prasophyllum olidum	Prasophyllum olidum	Pungent leek orchid	е	CR	endemic	2001	Requires surveys and accurate mapping
Prasophyllum perangustum	Prasophyllum perangustum	Prasophyllum perangustum	Prasophyllum perangustum	Knocklofty leek orchid	e	CR	endemic	2001	Needs to be relocated, marked and mapped
Prasophyllum pulchellum	Prasophyllum pulchellum	Prasophyllum pulchellum	Prasophyllum pulchellum	Pretty leek orchid	е	CR	endemic	2001	

Species name as per the Australian Plant Census (CHAH 2005 & 2006)	Species name as listed under the TSP Act schedules (June 2006)	Species name as listed under the EPBC Act schedules (June 2006)	Species name as per <i>The Orchids</i> <i>of Tasmania</i> (Jones et al. 1999)	Common Name (as per the TSP Act)	TSP Act status	EPBC Act status	Endemic Status	Listing Statement	Priorities
Prasophyllum pyriforme	Prasophyllum pyriforme		Prasophyllum pyriforme	Graceful leek orchid	е			2001	Requires surveys and accurate mapping
Prasophyllum robustum	Prasophyllum robustum	Prasophyllum robustum	Prasophyllum robustum	Robust leek orchid	е	CR	endemic	2001	Requires survey and management guidelines developed with landowners
Prasophyllum secutum	Prasophyllum secutum	Prasophyllum secutum	Prasophyllum secutum	Northern leek orchid	v	EN	endemic	2001	
Prasophyllum stellatum	Prasophyllum stellatum	Prasophyllum stellatum	Prasophyllum stellatum	Ben Lomond leek orchid	е	CR	endemic	2001	Requires surveys and negotiations with land managers
Prasophyllum tadgellianum	Prasophyllum tadgellianum		Prasophyllum tadgellianum	Tadgell's leek orchid	r			2001	Requires surveys and accurate mapping
Prasophyllum taphanyx	Prasophyllum taphanyx			Graveside leek orchid	е		endemic		Requires negotiations with land managers
Prasophyllum tunbridgense	Prasophyllum tunbridgense	Prasophyllum tunbridgense	Prasophyllum tunbridgense	Tunbridge leek orchid	е	EN	endemic	2001	Requires surveys and accurate mapping
Pterostylis atriola	Pterostylis atriola	Pterostylis atriola	Pterostylis atriola	Snug greenhood	е	EN	endemic	2001	Requires surveys and accurate mapping
Pterostylis commutata	Pterostylis commutata	Pterostylis commutata	Pterostylis commutata	Midland greenhood	e	CR	endemic	2001	Requires surveys and accurate mapping & negotiations with land managers to develop management guidelines

Species name as per the Australian Plant Census (CHAH 2005 & 2006)	Species name as listed under the TSP Act schedules (June 2006)	Species name as listed under the EPBC Act schedules (June 2006)	Species name as per <i>The Orchids of Tasmania</i> (Jones et al. 1999)	Common Name (as per the TSP Act)	TSP Act status	EPBC Act status	Endemic Status	Listing Statement	Priorities
Pterostylis cucullata	Pterostylis cucullata	Pterostylis cucullata	Pterostylis cucullata	Leafy greenhood	е	VU		2001	Provide maps to land managers and guidelines for management
	Pterostylis falcata		Pterostylis falcata	Sickle greenhood	r				
Pterostylis grandiflora	Pterostylis grandiflora		Pterostylis grandiflora	Superb greenhood	r			2002	Requires surveys and accurate mapping
Pterostylis pratensis	Pterostylis pratensis	Pterostylis pratensis	Pterostylis pratensis	Liawenee greenhood	r	VU	endemic	2001	Requires survey and accurate mapping
Pterostylis rubenachii	Pterostylis rubenachii	Pterostylis rubenachii	Pterostylis rubenachii	Arthur River greenhood	e	EN	endemic	2001	Requires guideline for management
	Pterostylis sanguinea		Pterostylis sanguinea	Banded greenhood	r				
Pterostylis tunstallii	Pterostylis tunstallii		Pterostylis tunstallii	Tunstall's greenhood	e			2001	Requires surveys & land at start of walking track should be purchased to ensure protection of site
Pterostylis wapstrarum	Pterostylis wapstrarum	Pterostylis wapstrarum	Pterostylis wapstreorum	Fleshy greenhood	е	CR	endemic	2001	Investigate current management & map population
Pterostylis ziegeleri	Pterostylis cycnocephala	Pterostylis ziegeleri	Pterostylis cycnocephala & Pterostylis ziegeleri	Swan greenhood	v	EN	endemic	2001	
Thelymitra antennifera	Thelymitra antennifera		Thelymitra antennifera	Rabbit-ears	e				
Thelymitra benthamiana	Thelymitra benthamiana		Thelymitra benthamiana	Blotched sun orchid	e				
Thelymitra holmesii	Thelymitra holmesii		Thelymitra holmesii	Holmes' sun orchid	r				

Species name as per the Australian Plant Census (CHAH 2005 & 2006)	Species name as listed under the TSP Act schedules (June 2006)	Species name as listed under the EPBC Act schedules (June 2006)	Species name as per <i>The Orchids</i> <i>of Tasmania</i> (Jones et al. 1999)	Common Name (as per the TSP Act)	TSP Act status	EPBC Act status	Endemic Status	Listing Statement	Priorities
Thelymitra jonesii	Thelymitra jonesii	Thelymitra jonesii	Thelymitra azurea	Sky-blue sun orchid	е	CR	endemic	2002	Check with council current management and reserve status of Kingston site & survey other sites
Thelymitra malvina	Thelymitra malvina		Thelymitra malvina	Mauve- tufted sun orchid	е			2001	
Thelymitra mucida	Thelymitra mucida		Thelymitra mucida	Plum orchid	r				

TSP Act: x = extinct, e = endangered, v = vulnerable, r = rare; **EPBC Act:** X = Extinct, CR = Critically Endangered, EN = Endangered, VU = Vulnerable.

Map of threatened orchid records in Tasmania

Threatened Orchid Records



Priority populations

Taxon	Population	NRM Region	Tenure	Year Last Recorded	# Plants Seen	Area (ha)	Priority
Arthrochilus huntianus subsp. nothofagicola	Needles Picnic ground	South	WHA/State Forest	2003	3-5		1
Caladenia anthracina	Greenhill	North	Private land	2002	19	0.679	2
Caladenia anthracina	Merton vale	North	Private land	2003	20		2
Caladenia anthracina	Beaufront	North	Private land	2002	11		2
Caladenia anthracina	Campbell Town Golf Course	North	Campbell Town Golf Club - Covenant	2002	2		2
Caladenia anthracina	Chiswick	North	Private land	1995	25		2
Caladenia dienema	Bottle Flat	North West	Arthur-Pieman Conservation Area	1988	10	0.25	2
Caladenia dienema	Nelson Bay River	North West	Arthur-Pieman Conservation Area	1998	15	0.02	2
Caladenia dienema	Rebecca Creek	North West	Arthur-Pieman Conservation Area	1999	40	0.2	2
Caladenia lindleyana	Diprose Lagoon	North	Diprose Lagoon Nature Reserve	1997	1		1
Caladenia pallida	Henry Somerset Private Sanctuary	North West	Henry Somerset Private Sanctuary - Gunns Ltd.	1987			1
Caladenia pallida	Epping Forest	North	Private land	1979			1

Taxon	Population	NRM Region	Tenure	Year Last Recorded	# Plants Seen	Area (ha)	Priority
Caladenia saggicola	Milford	South	Private land	1996	67		1
Genoplesium brachystachyum	Heemskirk and Temma Road Junction	North West	Arthur-Pieman Conservation Area	1999			3
Genoplesium brachystachyum	Rocky Cape Lighthouse	North West	Rocky Cape National Park	1999			3
Genoplesium firthii	Percy Street, Coles Bay	South	Nature Strip - Coles Bay Council	1997	12	0.1	1
Diuris lanceolata	Anthony Beach 2	North West	Private Land	2002	150	0.149	3
Diuris lanceolata	Anthony Beach 1	North West	Private Land	2002	200	0.719	3
Diuris lanceolata	Rebecca Lagoon 2	North West	Arthur-Pieman Conservation Area	2002	100	0.047	3
Diuris lanceolata	Rebecca Lagoon 1	North West	Arthur-Pieman Conservation Area	2002	50	0.068	3
Diuris palustris	Tiger Creek	North West	Arthur-Pieman Conservation Area	2002	40	0.02	3
Diuris palustris	Possum Banks	North West	Arthur-Pieman Conservation Area	2002	15	0.001	3
Caladenia campbellii	Newhaven Road	North West	Private land	1995	<50		2
Caladenia campbellii	Devils Elbow Road	North West	Crown land	1997	50	1	2
Caladenia sylvicola	Ridgeway Park	South	Ridgeway Park - Hobart City Council	1997	12-15	0.005	1
Caladenia tonellii	Henry Somerset Private Sanctuary	North West	Henry Somerset Private Sanctuary - Gunns Ltd.	1994			2
Caladenia tonellii	Old Deloraine Road	North West	State Forest	1996			2
Caladenia tonellii	Latrobe Municipal Water	North West	Latrobe Municipal Water Reserve	1996			2

Taxon	Population	NRM Region	Tenure	Year Last Recorded	# Plants Seen	Area (ha)	Priority
	Reserve						
Caladenia tonellii	Shanty Road	North	Crown land	1998	5		2
Prasophyllum amoenum	Snug Tiers 1	South	Snug Tiers Nature Recreation Area	2000	50	4	3
Prasophyllum amoenum	Snug Tiers 2	South	Snug Tiers Nature Recreation Area	1997	10	0.003	3
Prasophyllum castaneum	Pineapple Rocks Track	South	South Bruny National Park	1995	25	0.025	2
Prasophyllum castaneum	Mt Brown	South	Tasman National Park	1995	15	3	2
Prasophyllum incorrectum	Campbell Town Golf Course	North	Campbell Town Golf Club	1996			1
Prasophyllum milfordense	Milford	South	Private land	2000	200		1
Prasophyllum olidum	Campbell Town Golf Course	North	Campbell Town Golf Club	1996	200	0.05	1
Prasophyllum perangustum	Knocklofty	South	Knocklofty Park - Hobart City Council	2001	3		1
Prasophyllum pulchellum	Labillardiere Peninsula	South	South Bruny National Park	1994	50	0.04	2
Prasophyllum pulchellum	Squeaky Point	North West	Private land	2003	50	1	2
Prasophyllum pyriforme	Three Hummock Island	North West	3 Hummock Island State Reserve	1999	<70	0.25	3
Prasophyllum pyriforme	Squeaky Point	North West	Private land	2003	12	0.25	3

Taxon	Population	NRM Region	Tenure	Year Last Recorded	# Plants Seen	Area (ha)	Priority
Prasophyllum robustum	Dooleys Hill	North West	Private land	1998	50	0.1	1
Prasophyllum secutum	Lulworth Tip	North	Crown land	1990	100		3
Prasophyllum secutum	Anthony Beach	North West	Private land	1990	100		3
Prasophyllum stellatum	Storys Creek	North	Private land	1993	40	3	1
Prasophyllum tunbridgense	Tunbridge Lagoon	South	Township Lagoon Nature Reserve	1999	40	1	3
Prasophyllum tunbridgense	Tunbridge	South	Private land	1999	45	0.5	3
Prasophyllum tunbridgense	North of Tunbridge	North	Private land	1999	45	1	3
Pterostylis atriola	Snug Tiers	South	Snug Tiers Nature Recreation Area	1997	80	5	3
Pterostylis commutata	Cameron	North	Private land	1999	17	0.5	2
Pterostylis commutata	Ross Anglican Cemetery	North	Ross Anglican Cemetery	2000	10	0.25	2
Pterostylis cucullata	Possum Banks	North West	Arthur-Pieman Conservation Area	2002	300	0.07	3
Pterostylis cucullata	Hunter Island	North West	Lease hold - under negotiation	2002	1160	0.272	3
Pterostylis cucullata	3 Hummock Island 1	North West	3 Hummock Island State Reserve	2002	76	0.123	3
Pterostylis cucullata	3 Hummock Island 2	North West	3 Hummock Island State Reserve	2002	20	0.019	3
Pterostylis cucullata	Gardener Point	North West	Arthur-Pieman Conservation Area	2002			3
Pterostylis rubenachii	Bottle flat	North West	Arthur-Pieman Conservation Area	2002	250		2

Taxon	Population	NRM Region	Tenure	Year Last Recorded	# Plants Seen	Area (ha)	Priority
Pterostylis rubenachii	Tiger flat	North West	Arthur-Pieman Conservation Area	2002	200		2
Pterostylis rubenachii	Tiger Creek	North West	Arthur-Pieman Conservation Area	2002	176	0.3	2
Pterostylis tunstallii	Strezlecki Walking Track	North	Strezlecki National Park – Flinders Island	1999	50	2	3
Pterostylis tunstallii	Great Dog Island	North	Tasmanian Aboriginal Land Council	1992	18	0.16	3
Pterostylis wapstrarum	Pontville	South	Defence Force Rifle Range	1998	120	1	1
Pterostylis ziegeleri	Cape Portland	North	Cape Portland Private Sanctuary	1998	110-130	1.2	3
Pterostylis ziegeleri	Lanoma Point	North	Musselroe Bay Conservation Area	1983			3
Thelymitra antennifera	Archers Knob	North	Narawntapu National Park	1987	25	1	3
Thelymitra jonesii	Pirates Road	South	State Forest	2002	20	0.195	1
Thelymitra malvina	Denison Street, Kingston	South	Crown land	2001	12	0.6	3

Taxa facing imminent extinction in the wild

Taxon	# populations	Total # of individuals	Justification
Arthrochilus huntianus subsp.nothofagicola	1	3	Taxon has only ever been recorded at one location when approximately 5 plants were seen. 3 plants were observed in 2003. Population has been fenced to protect it from lyrebirds
Caladenia lindleyana	4	Unknown	Taxon last observed in 1997 at Diprose Lagoon Nature Reserve when only one plant was seen. No population information is available from other recorded populations but it is likely to exist in very low numbers since there have been few recently reported observations.
Caladenia pallida	2	Unknown	Despite distinctive appearance taxon has not been seen since 1987. If it still exists it is likely to occur in critically low numbers.
Caladenia saggicola	1	200	Population occurs at one location and despite good numbers in the population 1 catastrophic event could result in loss of this species.
Genoplesium brachystachyum	3	Unknown	Known from 3 populations however little information is available on the size or security of populations
Genoplesium firthii	2	Unknown	Taxon is known from 2 locations. It has only been observed at the Park Street location in recent years (1999) though at this site it occurs on a nature strip and is not secure.
Caladenia sylvicola	1	Unknown	Only recorded from 1 location. Has not been seen since 1996.
Prasophyllum milfordense	1	200	Population occurs at one location and despite good numbers in the population 1 catastrophic event could result in loss of this species.
Prasophyllum olidum	1	200	Population occurs at one location and despite good numbers in the population 1 catastrophic event could result in loss of this species.
Prasophyllum perangustum	1	3	Population only known from 1 location that was last observed in 2001. Population numbers believed to be very low.
Prasophyllum robustum	1	50	Population occurs at one location and despite good numbers in the population 1 catastrophic event could result in loss of this species.

Taxon	# populations	Total # of individuals	Justification
Prasophyllum stellatum	1	40	Population occurs at one location and despite good numbers in the population 1 catastrophic event could result in loss of this species.
Pterostylis wapstrarum	1	120	Population occurs at one location and despite good numbers in the population 1 catastrophic event could result in loss of this species.
Thelymitra jonesii	1	20	Population known from 4 locations however has only been observed at 2 locations in recent years where population numbers are low.

Procedure to be followed to determine management for threatened orchid populations



Threatened Tasmanian Orchid Flora Recovery Plan 2006-2010 54





Budget

Action	Working days year 1-5	Priority	Cost estimate
1.1 Baseline surveys	50	High	\$40,250.00
1.2 Conservation status assessments	30	High	\$4,300.00
1.3 Taxonomy	10	High	\$4,300.00
2.1 Notify landowners	25	High	\$10,750.00
2.2 Critical management actions	100	High	\$88,500.00
2.3 Manage spatial data	100	High	\$50,500.00
2.4 Identify priority populations	25	High	\$10,750.00
2.5 Identify threats and develop management strategies for priority populations	125	High	\$53,750.00
2.6 Management plans and guidelines	100	Moderate	\$81,750.00
2.7 Pursue long term protection of priority populations	150	High	\$78,250.00
3.1 Volunteer searches	25	Moderate	\$10,750.00
3.2 Develop systems to standardise data	10	Low	\$9,300.00
4.1 Prepare listing statements	75	High	\$32,250.00
4.2 Establish and facilitate regional recovery teams	60	Moderate	\$25,800.00
4.3 Technical guidelines and training in orchid monitoring and management	50	Moderate	\$35,250.00
4.4 Promote recovery program and community participation	20	Moderate	\$8,600.00
5.1 Maintain Tasmanian Orchid Recovery Team	10	High	\$27,300.00
5.2 Coordinate communication between recovery program participants	20	Moderate	\$16,100.00
6.1 Monitor Managed sites	75	Moderate	\$62,875.00
6.2 Monitor pollination and identify pollinators	25	Low	\$50,625.00
6.3 Identify soil characteristics that promote orchid and fungal symbiont growth	25	Low	\$50,625.00
7.1 Manage microhabitats	50	Moderate	\$45,250.00
7.2 Hand pollinate	25	Moderate	\$17,625.00
7.3 Collect seed and restock populations	25	Moderate	\$18,625.00
8.1 Identify critical habitat	25	Moderate	\$10,750.00
8.2 Identify potential habitat	10	Low	\$4,300.00
9.1 Establish seed bank	10	Moderate	\$27,625.00

9.2 Establish and maintain ex-situ populations	50	Low	\$40,250.00
9.3 Investigate techniques for mycorrhizal fungi isolation and storage	10	Low	\$34,300.00
High priority sub total			\$400,900.00
Moderate priority sub total			\$352,400.00
Low priority sub total			\$189,400.00
		Total	\$951,300.00

Populations requiring baseline surveys

Site	Land owner/manager	Taxon	Priority	Month
Flinders Island	Unknown	Anzybas fordhamii	High*	September
1 site	Flinders Island	Arthrochilus huntianus subsp. huntianus	Moderate	January
Annandale	Private	Caladenia anthracina	High	Oct/November
Chiswick	Private	Caladenia anthracina	High	Oct/November
Deal Island	PWS	Caladenia aurantiaca	Moderate*	November
Flinders Island	Unknown	Caladenia australis	Moderate*	November
Clarke Island	Unknown	Caladenia brachyscapa	High*	November
Devils Elbow Road	Crown Land	Caladenia campbellii	High	Oct/November
Newhaven Road	Crown Land	Caladenia campbellii	High	Oct/November
All records	Various	Caladenia caudata	Low	Sept/October
All records	Various	Caladenia congesta	Moderate	Nov/December
9 sites	Various	Caladenia dienema	High	Oct/November
3 sites	Various	Caladenia lindleyana	High	Oct/November
Henry Somerset Orchid Conservation Area	Gunns	Caladenia pallida	High*	November
Epping	Private	Caladenia pallida	High*	November
All records	Various	Caladenia patersonii	Moderate	Oct/November
All records	Various	Caladenia pusilla	Low	Oct/November
Milford	Private	Caladenia saggicola	High	October
Ridgeway Park	Hobart City Council	Caladenia sylvicola	High*	Oct/November
3 sites	Various	Caladenia tonellii	High	Oct/November
Great Dog Island	Aboriginal Land Council of Tasmania	Chiloglottis trapeziformis	High	September
All records	Various	Corunastylis morrisii	Moderate	Jan-April
All records	Various	Corunastylis nuda	Low	Jan-March
All records	Various	Cryptostylis leptochila	Moderate	Nov-March
All records	Various	Cyrtostylis robusta	Low	June-August

Site	Land owner/manager	Taxon	Priority	Month
4 sites	Various	Diuris lanceolata	High	Oct-December
10 sites	Various	Diuris palustris	High	Sept-November
6 sites	Various	Genoplesium brachystachyum	High	Feb-April
Coles Bay	Coles Bay Council	Genoplesium firthii	High	Dec-March
All records	Various	Microtis orbicularis	Low	November
All records	Various	Microtis atrata	Low	Oct-December
All records	Various	Oligochaetochilus squamatus	Low	Dec-March
All records	Various	Orthoceras strictum	Low	Dec-Feburary
Snug Tiers Nature Recreation Area - 2 sites	PWS	Prasophyllum amoenum	High	January
All records	Various	Prasophyllum apoxychilum	High	Oct/December
Pineapple Rocks Track	PWS	Prasophyllum castaneum	High	December
Mt Brown	PWS	Prasophyllum castaneum	High	December
Arthur-Pieman Conservation Area - 7 sites	PWS	Prasophyllum favonium	High	Oct/November
Nth of Campbell Town "Wanstead"	Private	Prasophyllum incorrectum	High	Oct/November
Campbell Town Golf Course	Campbell Town Golf Club	Prasophyllum incorrectum	High	Oct/November
Milford	Private	Prasophyllum milfordense	High	November
3 sites	Various	Prasophyllum montanum	Moderate	January
Campbell Town Golf Course	Campbell Town Golf Club	Prasophyllum olidum	High	Nov/December
Knocklofty Reserve	Hobart City Council	Prasophyllum perangustum	High*	Nov/December
5 sites	Various	Prasophyllum pulchellum	High	November
2 sites	3 Hummock Island, Dorothy Reeves Reserve	Prasophyllum pyriforme	Moderate	Oct/November
Dooleys Hill	Various private landowners	Prasophyllum robustum	High	November
13 sites	Various	Prasophyllum secutum	Moderate	November
Storys Creek	Private	Prasophyllum stellatum	High	February
3 sites	World Heritage Area	Prasophyllum tadgellianum	Low	December

Site	Land owner/manager	Taxon	Priority	Month
5 sites	Various	Prasophyllum tunbridgense	High	Oct/November
6 sites	Various	Pterostylis atriola	Moderate	Jan/March
5 sites	Various	Pterostylis commutata	High	Jan/March
15 sites	Various	Pterostylis ziegeleri	Moderate	Sept/November
3 sites	Various	Pterostylis falcata	Low	Nov/January
22 sites	Various	Pterostylis grandiflora	Low	April-August
11 sites	Various	Pterostylis pratensis	Low	Nov/December
All records	Various	Pterostylis sanguinea	Low	June-Sept
3 sites	Various	Pterostylis tunstallii	Moderate	July-September
Pontville Army Rifle Range	Commonwealth Land	Pterostylis wapstrarum	High	Oct/November
2 Sites	Private	Pterostylis ziegeleri	High	October
All records	Various	Thelymitra antennifera	Moderate	Oct/November
6 sites	Various	Thelymitra holmesii	Low	Nov-December
6 sites	Various	Thelymitra jonesii	High	November
7 sites	Various	Thelymitra malvina	Moderate	Oct/November
4 sites	Various	Thelymitra mucida	Low	Nov/December

Record sheet

Collector: Date:	Address: Phone:	E-mail:	
POPULATION DETAILS			
Family:		Species:	
Common Name:		Habit:	
Estimated number of individuals:		Estimate of area occupied:	
LOCATION DETAILS			

Tas Map:	Aspect:	Elevation (m):
Easting (6): Northing (7): (Datum - AGD 66 or GDA 94?) Accuracy: (radius in m)	Estimated GPS	
Locality Description:	Tenure:	

SITE DESCRIPTION

Geology: Soil texture:	Rock cover (%):
Site description:	Landform: Drainage:
Vegetation community description:	Associated species:

OTHER NOTES

(Eg. fire history, land use, threats, disturbance, flower colour, presence of fruit/flowers, evidence of recruitment, population demographics, etc.)

Has a specimen been collected?

Critical management actions

Taxon	Population	Required action
Arthrochilus huntianus subsp. nothofagicola	Needles Picnic ground	In 2003 three plants were relocated at the Needles Picnic Ground at the edge of a fence constructed to protect the site from foraging lyrebirds. The plants had not been seen since 1996 and it appears the fence is beneficial for the population. It is recommended that a larger area is fenced in an attempt to expand the population. The location of any flowering plants should also be marked with a stainless steel peg and numbered tag approximately 10cm away from the plant so that flowering and survival of individual plants can be monitored.
Caladenia anthracina	Greenhill	In 2002 the owners of the Greenhill property indicated that they were keen to manage a small patch of degraded remnant <i>Eucalyptus pauciflora</i> woodland to protect a significant population (19 sighted) of <i>Caladenia anthracina</i> located there. A further site visit is recommended to mark and map the location of all flowering plants. A simple monitoring system that the owners could implement should also be developed if they are interested. Sheep currently graze the site. Grazing may benefit the orchids by maintaining an open habitat, however it may also be promoting invasion of pasture species. If sheep are excluded a patch burning regime should be implemented to maintain an open habitat. At the time of the site visit in 2002, the owners were not interested in a conservation covenant however the RFA Private Forest Reserves Program is currently talking with the landowners. The project officer should inform the RFA Private Forest Reserves Program of the ecological requirements of the orchid to ensure covenant conditions do not limit orchid management.

Caladenia anthracina	Merton vale	The site was visited in 2002 with the landowner and a number of issues were discussed. There is a patch of gorse in close vicinity to the population, which has the potential to engulf the population if left unchecked. The landowner is currently managing the gorse however he could use some assistance. It is recommended that the gorse be cut out and pasted with herbicide. The landowner could then continue with follow up work. In addition, the kangaroo grass in the vicinity of the population was becoming dense and rank possibly crowding out the orchids. This site could be used to test the response of <i>Caladenia anthracina</i> growing in native grassland to a small patch burn. Further discussions with the landowner are required before any actions are taken, however he was happy to work with the Nature Conservation Branch when contacted in 2002.
Caladenia anthracina	Beaufront	A site visit in 2002 indicated that the small cage protecting the population from grazing by cattle, deer and macropods has been effective. However the cage was in poor condition at the time of the visit. It had been trampled and some of the plants had grown through the cage and been eaten off. At the very least a new stronger and larger cage should be constructed and erected over the population. Discussions were had with the landowner with regards to construction of a larger fenced off area around the population that would exclude deer, cattle and macropods in the hope that when grazing pressure is removed the population may expand. The landowner was not opposed to the idea. Further discussions are required to determine the exact location of the fence. It is recommended that the entire hill be fenced off if the landowner is not opposed to such an area.
Caladenia saggicola	Milford	Discussions were held with the landowners of the Milford property in 2002. The property provides critical habitat for two threatened orchids. It is unclear whether these populations are in decline, however two potential threats are rabbits and competition from surrounding vegetation. The landowners indicated that they would be willing to work with the Nature Conservation Branch to trial fencing the population from rabbits and small burns to maintain an open sedgy understorey. Further discussion should be held with the landowners prior to implementing these actions.

Caladenia sylvicola	Ridgeway Park	The only known population of forest fingers has not been seen for a number of years. The exact location of the population is unknown. It is important that the population is relocated, mapped, and marked in the field and the Hobart City Council is informed of its location and appropriate management.			
Prasophyllum milfordense	Milford	As for <i>Caladenia saggicola.</i>			
Prasophyllum perangustum	Knocklofty Reserve	The only known population of the Knocklofty leek orchid has not been seen for a number of years. The exact location of the population is unknown. It is important that the population is relocated, mapped and marked in the field and the Hobart City Council is informed of its location and appropriate management.			
Pterostylis cucullata	Possum Banks	Construction of a fence to exclude cattle from Possum Banks has been proposed. If this fence is constructed the population of leafy greenhoods that grow on the dunes of possum banks should be monitored for change. The proposed location of the fence will place some of the population outside the excluded area. The population should be monitored inside and outside the fence so the effects of exclusion from cattle grazing can be estimated.			
Pterostylis rubenachii	Bottle Flat	The Arthur River Greenhood has been recorded at sites in the Art Pieman Conservation Area. These sites are heavily grazed during summ The impacts of grazing on the population are unknown. An exclusion should be set up to monitor the effect of excluding cattle from the area is possible that summer grazing will cease in the Arthur Pier Conservation Area. It is therefore important to have an understanding the potential impacts this would have on the populations.			
Pterostylis rubenachii	Tiger Flat	As above.			
Pterostylis rubenachii	Tiger Creek	As above.			

Various	Various	Incentives are available for establishment of conservation covenants through the PFRP and PAPL Program. Incentives can be offered to landowners establishing conservation covenants over priority vegetation communities and communities that support threatened species. It is essential that these programs are aware of the location of threatened orchids particularly those that occur in priority vegetation communities. The PFRP and PAPL programs should be notified of the location of all threatened orchids occurring on private land and those that occur in priority vegetation communities.	
Various	Henry Somerset Private Sanctuary	The undergrowth in the Henry Somerset Private Sanctuary is becoming thick. A hot summer/autumn burn is required to open the vegetation up to allow orchid taxa to flower and set seed. In the past the site has been burnt under the supervision of the landowners (Gunns Pty. Ltd.) with assistance from the Tarleton Fire Brigade. A management plan is also required to guide future management.	
Various	Dorothy Reeves Reserve	The orchids on the Dorothy Reeves Reserve need to be surveyed an mapped. A conservation covenant and management plan is being finalise prior to resale. Assistance to implement the management plan will be required.	

Sites in urgent need of management plans or guidelines for management

Site	Land owner/manager	Threatened orchids recorded on site	Priority	Plan/guidelines
Henry Somerset Orchid Reserve	Gunns	Caladenia pallida	High	Plan
Dorothy Reeves Orchid Reserve	Tasmanian Land Conservancy	Prasophyllum pulchellum, Caladenia congesta, Prasophyllum pyriforme, Thelymitra holmesii, Caladenia tonellii	High	Plan
Milford	Private	Prasophyllum milfordense, Caladenia saggicola	High	Plan
Snug Tiers Nature Recreation Area	PWS	Prasophyllum amoenum	High	Guidelines
Dooleys Hill	Private	Prasophyllum robustum	Moderate	Guidelines
Storeys Creek	Private	Prasophyllum stellatum	Moderate	Guidelines
Ross Cemetery		Pterostylis commutata	High	Guidelines
Township lagoon	Northern Midlands Council	Pterostylis commutata	High	Guidelines
	Private	Pterostylis commutata	Moderate	Guidelines
Hunter Island	Lessee (Crown Land)	Pterostylis cucullata	Moderate	Guidelines
King Island	Private	Pterostylis cucullata	Moderate	Guidelines
Denison Street Kingston	Kingborough council	Thelymitra malvina	High	Guidelines
Pontville Army Rifle Range	Commonwealth land	Pterostylis wapstrarum, Pterostylis ziegeleri	Moderate	Guidelines

Arthur-Pieman Conservation Area sites	PWS	Pterostylis rubenachii, Caladenia dienema, Diuris palustris, Pterostylis cucullata, Prasophyllum favonium	High	Guidelines
Coles Bay Caravan Park	Federal Hotels	Corunastylis morrisii	High	Guidelines

Notes on monitoring orchid populations

Demographic studies

Demographic study (ie. study of the statistics of births, deaths, disease etc.) is the only way in which ecologists can analyse changes through time in the condition of a population (Hutchings 1990). Annual counts do not provide sufficient information on which to base management decisions or to assess the success or failure of management actions (Hutchings 1990). Therefore demographic studies involving annual census are required to determine ecological parameters like life span, rates of mortality and reproduction, age of reproductive maturity, and response to fire or management activities.

Demographic studies of terrestrial orchids are difficult because the orchids are not present above ground year round and their propensity to produce a leaf and flower is dependent on a range of factors (most not well understood) including density of competing vegetation and climatic conditions. Consequently it can be difficult to trace the progress of plants through their entire life cycle.

When conducting demographic studies of orchids it is essential that the exact locations of plants be recorded. This can be done in a number of ways and may include marking the location with a peg, surveying and a combination of both. In 2002 populations of *Caladenia anthracina, Pterostylis rubenachii* and *Thelymitra jonesii* were marked for future monitoring with a metal peg and a dog tag, which had the year and a number scratched into the surface. This technique has been used with some success in Victoria (pers. com. Andrew Pritchard, Fiona Coates).

The peg is approximately 12cm long and 2mm wide and is stainless steel so it will not rust. Rust could affect soil chemistry around the plants. The peg is placed in the soil approximately 10cm away from the actual plant. This is to avoid damaging the tuber of the plant. However it is essential that the direction the peg is moved away from the plant is systematic and recorded so that plants in close proximity do not get confused.



Monitoring systems

The following systems are being used in Victoria to monitor orchid populations. Each system has been designed to suit the specific site and population. It is recommended that these systems be used as a guide to designing monitoring systems for Tasmanian sites.

Transect

A transect line dissecting a population is delineated using two permanent pegs. A tape is stretched between the pegs. The locations of plants are mapped by measuring the distance along the transect and the distance out from the transect. A limit to the distance from the transect should be set so the plot has a defined area. Plants should also be marked with a peg so that their approximate location can be identified even if they fail to produce a leaf or flower. This system is effective for populations that are spread out and occupy a large patch.



Plots

Square plots of a defined area (ie 5mx5m) can be defined with permanent pegs. The location of each plant can be mapped by measuring the distance from two of the pegs (ie peg A and peg B). A formula can be used to plot the location of the plants on an X and Y axis. The location of pegs should also be recorded. This system is effective for a population that occurs in a single or multiple small welldefined patches.



Formulas

(X coordinate = (D1)*COS(90*($\pi/180$)-((ACOS(((Distance between pegs2)+ D12-D22)/((Distance between pegs)* D1)))))))

(Y coordinate = D1 *SIN(90*(π /180)-((ACOS (((Distance between pegs2)+ D12- D22)/((Distance between pegs2)* D1)))))))

Surveying

Some populations cannot be easily sampled using plots or transects because single plants tend to be scattered widely over a large area. In these cases surveying the exact location of plants using a theodolite or a GPS system that is accurate to 10 cm can be effective. The location of the plants should still be marked with a peg. Usually all the plants in a population will be sampled using this method because the plot does not have a defined area.

Mapping and recording seedlings.

It has been observed that seedlings in some orchid species have a high mortality rate. That is they develop and produce leaves but many die off before they reach reproductive maturity and do not re-emerge (pers. com. Andrew Pritchard and Gary French). Management practices like trimming competing vegetation, scarification of soil and distribution of seed around parent plants have ensured seedling establishment is dense around the parent plant. In such cases marking each with a peg is not possible without potentially damaging other plants. In Victoria the policy in many cases is to record the number



of seedlings but not to map or mark their location with pegs until they reach reproductive maturity as indicated by their first flowering event.

In Western Victoria, the development of seedlings of *Arachnorchis hastata* is being tracked by recording their location on a clear plastic sheet which is located over a set of permanent pegs defining a 1x1m area centred on the parent plant. The location of the seedlings is marked on the sheet with a permanent marker by standing above the defined area and looking down through the sheet. The information is then transferred to a GIS (digitised) for future reference. The point can be manually digitised. However, John Hill and Andrew Pritchard have found that taking a digital photograph of the plastic sheet and rectifying it using software used to rectify aerial photographs is effective and much quicker.

Essential parameters

The following are parameters that should always be recorded for each plant during a demographic census:

- Whether the plant is vegetative or flowering and the stage of development the flowers are in
- The number of flowers on each plant
- The number of flowers pollinated
- Whether the plant has been grazed, attacked by insects or disease; specifying the effected parts
- The number of seedlings surrounding the plant
- The microhabitat of the plant (e.g. whether it is growing out of moss, in the shelter of other plants, in bare soil, in deep leaf litter etc.
- Other comments

Additional parameters

A range of other parameters might be measured including:

- Scape width and length
- Leaf length
- Soil disturbance
- Biomass accumulation biomass should be sampled close to the site with the same habitat characteristics but not at the location of the plant(s). If it was sampled at the location of the plant(s) it could have the potential to affect next year's growth.
- Seedpod development the population might be monitored throughout the flowering period to determine things like the proportion of flowers successfully pollinated and the proportion of pollinated flowers producing seed.
- Seed viability germination tests can be conducted to determine the proportion of viable seed.

Photo points

Anecdotal evidence and at least one study conducted in Victoria (Coates 2001) suggests that flowering events and emergence of plants can be influenced by the density and or successional stage of the vegetation community in which the population exists. How these factors influence flowering and emergence could direct management of the population and its habitat. Therefore habitat conditions should be recorded when a demographic census is conducted. The density, structure and successional stage of the vegetation community at the time of census can be quickly recorded with a photograph. The photograph can be used in a qualitative analysis to determine how the population changes with changes in habitat. A permanent photo point should be set up at each site according to the guidelines detailed in Barnes and McCoull (2002). Adjustments may need to be made in order to record the detail required.

To conduct quantitative analysis of the population and how it changes with changes in habitat structure more detailed methods of recording changes in the habitat may be required. For example biomass accumulation may be measured.

References for Appendix 11

- Barnes, R.W. & McCoull, C.J. (2002). A Land Managers Guide for Assessing and Monitoring the Health of Tasmania's Forested Bush. Bushcare Technical Extension, Nature Conservation Branch, Resource Management and Conservation, Department of Primary Industries Water and Environment.
- Hutchings, M.J. (1990). The role of demographic studies in plant conservation: The case of *Ophys* sphegodes in chalk grassland. *Calcareous Grasslands Ecology and Management*. Proceedings of a joint British Ecological Society/Nature Conservancy Council symposium 16 September 1987 at the University of Sheffield.

These notes were complied based on information gained during visits to threatened orchid sites in Victoria and discussions with Andrew Pritchard (NRE), Gary French (Parks Victoria) and Brendon Sullivan (Parks Victoria).