Government of **Western Australia**
Department of **Environment and Conservation**

INTERIM RECOVERY PLAN NO. 331

CINNAMON SUN ORCHID

(*Thelymitra dedmaniarum*)

INTERIM RECOVERY PLAN

2013–2017

January 2013
Department of Environment and Conservation
Kensington

FOREWORD

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Conservation and Land Management (CALM) Policy Statements Nos. 44 and 50. Note: the Department of CALM formally became the Department of Environment and Conservation (DEC) in July 2006. DEC will continue to adhere to these Policy Statements until they are revised and reissued.

These plans outline the recovery actions that are required to urgently address those threatening processes most affecting the ongoing survival of threatened taxa or ecological communities, and begin the recovery process.

DEC is committed to ensuring that Threatened taxa are conserved through the preparation and implementation of Recovery Plans (RPs) or IRPs, and by ensuring that conservation action commences as soon as possible and, in the case of Critically Endangered taxa, always within one year of endorsement of that rank by the Minister.

This plan, which results from a review of, and replaces IRP No. 45 Cinnamon Sun Orchid (*Thelymitra manginii* ms) 1999-2002, will operate from January 2013 to December 2017 but will remain in force until withdrawn or replaced. It is intended that, if the taxon is still ranked as Critically Endangered in WA, this plan will be reviewed after five years and the need for further recovery actions assessed.

This plan was given regional approval on 10th October 2012 and was approved by the Director of Nature Conservation on 30th January 2013. The provision of funds identified in this plan is dependent on budgetary and other constraints affecting DEC, as well as the need to address other priorities.

Information in this plan was accurate at January 2013.

PLAN PREPARATION

This plan was prepared by Robyn Luu[1] and Andrew Brown[2].

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ACKNOWLEDGMENTS

The following people provided assistance and advice in the preparation of this plan:

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Kevin Bryant	WAPC
Alex Errington	Project Officer, Land Tenure Project, DEC.
Anne Harris	Flora Conservation Officer, DEC Swan Coastal District
Robert Huston	Nature Conservation Leader, DEC Perth Hills District
Belinda Newman	Botanic Gardens and Parks Authority
Catherine Page	Flora Conservation Officer, DEC Perth Hills District
Ryan Phillips	Research Scientist, Botanic Gardens and Parks Authority
Mia Podesta	Ecologist – TEC database, DEC Species and Communities Branch

Thanks also to the staff of the W.A. Herbarium for providing access to Herbarium databases and specimen information.

Cover photograph by Andrew Brown

CITATION

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SUMMARY

Scientific name:	***Thelymitra dedmaniarum***	**Common name:**	Cinnamon Sun Orchid
Family:	Orchidaceae	**Flowering period:**	Late October-November
DEC region:	Swan	**DEC districts:**	Perth Hills, Swan Coastal
Shires:	City of Swan, Gingin	**NRM regions:**	Swan, Northern Agricultural
IBRA region:	Jarrah Forest, Swan Coastal Plain	**Recovery team:**	Swan Region Threatened Flora and Communities Recovery Team (SRTFCRT)
IBRA subregion:	Northern Jarrah Forest, Perth		

Analysis of outputs and effectiveness of Interim Recovery Plan 45 Cinnamon Sun Orchid (*Thelymitra manginii* ms) 1999-2002, prepared by R. Phillimore, A. Brown and V. English.

The criteria for success in the previous plan (the number of individuals within populations and/or the number of populations have increased) has been met with an additional four subpopulations located. The majority of recovery actions in the plan have been fully or partially implemented.

Distribution and habitat: *Thelymitra dedmaniarum* is known from three areas northeast of Perth, two northwest of Gidgegannup and one north-west of Gingin. The species is found in open *Eucalyptus wandoo* (wandoo) and *E. accedens* (powderbark wandoo) woodlands. Soil is red-brown sandy-loam associated with dolerite and granite outcrops (Jeanes 2006).

Habitat critical to the survival of the species, and important populations: *Thelymitra dedmaniarum* is ranked CR in WA and it is considered that all known habitat for wild populations is habitat critical to the survival of the species, and that all wild populations are important populations. Habitat critical to the survival of *T. dedmaniarum* includes the area of occupancy of populations, areas of similar habitat surrounding and linking populations, additional occurrences of similar habitat that may contain undiscovered populations or be suitable for future translocations, and the local catchment for the surface and/or groundwater that maintains the habitat of the species.

Conservation status: *Thelymitra dedmaniarum* is declared as rare flora (DRF) under the Western Australian *Wildlife Conservation Act 1950* and is ranked as Critically Endangered (CR) in WA under International Union for Conservation of Nature (IUCN 2001) criteria B1ab(i,ii,iii,v); C2a(i); D. The species is listed as Endangered (as *T. manginii* ms) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Threats: The main threats to the species are weed invasion, grazing and trampling, road, track and firebreak maintenance, changed fire regimes, motorbikes and off road vehicles, illegal picking, poor recruitment and future mining operations.

Existing recovery actions: The following recovery actions have been or are currently being implemented:

1. Stakeholders have been made aware of the existence of this species and its locations.
2. Declared Rare Flora (DRF) markers have been installed at Subpopulations 1b and g.
3. In 1997, 2001 and 2002 spot spraying of annual grasses was undertaken at Population 1.
4. Between 2001 and 2003 feral pig baiting and trapping was undertaken adjacent to Population 1 by DEC staff with volunteer assistance.
5. Once-off hand application of 1080 rabbit baits were distributed in the area of all private property populations by the Department of Agriculture.
6. In 2002 eight animal exclusion cages were placed over *Thelymitra dedmaniarum* at Subpopulation 1a to prevent digging.
7. An information sheet for the species was produced with funding from the former Natural Heritage Trust and DEC.
8. An article on the range extension of *Thelymitra dedmaniarum* appeared in *WATSNU*.
9. The Botanic Gardens and Parks Authority (BGPA) have two fungal collections for this species in storage as part of their orchid fungal collection, and two seed collections with each vial containing 0.12mL of seed equalling approximately 2,000 seeds per vial. A further seed collection is kept in the glasshouse and contains 0.20mL of seed which is equivalent to approximately 4000 to 5000 seeds. Two live specimens are potted in the orchid nursery.
10. DEC research associate Fred Hort has undertaken extensive searches for *Thelymitra dedmaniarum*.
11. In 1997 BGPA undertook a research translocation of five species of temperate terrestrial orchids which included the successful establishment of *Thelymitra dedmaniarum*.
12. Staff from DEC Perth Hills and Swan Coastal Districts monitor known populations.
13. The SRTFCRT is assisting DEC to coordinate recovery actions for *Thelymitra dedmaniarum* along with other threatened species in the Region. Information on progress in implementing recovery actions is included in annual reports to DEC's Corporate Executive and funding bodies.

Objective: The objective of this plan is to abate identified threats and maintain or enhance *in situ* populations to ensure the long-term preservation of the species in the wild.

Recovery criteria

Criteria for success: The number of populations has increased and/or the number of mature individuals has increased by 20 per cent or more over the term of the plan.

Criteria for failure: The number of populations has decreased and/or the number of mature individuals has decreased by 20 per cent or more over the term of the plan.

Recovery actions

1. Coordinate recovery actions
2. Monitor populations
3. Underatke weed control
4. Install cages and fencing where required
5. Control feral animals that impact on the species
6. Develop and implement a fire management strategy
7. Manage recreational impacts at Subpopulations 1h and 2d
8. Undertake surveys
9. Ensure long term protection of habitat
10. Obtain biological and ecological information
11. Collect and store seed
12. Liaise with land managers and indigenous communities
13. Map habitat critical to the survival of *Thelymitra dedmaniarum*
14. Promote awareness
15. Review this plan and assess the need for further recovery actions

1. BACKGROUND

Analysis of outputs and effectiveness of Interim Recovery Plan 45 Cinnamon Sun Orchid (*Thelymitra manginii* ms) 1999-2002, prepared by R. Phillimore, A. Brown and V. English.

The criteria for success in the previous plan (the number of individuals within populations and/or the number of populations have increased) has been met with an additional four subpopulations located. With the exception of translocation and the preparation of a full recovery plan, recovery actions in the previous plan have now been fully or partially implemented. Their current status is listed in table 1.

Table 1: Status of recovery actions included in previous plan

Recovery action	% Implemented	Result
Coordinate recovery actions	100% complete and ongoing	Recovery actions were coordinated by DEC's Perth Hills and Swan Coastal Districts with assistance from DEC's Swan Region Threatened Flora Recovery Team which met biannually over the term of the plan.
Undertake weed control	100% complete	Spot hand spraying of annual grasses (veldt) and wild oats with Fusilade® (2001-2002).
Determine techniques to control diggings	100% complete	Pig trapping along creek line. In 2002, 8 cages were placed over known locations in pop 1a as a barrier to digging bandicoots.
Develop a fire management strategy	20% complete	DEC has no specific Fire Management Plan for this species. The City of Swan's Fire Prevention Plan includes firebreak construction regulations. The land manager of subpopulation 1a maintains firebreaks and carries out hazard reduction burns.
Promote awareness	Ongoing	A colour information flyer was produced and distributed. A draft revision of the flyer has been produced to include nomenclatural update. Flyer is intended to be distributed to the local Shire and landowners.
Monitor populations	100% complete	DEC's flora conservation officer has opportunistically monitored the populations during the term of the plan. Population data has been collected where monitored. All information has been stored at DEC's Perth Hills District and SCB.
Collect seed and cutting material	Ongoing	Botanic Gardens and Parks Authority (BGPA) have five seed collections in cryostorage and mycorrhizal isolations. Two live specimens are potted in the orchid nursery. Seeds have been collected for the Millennium Seed Bank Project.
Control feral animals	100% complete	Pig baiting and trapping was implemented in 2001-2003 with volunteer assistance. Once off hand application of 1080 rabbit baits on all private property populations by Department of Agriculture.
Conduct further surveys	100% complete	The species has been extensively and opportunistically surveyed for in areas of suitable habitat on private properties and in nature reserves near Gidgegannup. Four new subpopulations have been discovered.
Obtain biological and ecological information	Started, ongoing	BGPA has conducted germination and propagation trials in field sites.
Liaise with relevant land managers	100% complete	Appropriate authorities and land managers have been notified of the existence of the species and where it occurs (City of Swan and private property owners).
Propagate plants for translocation	Started, ongoing	BGPA have attempted to propagate plants from tissue culture and seeds. Trials and research is ongoing.
Start translocation process	0% complete	A translocation proposal was not prepared during the term of the plan. However, in 1997 BGPA conducted experimental translocation trials prior to plan commencement. This action is no longer required due to an improvement in tenure security with a new population located in a Nature Reserve.
Monitor translocation	0% complete	A translocation proposal was not prepared and implemented.
Write full Recovery Plan	0% complete	DEC does not generally produce full recovery plans for flora and current interim recovery plans have been extended to a five year term.

The majority of the recovery actions included in the previous plan have been fully or partially implemented. *Action 13* Start translocation process, is no longer required due to an improvement in tenure security with a new population located in a Nature Reserve. *Action 15* Develop a full Recovery Plan, is redundant as DEC does not generally produce full recovery plans for flora and current interim recovery plans have been extended to a five year term. Ongoing recovery actions included in the previous plan are included in this revised plan.

New recovery actions in this plan are:

Action 4	Install cages and fencing where required. This replaces the previous Action 3.
Action 7	Manage recreational impacts at subpopulations 1h and 2d.
Action 9	Ensure long term protection of habitat.
Action 13	Map habitat critical to the survival of *Thelymitra dedmaniarum*.
Action 15	Propose ranking criteria change.
Action 16	Review this plan and assess the need for further recovery actions.

History

The type specimen of *Thelymitra dedmaniarum* was collected from the Toodyay area by Mrs and Miss Dedman in November 1934, and the species was named in their honour by Richard Rogers in 1938. The orchid was not seen again until collected near Gidgegannup in 1987.

There has been some confusion about the delimitations of the taxon. Alex George created the new combination *T. fuscolutea* var. *stellata* (with *T. stellata* reduced to varietal rank and *T. dedmaniarum* [as *T. dedmanae*] reduced to synonymy therein). Following his study of Australian orchid types, Mark Clements again recognised *T. benthamiana*, *T. fuscolutea* and *T. stellata* as distinct species while relegating *T. dedmaniarum* (as *T. dedmaniae*) to synonymy under *T. stellata*. Hoffman and Brown (1992) followed Clements in recognising *T. benthamiana*, *T. fuscolutea* and *T. stellata* as distinct species, but also reinstated *T. dedmaniarum* (as *T. dedmaniae*) as a species following its recent rediscovery. Hoffman and Brown (1998) again recognised *T. benthamiana*, *T. fuscolutea*, *T. stellata* and *T. dedmaniarum* (this time with the name incorrectly applied to specimens found in 1996 during surveys southwest of York (now described as *Thelymitra yorkensis*) while recognising *Thelymitra* aff. *dedmaniarum* (the true *T. dedmaniarum*, and later to become incorrectly known informally as *Thelymitra manginii* ms and subsequently *Thelymitra manginiorum* ms) (Jeanes 2006).

In 1999, *Thelymitra dedmaniarum* was known from just two populations near Gidgegannup. A survey undertaken by DEC Swan Coastal District staff in 2009 located a third population at a nature reserve, north of Gingin. Currently, *T. dedmaniarum* is known from three populations together comprising around 40 flowering plants.

Description

The name *Thelymitra* is derived from the Greek *Thelys*, feminine and *mitra*, a turban or head dress, and refers to the hooded column of all species. Species of *Thelymitra* are known as Sun Orchids because their flowers remain closed at night or during cool, cloudy weather and open only on warm sunny days when there is little wind (Brown *et al*. 2008).

The distinguishing features of *Thelymitra dedmaniarum* include a sepal length of 12 to 28mm; mostly golden yellow perianth, which is often reddish brown towards the base; yellow or orange column apex; markedly clavate supra-anther lobe; rugose and bilobed supra-anther lobe apex; anther beak 2.5 to 3.5mm by c. 2mm; and cinnamon-like scent (Jeanes 2006).

Illustrations and/or further information

Brown, A., Dundas, P., Dixon, K. and Hopper, S. (2008) *Orchids of Western Australia*. University of Western Australia Press, Crawley; Western Australian Herbarium (1998−) *FloraBase − The Western Australian Flora*. Department of Environment and Conservation. http://florabase.dec.wa.gov.au/.

Distribution and habitat

Thelymitra dedmaniarum is known from three populations northeast of Perth (two northwest of Gidgegannup and one northwest of Gingin). The species is found in open *Eucalyptus wandoo* and *E. accedens* woodlands. Soil is red-brown sandy-loam associated with dolerite and granite outcrops (Jeanes 2006). Associated species

include *Acacia pulchella, A. saligna, Calothamnus quadrifidus, Melaleuca radula* and *Hakea lissocarpha*. The population northwest of Gingin is in open low woodland of *Eucalyptus marginata* and *Corymbia calophylla* with an understorey of *Hakea trifurcata, Bossiaea aquifolium* and *Hibbertia hypericoides* (Hoskins 2009).

Table 2. Summary of population land vesting, purpose and manager

Pop. no. & location	DEC district	Shire	Vesting	Purpose	Manager
1a. NW of Gidgegannup	Perth Hills	Swan	Freehold	Private Property	Landowners
1b. NW of Gidgegannup	Perth Hills	Swan	Unvested	Road Reserve	City of Swan
1c. NW of Gidgegannup	Perth Hills	Swan	City of Swan	Recreation	City of Swan
1d. NW of Gidgegannup	Perth Hills	Swan	Freehold	Private Property	Landowners
1e. NW of Gidgegannup	Perth Hills	Swan	City of Swan	Recreation	City of Swan
1f. NW of Gidgegannup	Perth Hills	Swan	Freehold	Private Property	Landowners
1g. NW of Gidgegannup	Perth Hills	Swan	Unvested	Road Reserve	City of Swan
1h. NW of Gidgegannup	Perth Hills	Swan	Dept of Planning	Government Requirements	Dept of Planning
1i. NW of Gidgegannup	Perth Hills	Swan	Freehold	Private Property	Landowners
1T. NW of Gidgegannup	Perth Hills	Swan	Freehold	Private Property	Landowners
2a. NW of Gidgegannup	Perth Hills	Swan	City of Swan	Recreation	City of Swan
2b. NW of Gidgegannup	Perth Hills	Swan	City of Swan	Recreation	City of Swan
2c. NW of Gidgegannup	Perth Hills	Swan	City of Swan	Recreation	City of Swan
2d. NW of Gidgegannup	Perth Hills	Swan	City of Swan	Recreation	City of Swan
3. NNW of Gingin	Swan Coastal	Gingin	Conservation Commission of WA	Nature Reserve	DEC

Biology and ecology

As is found in other Western Australian orchids, seed germination and seedling growth of *Thelymitra dedmaniarum* is reliant upon an interaction with symbiotic soil fungi. This association continues into adulthood. An infrequent pollinator is a beetle, a common Chrysomelid (*Diaphanops westermanni*). However, this beetle is not believed to be the main pollinator.

In establishing an experimental translocation of *Thelymitra dedmaniarum* in its natural habitat, Batty *et al.* (2006) found actively growing seedlings had significantly higher survival than individuals transferred as dormant tubers. In addition, no substantial benefit was observed in seedling survival of pre-inoculation of the site with the fungal endophyte. This may be a result of failure of introduced fungi to establish and whether or not the compatible fungi naturally occur at the translocation site.

Conservation status

Thelymitra dedmaniarum is declared as rare flora (DRF) under the Western Australian *Wildlife Conservation Act 1950* and in WA is ranked as Critically Endangered (CR) under International Union for Conservation of Nature (IUCN 2001) criteria B1ab(i,ii,iii,v); C2a(i); D. The species is listed as Endangered (as *T. manginii* ms) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Threats

The main threats to the species are:

- **Weed invasion**. *Watsonia* and Cape Tulip (*Moraea* sp.) are a threat to Subpopulation 1a, and introduced grasses are a threat to most other subpopulations, particularly those located on road reserves. Weeds suppress early plant growth by competing for soil moisture, nutrients and light. They also increase the fire hazard due to the easy ignition of high fuel loads, which are produced annually by many grass weed species.
- **Grazing, digging and trampling**. Feral pigs dig through large areas of soil in search of food, damaging plants and providing habitat for weeds. Bandicoots have also dug in the area of populations. Grazing by

kangaroos has resulted in flowering heads being frequently eaten. Although grazing does not appear to kill the plants it reduces their reproductive output.

- **Road, track and firebreak maintenance.** This is a threat to Subpopulations 1b, 1g, 2c and 2d. Threats include grading, chemical spraying, construction of drainage channels and the mowing of roadside vegetation. Several of these actions also encourage weed invasion.
- **Altered fire regimes.** These may interfere with the reproductive phase of the orchid (flowering, pollination, seed growth and seed dispersal). Seedlings can be killed by inappropriate timing of fires in the first few years of growth. Due to the restricted distribution of the species and low numbers of plants it is thought that populations may be seriously impacted if burnt during the species' active growing period between late April and early November. Fire may also facilitate weed invasion and when it occurs should be followed up with appropriate weed control.
- **Motorbikes and off-road vehicles.** These are a threat to Subpopulations 1h and 2d and may cause dissection of the habitat with eventual erosion of the edges of vegetation occurring where tracks are created. These activities increase the risk of damaging the species through trampling and may increase the spread of disease.
- **Illegal picking and trampling.** This is a threat to Subpopulations 1h and 2d which are in areas used by the general public.
- **Poor recruitment.** Factors that negatively influence reproduction, such as grazing, poor seed set and changed fire regimes may result in little or no recruitment.
- **Future mining operations.** These are a potential threat to Populations 1 and 2. Mineral extraction leases cover the sites and have the potential to severely impact habitat.

The intent of this plan is to provide actions that will deal with immediate threats to *Thelymitra dedmaniarum*. Although climate change may have a long-term effect on the species, actions taken directly to prevent the impact of climate change are beyond the scope of this plan.

Table 3. Summary of population information and threats

Pop. no. & location	Land status	Year / no. of plants	Condition of habitat	Threats
1A. NW of Gidgegannup	Private property	1991 75 2005 7 (3) 2007 1(6)	Moderate	Grazing, weeds, altered fire regimes, digging
1B. NW of Gidgegannup	Road reserve	1990 36 1998 1 2001 0	Moderate	Weeds, road maintenance, digging
1C. NW of Gidgegannup	Recreation reserve	1995 5 1996 1 2001 0	Moderate	Altered fire regimes, weeds, digging
1D. NW of Gidgegannup	Private property	1995 13 1996 8(2) 2001 0	Moderate	Digging, altered fire regimes
1E. NW of Gidgegannup	Recreation reserve	1995 20 1996 13	Healthy	Weeds, altered fire regimes, feral pigs, illegal picking
1F. NW of Gidgegannup	Private property	1995 9 2001 0	Disturbed	Digging, weeds, altered fire regimes
1G. NW of Gidgegannup	Road reserve	1994 2 1999 1(4) 2001 0	Moderate	Digging, road maintenance, altered fire regimes
1H. NW of Gidgegannup	Government requirements	2007 1	Poor	Grazing, recreational use (off road vehicles), trampling, weeds, altered fire regimes
1I. NW of Gidgegannup	Private property	2005 3 2007 2(3)	Healthy	Grazing, fire
2A. NW of Gidgegannup	Recreation Reserve	1991 11 2001 1	Healthy	Altered fire regimes
2B. NW of Gidgegannup	Recreation reserve	2006 7(3)	Healthy	
2C. NW of Gidgegannup	Recreation reserve	2007 3(8)	Moderate	Trampling (kangaroos), grazing, firebreak maintenance, weeds, altered fire regimes
2D. NW of Gidgegannup	Recreation	2007 1	Healthy	Trampling, grazing, firebreak maintenance, altered

	reserve			fire regimes, weeds, off road vehicles (4WD's and motorbikes), recreational impacts (illegal picking)
3. NNW of Gingin	Nature reserve	1996 15 2009 11(6)	Healthy	Grazing, altered fire regimes

Note: ( ) = number of non flowering plants; Subpopulation 1I is a translocated population; Populations in **bold text** are considered to be important populations.

Guide for decision-makers

Section 1 provides details of current and possible future threats. Actions for development and/or land clearing in the immediate vicinity of *Thelymitra dedmaniarum* may require assessment.

Actions that could result in any of the following may potentially result in a significant impact on the species:

- Damage or destruction of occupied or potential habitat.
- Alteration of the local surface hydrology or drainage.
- Reduction in population size.
- A major increase in disturbance in the vicinity of a population.

Habitat critical to the survival of the species, and important populations

Thelymitra dedmaniarum is ranked in WA as CR, and as such it is considered that all known habitat for wild populations is habitat critical to the survival of the species, and that all wild populations are important populations. Habitat critical to the survival of *T. dedmaniarum* includes the area of occupancy of populations, areas of similar habitat surrounding and linking populations (these providing potential habitat for population expansion and for pollinators), additional occurrences of similar habitat that may contain undiscovered populations of the species or be suitable for future translocations, and the local catchment for the surface and/or groundwater that maintains the habitat of the species.

Benefits to other species or ecological communities

Recovery actions implemented to improve the quality or security of the habitat of *Thelymitra dedmaniarum* will also improve the status of associated native vegetation. Two DRF species and seven priority flora also occur within the same bushland as *T. dedmaniarum*. These taxa are listed in the table below:

Table 4. Conservation–listed flora species occurring within 500m of *Thelymitra dedmaniarum*

Species name	**Conservation status (WA)**	**Conservation status (EPBC Act 1999)**
Diplolaena andrewsii	DRF (Vulnerable)	
Grevillea flexuosa	DRF (Vulnerable)	Vulnerable
Hibbertia glomerata subsp. *ginginensis*	Priority 1	
Acacia oncinophylla subsp. *oncinophylla*	Priority 3	
Tetratheca sp. Granite (S. Patrick SP1224)	Priority 3	
Thomasia sp. Gingin (F. & J. Hort 1511)	Priority 3	
Darwinia pimelioides	Priority 4	
Drosera occidentalis subsp. *occidentalis*	Priority 4	
Templetonia drummondii	Priority 4	

For a description of the Priority categories see Smith (2012).

Thelymitra dedmaniarum does not occur within or adjacent to any Threatened or Priority Ecological Communities (TECs/PECs).

International obligations

This plan is fully consistent with the aims and recommendations of the Convention on Biological Diversity, ratified by Australia in June 1993, and will assist in implementing Australia's responsibilities under that Convention. The species is listed (as *Thelymitra dedmaniae*) under Appendix II in the United Nations

Environment Program World Conservation Monitoring Centre (UNEP-WCMC) Convention on International Trade in Endangered Species (CITES). This plan does not affect Australia's obligations under any other international agreements.

Indigenous consultation

A search of the Department of Indigenous Affairs Aboriginal Heritage Sites Register revealed two sites (# 3536, Swan River; # 3387, Wooroloo Brook) of Aboriginal significance adjacent to Populations 1 and 2 of *Thelymitra dedmaniarum*, and three sites (#20008, Gingin Brook Waggyl Site; #20749, Moore River Waugal; #21620, Chandala Brook) adjacent to Population 3 of the species. Input and involvement has been sought through the South West Aboriginal Land and Sea Council (SWALSC) and Department of Indigenous Affairs to determine if there are any issues or interests. Indigenous opportunity for future involvement in the implementation of the Recovery plan is included as an action in the plan. Indigenous involvement in management of land covered by an agreement under the *Conservation and Land Management Act 1984* is also provided for under the joint management arrangements in that Act, and will apply if an agreement is established over any reserved lands on which this species occurs.

Social and economic impacts

The implementation of this recovery plan may cause some social and economic impact. For private property Subpopulations 1a, d, f and i, this would be through the loss of land available for development, the requirement to modify land management practices and through the cost of implementing recovery actions. Subpopulations 1b, c, e, g; and 2a, b, c and d occur on land vested with or managed by the local Shire and economic impacts may be through the modification of road management practices, and implementation of recovery actions Mineral exploration leases cover the area where Populations 1 and 2 are found and there is potential for economic impact should mining be impeded or if mining operations go ahead and are affected by the proximity of these populations. Five sites of Aboriginal significance also occur in the areas of populations and recovery actions may require consideration of Indigenous interests.

Affected interests

The stakeholders potentially affected by the implementation of this plan include the City of Swan, indigenous parties, private landholders and mining tenement holders.

Evaluation of the plan's performance

DEC, with assistance from the Swan Region Threatened Flora and Communities Recovery Team (SRTFCRT), will evaluate the performance of this plan. In addition to annual reporting on progress the plan will be reviewed and evaluated against the criteria for success and failure following five years of implementation.

2. RECOVERY OBJECTIVE AND CRITERIA

Objective

The objective of this plan is to abate identified threats and maintain or enhance *in situ* populations to ensure the long-term preservation of the species in the wild.

Criteria for success: The number of populations has increased and/or the number of mature individuals has increased by 20 per cent or more over the term of the plan.

Criteria for failure: The number of populations has decreased and/or the number of mature individuals has decreased by 20 per cent or more over the term of the plan.

3. RECOVERY ACTIONS

Existing recovery actions

Stakeholders have been made aware of the existence of this species and its locations. These notifications detail the current status of the species as DRF and the associated legal obligations in regards to their protection.

Declared Rare Flora (DRF) markers have been installed at Subpopulations 1b and g. These alert people working in the vicinity of populations to the presence of DRF and the need to avoid work that may damage the species or its habitat. Dashboard stickers and posters describing the significance of DRF markers have been produced and distributed to relevant Shires and other organisations.

Spot hand spraying of annual grasses (veldt and wild oats) using Fusilade® was undertaken at Population 1 in 1997, 2001 and 2002.

Between 2001 and 2003, feral pig baiting and trapping was undertaken near Population 1 by DEC with volunteer assistance. In addition, once-off hand application of 1080 rabbit baits, were distributed on all private property populations by the Department of Agriculture.

In 2002, cages were placed over *Thelymitra dedmaniarum* at Subpopulation 1a to act as a barrier to digging animals.

An information sheet for *Thelymitra dedmaniarum* (as *manginii*) was jointly produced by the former Natural Heritage Trust and DEC. The sheet contains photographs, a description of the plant, its habitat type, threats and management actions. This poster was distributed to owners of land that contains this species, to owners of land who live in close proximity to known populations and to local Shires.

In 2009, an article on the range extension of *Thelymitra dedmaniarum* appeared in *WATSNU* volume 15, issue 2 (Hoskins 2009).

The Botanic Gardens and Parks Authority (BGPA) have two fungal collections for this species in storage as part of their orchid fungal collection and two seed collections, with each vial containing 0.12mL of seed equalling approximately 2,000 seeds per vial. A further seed collection is kept in the glasshouse and contains 0.20mL of seed which is equivalent to approximately 4000 to 5000 seeds. Two live specimens are potted in the orchid nursery.

Since 1998, DEC research associate Fred Hort has undertaken extensive searches for *Thelymitra dedmaniarum*.

In 1997 BGPA undertook a research translocation of five species of temperate terrestrial orchids which included *Thelymitra dedmaniarum* (Dixon 1997). The aim of this study was to investigate the potential for field re-introductions with seedlings and dormant tubers propagated *ex situ*. Research was also carried out to detect the presence of fungi associated with translocated orchids through re-isolation from translocated orchids (Batty *et al*. 2006). Using material collected from a known population, 25 dormant tubers were planted back into the same population. For *T. dedmaniarum*, 18 per cent of plants resulting from the translocation of dormant tubers persisted after five years.

Staff from DEC Perth Hills and Swan Coastal Districts monitor all populations.

The SRTFCRT is assisting DEC to coordinate recovery actions for *Thelymitra dedmaniarum* along with other threatened species in the Region. Information on progress in implementing recovery actions will be reported through annual reports to DEC's Corporate Executive and funding bodies.

Future recovery actions

Where *Thelymitra dedmaniarum* occurs on lands other than those managed by DEC, permission has been or will be sought from appropriate owners/land managers prior to recovery actions being undertaken. The

following recovery actions are generally in order of descending priority, influenced by their timing over the life of the plan. However this should not constrain addressing any of the actions if funding is available and other opportunities arise.

1. Coordinate recovery actions

The SRTFCRT will assist DEC in coordinating recovery actions for *Thelymitra dedmaniarum* along with other threatened species. Information on progress in implementing recovery actions will be reported through annual reports to DEC's Corporate Executive and funding bodies.

Action: Coordinate recovery actions
Responsibility: DEC (Perth Hills and Swan Coastal Districts) with assistance from the SRTFCRT
Cost: $6,000 per year

2. Monitor populations

Monitoring should be undertaken and may include factors such as grazing, weed invasion, habitat degradation, hydrology, population stability (expansion or decline), pollinator activity, seed production, recruitment.

Action: Monitor populations
Responsibility: DEC (Perth Hills and Swan Coastal Districts)
Cost: $10,000 per year

3. Conduct weed control

Weeds are a threat to all populations and control is required. A weed management plan drafted for *Diplolaena andrewsii* (Bettink 2011) also covers Population 1 of *Thelymitra dedmaniarum* which is located in the same area. The following actions as per Bettink (2011) will be implemented for Population 1 of *T. dedmaniarum*:

- Liaise and support land managers in commencing, continuing and/or extending treatment of *Watsonia* in populations.
- Control infestations of priority weeds in the vicinity of Population 1.
- Map and control encroachment of Cape Tulip into Population 1.
- Following unplanned fires, implement broad scale *Watsonia* control.

The following actions will be implemented for other populations:

- Undertake mapping of invasive weeds within reserves that contain populations of *Thelymitra dedmaniarum*.
- Control invasive weeds by the most approriate technique - herbicide, mowing or hand weeding.
- To maintain low weed levels, revegetation with site-specific species is required (in Autumn).
- Monitor and report on the effects of weed control on *Thelymitra dedmaniarum* and associated native plant species.

Action: Conduct weed control
Responsibility: DEC (Perth Hills and Swan Coastal Districts)
Cost: $6,000 per year, as required

4. Install cages and fencing where required

To prevent impacts on plants from digging, trampling and grazing, exclusion cages and/or fencing may be required for protection.

Action: Install cages and fencing where required

Responsibility: DEC (Perth Hills and Swan Coastal Districts)
Cost: $5,000 per year, as required

5. Control feral animals that impact on the species

Grazing by animals such as feral pigs and rabbits will be monitored and managed at all populations. If necessary, grazing will be controlled through baiting or other methods.

Action: Control feral animals that impact on the species
Responsibility: DEC (Perth Hills and Swan Coastal Districts)
Cost: $5,000 per year

6. Develop and implement a fire management strategy

Where possible, fire will be excluded from the habitat of populations (in particular fire between late April and November) except where it is being used experimentally as a recovery tool. A fire management strategy will be developed in consultation with relevant authorities and land managers that recommends appropriate fire frequency, intensity, season, and control measures.

Action: Develop and implement a fire management strategy
Responsibility: DEC (Perth Hills and Swan Coastal Districts)
Cost: $10,000 in first year and $2,000 in subsequent years

7. Manage recreational impacts at subpopulations 1h and 2d

To deter access to Subpopulations 1h and 2d barriers such as bollards or fencing may be needed. Signs indicating the significance of the area may also need to be introduced to prevent trampling.

Action: Manage recreational impacts at subpopulations 1h and 2d
Responsibility: DEC (Perth Hills District), City of Swan and Department of Planning
Cost: $10,000 in years 1 and 2

8. Undertake surveys

It is recommended that areas of potential habitat be surveyed for the presence of *Thelymitra dedmaniarum* during its flowering period. All surveyed areas will be recorded and the presence or absence of the species documented to increase survey efficiency and reduce unnecessary duplicate surveys. Where possible, volunteers from the local community, Landcare groups, the WA Native Orchid Study and Conservation Group, wildflower societies and naturalists clubs will be encouraged to become involved.

Action: Undertake surveys
Responsibility: DEC (Perth Hills and Swan Coastal Districts) with assistance from community groups
Cost: $5,000 per year

9. Ensure long-term protection of habitat

DEC will investigate the possibility of obtaining land containing populations of *Thelymitra dedmaniarum* and having it declared as reserves for conservation. Subpopulation 1h located on WAPC land is intended to eventually be transferred to the Conservation Commission.

Action: Ensure long-term protection of habitat
Responsibility: DEC (Perth Hills and Swan Coastal Districts, Land Unit); DoP and Department of Mines and Petroleum (DMP)
Cost: $3,000 per year

10. Obtain biological and ecological information

Additional information on the biology and ecology of *Thelymitra dedmaniarum* will provide a scientific basis for its management in the wild and should include research on:

1. the fungal symbiont associated with *Thelymitra dedmaniarum* and its distribution in the wild
2. seed viability and conditions necessary for germination
3. species response to disturbance such as fire
4. longevity of plants, and time taken to reach maturity, and
5. the species' pollination biology, identification of pollinators and their habitat requirements.

Actions: Obtain biological and ecological information
Responsibility: DEC (Perth Hills and Swan Coastal Districts) and BGPA
Cost: $10,000 per year

11. Collect and store seed

Preservation of genetic material is essential to guard against extinction of the species if the wild populations are lost. It is recommended that additional seed of *Thelymitra dedmaniarum* be collected and stored by BGPA along with samples of the symbiotic fungus. Collections should aim to sample and preserve the maximum range of genetic diversity possible (which should be determined by an appropriate molecular technique such as genetic fingerprinting if feasible).

Action: Collect and store seed
Responsibility: BGPA, DEC (Perth Hills and Swan Coastal Districts)
Cost: $5,000 per year

12. Liaise with land managers and indigenous communities

Staff from DEC Perth Hills and Swan Coastal Districts will liaise with land managers to ensure that populations of *Thelymitra dedmaniarum* are not accidentaly damaged or destroyed. Indigenous consultation will take place to determine if there are any issues or interests in areas that are habitat for *T. dedmaniarum*.

Action: Liaise with land managers and indigenous communities
Responsibility: DEC (Perth Hills and Swan Coastal Districts)
Cost: $2,000 per year

13. Map habitat critical to the survival of *Thelymitra dedmaniarum*

Spatial data relating to habitat critical to the survival of *Thelymitra dedmaniarum* should be determined. Although this is alluded to in Section 1, it has not yet been mapped and will be addressed under this action. If additional populations are located, habitat critical to their survival will also be determined and mapped.

Action: Map habitat critical to the survival of *Thelymitra dedmaniarum*
Responsibility: DEC (SCB, Perth Hills and Swan Coastal Districts)
Cost: $6,000 in year 2

14. Promote awareness

The importance of biodiversity conservation and the protection of *Thelymitra dedmaniarum* will be promoted to the public. This will be achieved through an information campaign using local print and electronic media and by setting up poster displays. The current information sheet will be updated to include nomenclatural changes and will be distributed to local landowners and shires. Formal links with local naturalist groups and interested individuals will also be encouraged.

Action: Promote awareness
Responsibility: DEC (Perth Hills and Swan Coastal Districts, SCB, Strategic Development and Corporate Affairs Division) with assistance from the SRTFCRT

Cost: $4,000 in year 1 and $2,000 in years 2-5

15. Review this plan and assess the need for further recovery actions

If *Thelymitra dedmaniarum* is still ranked CR at the end of the five-year term of this plan, the need for further recovery actions, or a review of this plan will be assessed and a revised plan prepared if necessary.

Action: Review this plan and assess the need for further recovery actions
Responsibility: DEC (SCB, Perth Hills and Swan Coastal Districts) with assistance from the SRTFCRT
Cost: $3,000 in year 5

Table 5. Summary of recovery actions

Recovery action	Priority	Responsibility	Completion date
Coordinate recovery actions	High	DEC (Perth Hills and Swan Coastal Districts) with assistance from the SRTFCRT	Ongoing
Monitor populations	High	DEC (Perth Hills and Swan Coastal Districts)	Ongoing
Conduct weed control	High	DEC (Perth Hills and Swan Coastal Districts)	Ongoing
Install caging and fencing where required	High	DEC (Perth Hills and Swan Coastal Districts)	Ongoing
Control feral animals that impact on the species	High	DEC (Perth Hills and Swan Coastal Districts)	Ongoing
Develop and implement a fire management strategy	High	DEC (Perth Hills and Swan Coastal Districts)	Ongoing
Manage recreational impacts at Subpopulations 1h and 2d	High	DEC (Perth Hills District), City of Swan, Department of Planning	2013
Undertake surveys	High	DEC (Perth Hills and Swan Coastal Districts)	Ongoing
Ensure long-term protection of habitat	High	DEC (Perth Hills and Swan Coastal Districts, Land Unit); DPI; Department of Mines and Petroleum (DOMP)	Ongoing
Obtain biological and ecological information	High	DEC (Perth Hills and Swan Coastal Districts), BGPA	2017
Collect and store seed	High	BGPA, DEC (Perth Hills and Swan Coastal Districts)	2017
Liaise with land managers and indigenous communities	Medium	DEC (Perth Hills and Swan Coastal Districts)	Ongoing
Map habitat critical to the survival of *Thelymitra dedmaniarum*	Medium	DEC (SCB, Perth Hills and Swan Coastal Districts)	2013
Promote awareness	Medium	DEC (Perth Hills and Swan Coastal Districts, SCB, Strategic Development and Corporate Affairs Division) with assistance from the SRTFCRT	Ongoing
Review this plan and assess the need for further recovery actions	Medium	DEC (SCB, Perth Hills and Swan Coastal Districts) with assistance from the SRTFCRT	2017

4. TERM OF PLAN

This plan will operate from January 2013 to December 2017 but will remain in force until withdrawn or replaced. If the species is still ranked CR after five years, the need for further recovery actions will be determined.

5. REFERENCES

Batty, A.L., Dixon, K.W., Brundrett, M. and Sivasithamparam, K. (2001) Long-term storage of mycorrhizal fungi and seed as a tool for the conservation of endangered Western Australian terrestrial orchids. *Australian Journal of Botany* 49: 619-628.

Batty, A.L., Brundrett, M.C., Dixon, K.W. and Sivasithamparam, K. (2006) In situ symbiotic seed germination and propagation of terrestrial orchid seedlings for establishment at field sites. *Australian Journal of Botany* 54: 375-381.

Bettink, K. (2011) Draft Weed Management and Restoration Plan for *Diplolaena andrewsii* Ostenf. (Native Wild Rose).

Brown, A., Dundas, P., Dixon, K. and Hopper, S. (2008) *Orchids of Western Australia*. University of Western Australia Press, Crawley.

Department of Conservation and Land Management (1992) Policy Statement No. 44 *Wildlife Management Programs*. Department of Conservation and Land Management, Western Australia.

Department of Conservation and Land Management (1994) Policy Statement No. 50 *Setting Priorities for the Conservation of Western Australia's Threatened Flora and Fauna*. Department of Conservation and Land Management, Western Australia.

Dixon, K. (1997) Research Translocation Proposal for Cinnamon Sun Orchid (*Thelymitra dedmaniarum*), Purdies Donkey Orchid (*Diuris purdiei*) and Dwarf Bee Orchid (*Diuris micrantha*). Kings Park and Botanic Garden, West Perth.

Fairs, A. (2008) Review of approved Western Australian Recovery Plans adopted as National Recovery Plans under the EPBC Act. NHT Project ID 61821.

Government of Australia (1999) Environment Protection and Biodiversity Conservation Act.

Hoskins, M. (2009) Range extension for cinnamon sun orchid. *WATSNU* 15 (2): 3.

International Union for Conservation of Nature (2001) *IUCN Red List Categories: Version 3.1*. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.

Jeanes, J.A. (2006) Resolution of the *Thelymitra fuscolutea* R.Br. (Orchidaceae) complex of southern Australia. *Muelleria* 24: 3-24.

Phillimore, R., Brown, A. and English, V. (1999) Cinnamon Sun Orchid (*Thelymitra manginii* ms) Interim Recovery Plan No. 45, 1999-2002. Department of Conservation and Land Management, Perth, Western Australia.

Smith, M. (2012) *Declared Rare and Priority Flora List for Western Australia.* Department of Environment and Conservation, Perth, Western Australia.

Western Australian Herbarium (1998−) *FloraBase − The Western Australian Flora*. Department of Environment and Conservation. http://florabase.dec.wa.gov.au/.

6. TAXONOMIC DESCRIPTION

Thelymitra dedmaniarum

Jeanes, J.A. (2006) Resolution of the *Thelymitra fuscolutea* R.Br. (Orchidaceae) complex of southern Australia. *Muelleria* 24: 3-24.

Glabrous terrestrial *herb*. *Tubers* not seen. *Leaf* ovate-lanceolate to ovate, 5–25 centimetres long, 10–35 millimetres wide, erect or obliquely erect, blade flat, leathery, bright green to yellowish green, sheathing at base, apex subacute to acute, sometimes shortly apiculate. *Scape* 25–55 centimetres tall, 2–3.5 millimetres diam., slender to stout, straight, green. *Sterile bracts* usually 2, occasionally 3, lanceolate, 2.5–9 centimetres long, 4–10 millimetres wide, closely sheathing at base, usually green, apex often free and diverging from scrape, acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 7–35 millimetres long, 3–9 millimetres wide, sheathing the pedicels, usually green. *Pedicels* 1–15 millimetres long, slender. *Ovary* narrow-obovoid, 6–12 millimetres long, 1.5–4 millimetres wide, curved. *Flowers* 2–12, 28–55 millimetres across, thick-textured, golden yellow, often reddish brown towards the centre, cinnamon scented, opening freely in warm weather. *Perianth segments* 12–28 millimetres long, 3–10 millimetres wide, more or less flat, both surfaces sparsely covered with tiny beads-like glands, apex often slightly twisted, acute to shortly acuminate, often shortly apiculate; *dorsal sepal* ovate-lanceolate to lanceolate; *lateral sepals* ovate-lanceolate to lanceolate, asymmetric; *petals* ovate-lanceolate to lanceolate, asymmetric; *labellum* lanceolate, often somewhat smaller than other segments. *Column* erect from the end of ovary, 6–9 millimetres long, 5–8 millimetres wide, yellow, broadly winged, wings deeply dentate along distal margins, teeth 0.1–2 millimetres long; *post-anther lobe* with dorsal surface covered by a dense mass of orange trichomes (each c. 0.4 millimetres long); *supra-anther lobe* 2–3 millimetres long, yellow, rod-like with a swollen clavate notched apex 1–2.2 millimetres wide, 1.5–3 millimetres thick, apex rugose, ventral surface papillose at base; *auxiliary lobes* absent; *lateral lobes* digitiform, 1–2.5 millimetres long, c. 0.4 millimetres thick, fleshy, yellow, with 2 similar but slightly thinner basal lobes that are entire or, less often, divided. *Anther* inserted towards base of column, partly obscured behind stigma, ovoid, 5–7 millimetres long, 2–3.5 millimetres wide, connective produced into a fleshy, curved beak 2.5–3.5 millimetres long, c. 2 millimetres thick, shallowly s-shaped in profile, extending to tip of column; *pollinarium* 2–4 millimetres long; *viscidium* almost round, c. 0.6 millimetres diam.; *pollinia* coherent, white. *Stigma* situated at base of column, ovate-quadrate, 3–4 millimetres long, 3–4.5 millimetres wide, margins irregular. *Capsules* not seen.