INTERIM RECOVERY PLAN NO. 172

ELEGANT SPIDER ORCHID

(*CALADENIA ELEGANS*)

INTERIM RECOVERY PLAN

2004-2009

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Photograph: Andrew Brown

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Government of Western Australia

DEPARTMENT OF Conservation AND LAND MANAGEMENT
Conserving the nature of WA

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.

IRPs 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.

CALM is committed to ensuring that Critically Endangered taxa are conserved through the preparation and implementation of Recovery Plans or Interim Recovery Plans and by ensuring that conservation action commences as soon as possible and always within one year of endorsement of that rank by the Minister.

This Interim Recovery Plan replaces number 63 Elegant Spider Orchid (*Caladenia elegans* ms) (R. Phillimore *et al*. 2000).

This Interim Recovery Plan will operate from July 2004 to June 2009 but will remain in force until withdrawn or replaced. It is intended that, if the taxon is still ranked Critically Endangered, this IRP will be reviewed after five years and the need for a full Recovery Plan will be assessed.

This IRP was given regional approval on 22 June 2004 and was approved by the Director of Nature Conservation on 22 July 2004. The allocation of staff time and provision of funds identified in this Interim Recovery Plan is dependent on budgetary and other constraints affecting CALM, as well as the need to address other priorities.

Information in this IRP was accurate at July 2004.

ACKNOWLEDGMENTS

The following people have provided assistance and advice in the preparation of this Interim Recovery Plan:

Andrew Brown	Co-ordinator, Threatened Flora, CALM's WA Threatened Species & Communities Unit (WATSCU)
Anthony Desmond	Regional Leader, Nature Conservation, CALM Midwest Region
Val English	Acting Senior Ecologist, CALM's WATSCU
Stephen Hopper	Director, Botanic Gardens and Parks Authority
Sue Patrick	Senior Research Scientist, CALM W.A. Herbarium
Phil Roberts	Wildlife Officer, CALM Geraldton District

Thanks also to staff of the W.A. Herbarium for providing access to Herbarium databases and specimen information, and CALM's Wildlife Branch for assistance.

SUMMARY

Scientific Name:	*Caladenia elegans* Hopper & A.P.Br., *sp. nov.*	**Common Name:**	Elegant Spider Orchid
Family:	Orchidaceae	**Flowering Period:**	Late July-August
CALM Region:	Midwest	**CALM District:**	Geraldton
Shire:	Northampton	**Recovery Team:**	Geraldton District Threatened Flora and Communities Recovery Team

Illustrations and/or further information: Brown, A., Thomson-Dans, C. and Marchant, N. (Eds). (1998) *Western Australia's Threatened Flora*. Department of Conservation and Land Management, Western Australia; Hoffman, N. and Brown, A. (1998) *Orchids of South-west Australia*. Revised 2nd edition with supplement. University of Western Australia Press, Nedlands; Hopper, S.D. and Brown, A.P. (2001) Contributions to Western Australian Orchidology: 2. New taxa and circumscriptions in *Caladenia* (Spider, Fairy and Dragon Orchids of Western Australia). *Nuytsia* 14 (1/2), 221-224; Western Australian Herbarium (1998) FloraBase - Information on the Western Australian Flora. Department of Conservation and Land Management, Western Australia. http://www.calm.wa.gov.au/science/.

Current status: *Caladenia elegans* was declared as Rare Flora in May 1991 under the Western Australian *Wildlife Conservation Act* 1950 and ranked as Critically Endangered (CR) in September 1995. The taxon is also listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999. It currently meets World Conservation Union (IUCN 2000) Red List Category 'CR' under criteria B1ab(iii,v)+2ab(iii,v) as the populations are highly fragmented, and there is continuing decline in the quality of habitat and number of plants. The main threats are hydrological changes, weed invasion, water erosion, road, track and firebreak maintenance activities, feral pigs, grazing, inappropriate fire regimes and chemical drift.

Critical habitat: The critical habitat for *Caladenia elegans* comprises the area of occupancy of the known populations; similar habitat within 200 metres of known populations; remnant vegetation that links populations; additional nearby occurrences of similar habitat that do not currently contain the taxon but may have done so in the past and may be suitable for translocations; and the local catchment for the surface and possibly groundwaters that provide the winter-wet habitat of the taxon.

Habitat critical to the survival of the species, and important populations: Given that this taxon is listed as Critically Endangered it is considered that all known habitat for wild and translocated populations is habitat critical.

Benefits to other species/ecological communities: The habitat of *Caladenia elegans* also supports *Pterostylis* sp. Northampton (Critically Endangered) and *Caladenia hoffmanii* subsp. *hoffmanii* (Endangered). Recovery actions implemented to improve the quality or security of the habitat, such as weed control and rehabilitation, will be of benefit to the other threatened species that occur with *C. elegans*.

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 taxon is listed under the United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) Convention on International Trade in Endangered Species (CITES).

Role and interests of indigenous people: According to the Department of Indigenous Affairs Aboriginal Heritage Sites Register, there are burial grounds, and artefacts listed in the vicinity of the taxon but none within the immediate habitat of the populations. Input and involvement will be sought from any indigenous groups that have an active interest in areas that are habitat for *Caladenia elegans*, and this is discussed in the recovery actions.

Social and economic impacts: The implementation of this recovery plan has the potential to have some social and economic impact, as some populations are located on private property. Areas on private land that are considered to be 'habitat critical' may be regarded as having potential for uses other than conservation by landholders. Approaches that may minimise this potential impact could include covenants, management agreements or land acquisition. Recovery actions refer to continued negotiations with stakeholders with regard to these areas.

Evaluation of the Plans Performance: CALM, in conjunction with the Recovery Team will evaluate the performance of this IRP. The plan is to be reviewed within five years of its implementation.

Habitat requirements: *Caladenia elegans* grows on wet clay flats among low dense shrubs and annuals under taller scattered *Hakea*, *Melaleuca* and *Acacia*, north-west of Northampton.

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

1. Land managers have been notified of the location and threatened status of the taxon.
2. Declared Rare Flora (DRF) markers have been installed at Populations 1, 3a, 4a, 5a, 7a and 10a.
3. Dashboard stickers and posters describing the significance of DRF markers have been produced and distributed.
4. An A4 sized poster, that provides a description of the species and information about threats and recovery actions, has been developed for *Caladenia elegans*.
5. Populations 2, 3b, 7b and 7c have been fenced to prevent grazing by feral pigs, kangaroos and sheep.
6. In 1989, the Agriculture Protection Board conducted a 1080 baiting program throughout Northampton in an attempt to control feral pigs.
7. Leaf material was collected in 1999 for DNA analysis. This is part of the revision of *Caladenia* and allied genera being undertaken by the Department of Botany at Okhlahoma University, U.S.A.
8. A 10 x 10 metre quadrat was established at Population 1 in August 1990 by CALM staff.
9. A Rare Flora information session and maps have been provided to the Shire and personnel involved in road maintenance at Population 5 by Geraldton District staff.
10. Works to manage drainage/erosion problems have been undertaken on the road reserve at Population 1 of *Caladenia elegans*.
11. Weed control was conducted at Populations 1, 6 and 7 in April/May 2000, 2001, and 2003 by Geraldton District staff.
12. Native seedlings were planted in 2001, 2002 and 2003 at Populations 1 and 6 by CALM District staff, students and members of the Northampton Herbarium Group to help rehabilitate habitat of *Caladenia elegans*.
13. An 'Endangered' article about *Caladenia elegans* was published in Landscope in winter 2000.
14. Seed was collected by staff of the Botanic Gardens and Parks Authority (BGPA) in 2002 and stored in liquid nitrogen. Fungal isolates were obtained in 2002.
15. Soil from Populations 1, 2, 3, and 6 was collected in March 2004 by CALM District staff and sent to BGPA for mycorrhizal association studies.
16. The Geraldton District Threatened Flora and Communities Recovery Team is overseeing the implementation of this IRP.
17. Staff from CALM's Geraldton District regularly monitor populations of this taxon.

IRP Objective: The objective of this Interim Recovery Plan is to abate identified threats and maintain or enhance *in situ* populations to ensure the long-term preservation of the taxon in the wild.

Recovery criteria

Criteria for success: The number of individuals within populations and/or the number of populations have increased by ten percent or more over the period of the plan's adoption under the EPBC Act.

Criteria for failure: The number of individuals within populations and/or the number of populations have decreased by ten percent or more over the period of the plan's adoption under the EPBC Act.

Recovery actions

1. Coordinate recovery actions.
2. Map critical habitat.
3. Formally notify land owners.
4. Undertake weed control.
5. Develop and implement a drainage strategy for Population 1.
6. Fence Populations 9 and 11.
7. Rehabilitate habitat at Population 11.
8. Conduct further surveys.
9. Control feral animals that impact the species.
10. Liaise with land managers.
11. Seek long-term protection of habitat.
12. Collect seed and fungi.
13. Develop and implement a fire management strategy.
14. Seek to erect weed barriers, and continue to rehabilitate buffer at Population 6.
15. Monitor populations.
16. Monitor salinity and groundwater levels.
17. Obtain biological and ecological information.
18. Promote awareness.
19. Develop and implement a Translocation Proposal.
20. Review the need for a full Recovery Plan.

1. BACKGROUND

History

Caladenia elegans was first collected by A. Brown in August 1982 from west of Northampton. In 1990**,** two additional populations, Populations 2 and 3 were discovered north of the original population. Unfortunately, the largest of these populations was cleared shortly after discovery, leaving 2200 plants in the two remaining populations. Some regeneration of Population 2 was noted during a survey in 1996.

Three previously unrecorded populations were also discovered during a 1996 survey, increasing the range of the species to 61 km. A total of over 3000 plants were recorded from the populations that were known at this time. Also in 1996, another population (Population 6) was discovered on a Shire reserve west-north-west of Northampton by a member of the general public. The reserve also contains a population of another Critically Endangered orchid, *Pterostylis* sp. Northampton.

Further survey in 1998 by the West Australian Native Orchid Study and Conservation Group (WANOSCG) located another population of *Caladenia elegans* on a pastoral station well north of its previously known range. Two new populations of the taxon were also located by the volunteers from the Northampton Regional Herbarium in 2001 on private land. *C. elegans* is currently known from 12 populations totalling approximately 1900 plants.

An Interim Recovery Plan was developed for the species in 2000 (Phillimore *et al*. 2000). Information accumulated since that plan was completed has been incorporated into this plan and this document now replaces Phillimore *et al*. (2000).

Description

Caladenia elegans Hopper & A.P.Br. *sp. nov.* is an erect tuberous herb to 30 cm high, and has a narrow hairy leaf, 6 to 12 cm long and 3 to 5mm wide. It has up to three large creamy-yellow flowers, 5 to 8 cm across and dark maroon hairs on the tips of the slender, filamentous petals and sepals. The pale yellow labellum (lip) is striped with dark red. The edge of the labellum has irregular teeth and the calli (glands) are in two rows. Flowering occurs from late July to August (Brown *et al*. 1998; Hoffman and Brown 1998).

Caladenia elegans occurs with the common and widespread *C. vulgata*. *C. elegans* differs in having bright lemon yellow flowers with the calli glossy on top, a marginally earlier flowering period and a wet clay habitat, compared to the well drained soils further upslope that are the preferred habitat of *C. vulgata* (Hopper and Brown 20001).

Distribution and habitat

Caladenia elegans is known from 12 populations growing west-north-west, nor-nor-west, north west and east of Northampton, and north of Kalbarri. The taxon grows on wet clay flats among low dense shrubs and annuals under taller scattered *Hakea*, *Melaleuca* and *Acacia* (Hopper and Brown 2001).

Associated species include *Thryptomene denticulata, Chorizema ericifolium, Dodonaea inaequifolia, Acacia acuminata, Hakea recurva, Melaleuca uncinata, Grevillea thelemanniana* subsp. *pinaster, Conostylis prolifera* and *Drosera neesii* subsp. *borealis*.

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

Given that this taxon is ranked as Critically Endangered it is considered that all known habitat is habitat critical. In addition all populations, including translocated populations, are considered important to the survival of the taxon. Recovery actions include survey for further populations that may lead to the identification of additional critical habitat.

Benefits to other species/ecological communities

The Critically Endangered *Pterostylis* sp. Northampton occurs in the habitat of Populations 1, 2, 3, 6 and 11 of *Caladenia elegans*, and the Endangered *Caladenia hoffmanii* subsp. *hoffmanii* occurs with Population 1. Recovery actions implemented to improve the quality or security of the habitat of the species, such as weed control and rehabilitation, will be of benefit to the other threatened species that occur with *C. elegans*.

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 taxon is specifically listed under the United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) Convention on International Trade in Endangered Species (CITES).

Role and interests of indigenous people

According to the Department of Indigenous Affairs Aboriginal Heritage Sites Register, there are burial grounds, and artefacts listed in the vicinity of the taxon but none within the immediate habitat of the populations. Input and involvement will be sought from any indigenous groups that have an active interest in areas that are habitat for *Caladenia elegans*, and this is discussed in the recovery actions.

Social and economic impacts

The implementation of this recovery plan has the potential to have social and economic impact, as some populations are located on private property (Populations 2, 3b, 4b, 7b, 7c, 8, 9, 10b, 11 and 12). Areas on private land that are considered to be 'habitat critical' may be regarded as having potential for uses other than conservation by landholders. Approaches that may minimise this potential impact could include covenants, management agreements or land acquisition. Recovery actions refer to continued negotiations with stakeholders with regard these areas.

Evaluation of the Plan's Performance

CALM, in conjunction with the Geraldton District Threatened Flora and Communities Recovery Team (GDTFCRT) will evaluate the performance of this Interim Recovery Plan. The plan is to be reviewed within five years of its implementation. Any changes to management or recovery actions will be documented accordingly.

Critical habitat

Critical habitat is habitat identified as being critical to the survival of a listed threatened species or listed threatened ecological community. Habitat is defined as the biophysical medium or media occupied (continuously, periodically or occasionally) by an organism or group of organisms or once occupied (continuously, periodically or occasionally) by an organism, or group of organisms, and into which organisms of that kind have the potential to be reintroduced (*Environment Protection and Biodiversity Conservation Act* 1999 - EPBC Act).

The critical habitat for *Caladenia elegans* comprises:

- the area of occupancy of known populations;
- areas of similar habitat within 200 metres of known populations, ie. on wet clay flats among low dense shrubs and annuals under taller scattered *Hakea*, *Melaleuca* and *Acacia* (these provide potential habitat for natural range extension);
- remnant vegetation that surrounds or links populations (this is necessary to allow pollinators to move between populations);
- additional occurrences of similar habitat that do not currently contain the taxon but may have done so in the past (these represent possible translocation sites); and
- the local catchment for the surface and possibly groundwaters that provide the winter-wet habitat of the taxon (the taxon occurs in wetland habitat whose occurrence depends on the maintenance of local hydrology).

Biology and ecology

Caladenia species such as *C. elegans* typically have a growing phase from March through to late November. Early in the growing season the orchid remains below ground as a newly sprouted shoot from the dormant tuber. Following the first seasonal rains a single leaf appears above ground and mycorrhizal associations are active. During winter the replacement tuber, which is essential for survival until the following year, is initiated and continues to develop until late in the growing season. Not all plants in a population will produce flowers in any one year. Generally, for every plant in flower, a number of vegetative plants will be present. The proportion of flowering to non-flowering individuals is influenced by environmental conditions including the presence or absence of summer fire and the amount of rainfall received during winter and spring.

Flowering individuals will produce a bud mid way through the growing season that continues to grow until flowering. Plants flower for approximately two weeks or until pollination occurs, after which flowers collapse and if pollination was successful a seed capsule develops. The capsule swells as seed matures, and this can take from six to eight weeks to develop depending on climatic conditions. If temperatures are higher than average seeds may mature faster. Prior to seeds being released the green capsule turns yellow and then brown. Small slits develop in the capsule from which the seed is dispersed. Although very large quantities of seed are released from each capsule, few grow to maturity (Carstairs and Coates 1994).

Seeds will remain dormant in the soil over summer until the break of the season the following year. Once wet, the seeds imbibe water and the seed coat splits. At this point infection by a suitable fungus is required for germination to occur, which will result in a protocorm and subsequent seedling. Not all of these seedlings will mature, as those that fail to produce a tuber will not survive dry summer conditions. If no fungus is present, seed remains dormant in the soil throughout the growing season, and those that are not predated are killed by dry summer conditions (Batty *et al.* 2000).

Orchid seedlings are very small for the first growing season and are difficult to locate. Leaves are typically less than 20 mm long and only a few mm wide. It appears that leaf and tuber size increase over the next 4 to 5 years until adult plants capable of flowering are present.

Adult plants are probably long-lived (tens of years). Flowering is synchronised within and among populations to produce an expansive bloom of short duration. The flowers are sweetly scented and pollinated by male thynnid wasps, possibly attracted in response to pheromones emitted by the flowers. Once the wasp has been attracted to the flower visual and tactile cues stimulate further pollination responses (Carstairs and Coates 1994). Mating season (August) is the only time the male thynnid wasp pollinators of *Caladenia elegans* are active above ground.

Caladenia elegans does not require fire to complete its life cycle however there is some evidence to suggest that it may benefit from fire every ten years or so. Fire opens up the understorey thereby reducing competition for space and light and provides a source of nutrients for the growth of mycorrhiza on which *C. elegans* seedlings depend for their establishment and growth. Research has indicated that adult plants are most vulnerable to fire during their vegetative stage (April-July) when replacing their parent tuber (Carstairs and Coates 1994).

Threats

Caladenia elegans was declared as Rare Flora in May 1991 under the Western Australian *Wildlife Conservation Act 1950* and ranked as Critically Endangered (CR) in September 1995. The taxon is also listed as Endangered under the Commonwealth *Environmental Protection and Biodiversity Conservation* Act 1999 (EPBC Act). It currently meets World Conservation Union (IUCN) Red List Category ‘CR’ under criteria B1ab(iii,v)+2ab(iii,v) (IUCN 2000) as populations are severely fragmented and there is continuing decline in the quality of habitat and number of plants. The main threats are hydrological changes, weed invasion, water erosion, road, track and firebreak maintenance activities, feral pigs, grazing, inappropriate fire regimes and chemical drift.

- **Weed invasion** is a major threat to all populations. Weeds suppress early plant growth by competing for soil moisture, nutrients and light. They also exacerbate grazing pressure and increase the fire hazard due to the easy ignition of high fuel loads, which are produced annually by many weed species.

- **Hydrological change including salinisation** may be impacting the taxon. Salinisation can occur as a consequence of evaporation of increased levels of surface water resulting in salt residues on the soil. The Northampton area has also been identified in a dryland salinity assessment as an area being at medium risk based on groundwater depth and soil system (Short and McConnell 2001).

- **Water erosion** in a drainage channel at Population 1 is directly affecting *Caladenia elegans* plants and their habitat. The site may originally have been a natural drainage line, but road building and land clearing have resulted in large volumes of runoff into the road reserve that contains Population 1. A drainage culvert and constructed levy bank in an adjacent paddock on the south side of the road have served to further direct the water into the road reserve. This has resulted in the erosion of large sections of the road reserve, creating wide channels up to five metres in width adjacent to the road. Parallel erosion channels have begun to form in the centre of the road reserve. The water flowing from adjacent land is also channelling seeds of pasture grasses, fertilisers and silt into the habitat of the orchid, causing weed infestation and a coverage of silt. A monitoring site established at that site in 1990 has become densely infested with weeds, and no orchids were observed within the plot in 1994. Similarly, on the north side of the road at Population 1, a spoon drain directs water, silt and weed seeds into the road reserve. Despite some works that have occurred in an attempt to stem the water flow (see existing recovery actions), overall the drainage situation is not good with water still flowing through the area too quickly rather than soaking in to the clay.

- **Road, track and firebreak maintenance activities** threaten the *Caladenia elegans* and its habitat. Threats include actions such as grading road reserves, road widening (in particular Population 1), spraying of chemicals, constructing drainage channels and mowing the roadside vegetation to improve visibility. In particular on the north side of the road reserve where Population 1 is located, firebreaks have been cleared both sides of the boundary fence in a section of the habitat. These disturbance events also often encourage weed invasion into adjacent habitat, as well as causing damage to actual plants. Population 5a was damaged during road maintenance activities in early 2000.

- **Feral pig** activity has been observed in most populations. As well as grazing the orchids themselves, pigs can destroy the underground tubers of the orchid and also affect the growth of symbiotic fungi that are essential for germination and for providing starches for the plant (Hoffman and Brown 1998).

- **Grazing** by kangaroos (*Macropus fuliginosus*) and rabbits (*Oryctolagus cuniculus*) has impacted upon most populations. In addition, disturbance of soil by rabbit warren construction, increased nutrient levels from their droppings and the introduction of weeds impact on the habitat of the species. Grazing may impact on the establishment of *Caladenia elegans* seedlings thereby limiting natural recruitment. In recent years, the impact of rabbits has declined due to rabbit baiting by many landholders, and the introduction of the calici virus. Managers of land that contains Population 8 already undertake rabbit control in the area.

- **Inappropriate fire regimes** may affect the viability of populations. Undergrowth can get excessively dense and orchids can be out-competed if an area is too long unburnt. However, fire that occurs when the orchid has above-ground growth will prevent seed set and possibly kill the tuber through a lack of opportunity to build up starch reserves. Most orchid species emerge from the soil by mid April and dehisce their seed by late November. The optimum time for fire in orchid populations is therefore from December to March. The orchids become dormant at this time when climatic conditions are typically hot and dry. This time, however, is with associated risks of fire becoming uncontrolled and risking lives and property. In addition to the detrimental effects of inappropriate fire on the vegetative stages of the species, a proliferation of weeds often follows burning, partly due to a temporary increase in the availability of nutrients (Panetta and Hopkins 1991).

- **Chemical drift** from herbicide and fertiliser applications from adjacent farmland have the potential to impact the species' growth and survival.

Summary of population information and threats

Pop. No. & Location	Land Status	Year/No. plants	Habitat Condition	Threats
1. WNW of Northampton	Shire road reserve	1990 2000+ 1994 1000+ 1996 500+ 1998 231+ 1999 150+ 2000 47 2001 61 2003 74	Poor	Weeds, water erosion, chemical drift, road and firebreak maintenance, hydrological changes, pigs, inappropriate fire regimes, grazing
2. WNW of Northampton	Private Property	1990 500+ 1994 1 1995 12 1999 20+ 2000 3 2001 0 2002 256	Poor	Track maintenance, weeds, chemical drift, hydrological changes, pigs, inappropriate fire regimes, grazing
3a. WNW of Northampton	Shire road reserve	1990 200+* 1994 200+* 1996 10* 1999 22+* 2000 0 2001 2* 2003 46	Moderate	Weeds, road maintenance, chemical drift, hydrological changes, pigs, inappropriate fire regimes, grazing
3b. WNW of Northampton	Private Property	1990 200+* 1994 200+* 1996 10* 1999 22+* 2000 7 2001 2* 2003 60+	Healthy	Weeds, chemical drift, hydrological changes, pigs, inappropriate fire regimes
4a. WNW of Northampton	Shire road reserve	1994 200* 2001 0	Moderate	Weeds, road maintenance, chemical drift, hydrological changes, pigs, inappropriate fire regimes
4b. WNW of Northampton	Private Property	1994 200* 2000 7 2001 0 2002 11	Moderate	Weeds, chemical drift, hydrological changes, pigs, inappropriate fire regimes
5a. East of Northampton	Shire Road Reserve	1996 300+* 1999 210+* 2000 0* 2002 90+* 2003 20+*	Healthy	Weeds, hydrological changes, pigs, inappropriate fire regimes
5b. East of Northampton	Unallocated Crown Land	1996 300+* 1999 210+* 2000 0* 2002 90+* 2003 20+*	Healthy	Weeds, hydrological changes, pigs, inappropriate fire regimes
6. WNW of Northampton	Shire reserve	1996 1000+ 1998 100+ 2000 91+ 2001 79 2002 150+	Healthy	Weeds, chemical drift, inappropriate fire regimes, hydrological changes, pigs, grazing
7a. WNW of Northampton	Shire road reserve	1996 500+* 1999 20+ 2001 150+* 2002 180+* 2003 8	Moderate	Road maintenance, weeds, chemical drift, hydrological changes, pigs, inappropriate fire regimes, grazing
7b. WNW of	Private	1996 500+*	Healthy	Weeds, chemical drift,

Northampton	Property	1999 100+ 2001 150+* 2002 180+* 2003 200+		hydrological changes, pigs, inappropriate fire regimes, grazing
7c. WNW of Northampton	Private Property	1996 500+* 1999 80+ 2001 150+*	Healthy	Weeds, chemical drift, hydrological changes, pigs, inappropriate fire regimes, grazing
8. North of Kalbarri	Pastoral Lease	1998 4	Healthy	Grazing, track and firebreak maintenance, hydrological changes, inappropriate fire regimes
9. NW of Port Gregory	Private Property	2000 200+	Healthy	Pigs, hydrological changes, inappropriate fire regimes
10a. NW of Port Gregory	Shire Road Reserve	2000 500+* 2001 500+* 2003 600+*	Healthy	Road maintenance, weeds, pigs, hydrological changes, inappropriate fire regimes
10b. NW of Port Gregory	Private Property	2000 500+* 2001 500+* 2002 371 2003 600+*	Healthy	Weeds, pigs, hydrological changes, inappropriate fire regimes
11. NW of Port Gregory	Private Property	2001 15 2002 162 2003 100+	Moderate	Weeds, pigs, hydrological changes, inappropriate fire regimes
12. NW of Port Gregory	Private Property	2002 60	Healthy	Hydrological changes, inappropriate fire regimes

* = total for subpopulations combined.

Guide for decision-makers

Section 1 provides details of current and possible future threats. Developments in the immediate vicinity of the populations or within the defined critical habitat of *Caladenia elegans* require assessment. No developments should be approved unless the proponents can demonstrate that they will have no significant impact on the taxon, its habitat or potential habitat, or the local surface or groundwater hydrology.

2. RECOVERY OBJECTIVE AND CRITERIA

Objectives

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

Criteria for success: The number of individuals within populations and/or the number of populations have increased by ten percent or more over the period of the plan's adoption under the EPBC Act.
Criteria for failure: The number of individuals within populations and/or the number of populations have decreased by ten percent or more over the period of the plan's adoption under the EPBC Act.

3. RECOVERY ACTIONS

Existing recovery actions

Land managers have been notified of the location and threatened status of the taxon. The notification details the Declared Rare status of *Caladenia elegans* and the legal responsibility to protect it.

Declared Rare Flora (DRF) markers have been installed at Populations 1, 3a, 4a, 5a, 7a and 10a. These serve to alert people working in the vicinity to the presence of DRF, and the need to avoid work that may damage plants or their habitat. Dashboard stickers and posters describing the significance of DRF markers have also been produced and distributed.

An A4 sized poster, that provides a description of the species and information about threats and recovery actions, has been developed for *Caladenia elegans*. These posters have been distributed to the local community in the hope that it will result in the discovery of new populations.

Populations 2, 3b, 7b and 7c have been fenced to prevent grazing and other damage caused by feral pigs, kangaroos and sheep.

In 1989, the Agriculture Protection Board conducted a 1080 baiting program throughout Northampton in an attempt to control feral pigs. By 1991, pigs had reinvaded the area, and in August 1994 recent pig diggings were observed near the populations of *Caladenia elegans*. In summer 2001/2002, baiting was undertaken by Agriculture WA at Population 6. Liaison between staff of CALM Geraldton District and Agriculture WA is continuing with regard to pig control.

Leaf material was collected in 1999 for DNA analysis. This is part of the revision of *Caladenia* and allied genera being undertaken by the Department of Botany at Okhlahoma University, U.S.A.

A 10 x 10 metre quadrat was established at Population 1 in August 1990 by CALM staff. Seventy *Caladenia elegans* plants were originally counted in this plot. The condition of the vegetation and number of *C. elegans* plants are monitored regularly by CALM staff.

A Rare Flora information session and maps have been provided by CALM's Geraldton District staff to the Shire and personnel involved in road maintenance at Population 5.

Works to manage drainage/erosion problems on the road reserve at Population 1 of *Caladenia elegans* have included:

- Modifying a culvert to direct water to the opposite side of the road to divert the water flow and hence slow it down. This culvert becomes blocked during heavy rain, however.
- A gravel pit to the east of the population has been ripped to slow runoff and encourage regeneration. The pit was then planted with endemics in 2001 and 2002 by school children groups. Most of the seedlings have since died due to drought, and lack of topsoil has prevented rehabilitation success. The Shire of Northampton placed topsoil and native vegetation in the pit (available from a road widening operation) and will spread this over the surface to assist the rehabilitation.
- A drain that leads from an adjoining paddock into the road reserve has been brushed and planted with seedlings to stem the flow of water into the culvert.
- Piles of rock have been placed in the erosion gully. These rocks have helped to slow the water flow, but the soil attached to the rocks also increased weed invasion.
- The water flow through Population 1 of *Caladenia elegans* was examined and mapped during a high rainfall event to help determine local topography and most appropriate actions to manage surface water flows

Weed control was conducted at Populations 1, 6 and 7 in April/May 2000, 2001, and 2003 by Geraldton District staff. Weeds at these populations were either removed by spraying fusilade or roundup, or by hand weeding.

Approximately 700 native seedlings were planted on Arbour Day 2001 at Populations 1 and 6 of *Caladenia elegans*, and 300 seedlings were also planted in 2002/2003 by CALM District staff, students and members of the Northampton Herbarium Group, to rehabilitate the sites. These areas were also baited to control feral pigs with property owners monitoring the level of pig activity.

An 'Endangered' article about *Caladenia elegans* was published in Landscope in winter 2000 (Brown and English 2000).

Seed was collected by staff of the Botanic Gardens and Parks Authority (BGPA) in 2002 and stored in liquid nitrogen. Fungal isolates were also obtained in 2002 and were confirmed to be mycorrhizal through germination trials. Fungal isolates are stored in liquid nitrogen at the BGPA.

Soil was collected from Populations 1, 2, 3, and 6 in March 2004 by CALM District staff and sent to BGPA for mycorrhizal association studies.

The Geraldton District Threatened Flora and Communities Recovery Team (GDTFCRT) is overseeing the implementation of this IRP and will include information on progress in its annual report to CALM's Corporate Executive and funding bodies.

Staff from CALM's Geraldton District regularly monitor all populations of this taxon.

Future recovery actions

Where populations occur on lands other than those managed by CALM, permission has been or will be sought from appropriate land managers prior to recovery actions being undertaken. The following recovery actions are roughly in order of descending priority; however this should not constrain addressing any of the priorities if funding is available for 'lower' priorities and other opportunities arise.

1. Coordinate recovery actions

The GDTFCRT will continue to coordinate recovery actions for *Caladenia elegans* and other Declared Rare Flora in their region. They will include information on progress in their annual report to CALM's Corporate Executive and funding bodies.

Action: Coordinate recovery actions
Responsibility: CALM (Geraldton District) through the GDTFCRT
Cost: $2,100 per year

2. Map critical habitat

It is a requirement of the EPBC Act that spatial data relating to critical habitat be determined. Although critical habitat is described in Section 1, the areas as described have not yet been mapped and that will be done under this action. If any additional populations are located, then critical habitat will also be determined and mapped for these locations.

Action: Map critical habitat
Responsibility: CALM (Geraldton District, WATSCU) through the GDTFCRT
Cost: $2,000 in the first year

3. Formally notify land owners

The owners of land containing Population 10b and 12 need to be formally notified of the presence of *Caladenia elegans* to help ensure plants are not damaged accidentally. Both of these populations are located on private property.

Action: Formally notify land owners
Responsibility: CALM (Wildlife Branch)
Cost: $100 in the first year

4. Undertake weed control

Weed control will be undertaken as required in populations of *Caladenia elegans*, in consultation with the land managers. Appropriate methods of weed control are found in Brown and Brooks (2002) and may include localised application of herbicide or hand pulling. All applications of weed control will be followed by a report on the method, timing and success of the treatment, and the effect on *C. elegans* and associated native plant species. It is anticipated that native species in the habitat will regenerate more effectively as weed competition is removed.

Action: Undertake weed control
Responsibility: CALM (Geraldton District, WATSCU) through the GDTFCRT
Cost: $1,500 per year

5. Develop and implement a drainage and rehabilitation strategy for Population 1

Strategies to restore the habitat through drainage management, controlling weeds and reintroducing plant species native to the site is essential to conserve Population 1. A drainage control and rehabilitation strategy will be developed and implemented in liaison with relevant stakeholders including the local Shire. Water flows around the population have been examined during a high rainfall event to help determine local topography and to help determine the most appropriate actions.

Possible actions include:

- Diverting the road.
- Lining the current erosion channels on the south side of the road with rocks.
- Levelling the spoon drain formed on the north side of the road, to ensure water flowing off the road flows alongside the road and not into the road reserve.
- On the south side of the road, channelling water so that it flows off farm land and into the road reserve in an area that is outside of the habitat of this and other DRF species.
- Fill in the current channel on the south side of the road and duct water through a large concrete pipe.
- Completely fill in the channel on the south side of the road with clean soil and create a much narrower rock-lined channel.
- Fill the current channel on the south side of the road at intervals with rocks to create riffles to slow the water flow and decrease erosion.
- Place smaller 'blunt ended' rock lined channels at angles to the current channel on the south side of the road to divert the water, and allow it to drain away more slowly. This is not a favoured option, as it will remove possible habitat and increase disturbance, weeds and flooding in the road reserve.
- Fill the channel on the south side of the road at intervals with brush cut from local species to slow water flow. Note that this is unlikely to have any real effect as the brush is likely to be washed away due to the high water flows at the site. This action may be more effective if combined with partial filling of the channel.

Action: Develop and implement a drainage and rehabilitation strategy for Population 1
Responsibility: CALM (Geraldton District) through the GDTFCRT
Cost: To be determined

6. Fence Populations 9 and 11

Where feasible, remnant vegetation on private property that contains Populations 9 and 11 will be fenced. This will prevent damage by pigs, and stock that occur in the area during the summer.

Action: Fence Populations 9 and 11
Responsibility: CALM (Geraldton District) through the GDTFCRT
Cost: $7,800 in the first year

7. Rehabilitate habitat at Population 11

Planting of degraded areas will be undertaken in the habitat of Population 11 to prevent weed encroachment.

Action: Rehabilitate habitat at Population 11
Responsibility: CALM (Geraldton District) through the GDTFCRT
Cost: $7,100 in the first year and $2,400 in the second year

8. Conduct further surveys

Further surveys will be conducted during the species' flowering period (late July to August). Local volunteers such as members of naturalists clubs, WANOSCG, regional herbaria and wildflower societies will be encouraged to be involved in surveys supervised by CALM staff.

Action: Conduct further surveys
Responsibility: CALM (Geraldton District) through the GDTFCRT
Cost: $3,500 per year

9. Control feral animals that impact the species

Disturbance by feral animals will be monitored at all populations, and if necessary numbers will be controlled through baiting or other alternative methods.

Action: Control feral animals that impact the species
Responsibility: CALM (Geraldton District) through the GDTFCRT
Cost: $2,500 per year

10. Liaise with land managers

Staff from CALM's Geraldton District will continue to liaise with the Shire and adjacent landowners to ensure that populations are not accidentally damaged or destroyed. Input and involvement will also be sought from any indigenous groups that have an active interest in areas that are habitat for *Caladenia elegans*.

Action: Liaise with land managers
Responsibility: CALM (Geraldton District) through the GDTFCRT
Cost: $800 per year

11. Seek long-term protection of habitat

Ways and means of improving the security of populations and their habitat on private land will be sought. This may include conservation covenants with a range of agencies or registration through the Land for Wildlife scheme. In addition, Population 6 of *Caladenia elegans* is located on a Shire reserve for "Picnic Ground and Flora" and Population 5b is located on Unallocated Crown Land. The possibility of acquiring these reserves and vesting them with the Conservation Commission will be investigated.

Action: Seek long-term protection of habitat
Responsibility: CALM (Geraldton District, Land and External Funding Unit, WATSCU) through the GDTFCRT
Cost: $1,500 in the second and third years

12. Collect seed and fungi

Preservation of germplasm is essential to guard against extinction if wild populations are lost. Such collections are also needed to propagate plants for translocations. Some seed and endophytic material has been collected from *Caladenia elegans* but further collections are required from all populations. Hand pollination of the orchid may promote a higher seed set.

Action: Collect seed and fungal material
Responsibility: BGPA and CALM (Geraldton District) through the GDTFCRT
Cost: $3,200 per year

13. Develop and implement a fire management strategy

A fire management strategy that defines fire control measures, and fire intensity, frequency and timing will be developed in consultation with relevant authorities and land managers. In particular, at Population 1 occasional fire, in conjunction with weed control, may be advantageous to reduce competition from dense understorey shrubs.

Action: Develop and implement a fire management strategy
Responsibility: CALM (Geraldton District) through the GDTFCRT
Cost: $2,600 in first year and $1,100 in subsequent years

14. Seek to erect weed barriers, and continue to rehabilitate buffer at Population 6

Population 6 of *Caladenia elegans* is located on a Shire reserve for 'Picnic Ground and Flora'. Planting of degraded areas has already been undertaken and will be continued to help prevent weed encroachment into the reserve. Permission will be sought from the shire to erect a shade cloth barrier to prevent the spread of weed seeds.

Action: Seek to erect weed barriers, and continue to rehabilitate buffer at Population 6
Responsibility: CALM (Geraldton District) through the GDTFCRT
Cost: $7,600 in first year, $2,400 in second and third years

15. Monitor populations

Monitoring of factors such as weed invasion, pig activity, grazing, habitat degradation, and population stability (expansion or decline), pollinator activity, seed production, recruitment, and longevity is essential. All populations will be inspected annually with special attention given to any impacts from increased salinisation.

Action: Monitor populations
Responsibility: CALM (Geraldton District) through the GDTFCRT
Cost: $1,000 per year

16. Monitor salinity and groundwater levels

A number of monitoring bores will need to be installed at each population to monitor groundwater and salinity levels. Soil salinity and pH readings will also be taken annually during winter. Soil samples may be collected using an auger to determine the soil profile. The monitoring results will continue to be examined and the implications for management determined.

Action: Monitor salinity and groundwater levels
Responsibility: CALM (Geraldton District) through the GDTFCRT
Cost: $2,500 in year one and two, $1,500 per year thereafter

17. Obtain biological and ecological information

Increased knowledge of the biology and ecology of the species will provide a scientific basis for management of *Caladenia elegans* in the wild. Investigations will include:

1. Study of the role of various factors including disturbance, competition, rainfall and grazing in recruitment and seedling survival.
2. Determination of reproductive strategies, phenology and seasonal growth.
3. Investigation of the mating system and pollination biology.
4. Investigation of population genetic structure, levels of genetic diversity and minimum viable population size.
5. Investigate the distribution of fungi associated with *C. elegans*.

Action: Obtain biological and ecological information
Responsibility: CALM (CALMScience, Geraldton District) and BGPA through the GDTFCRT
Cost: $18,100 per year for first three years

18. Promote awareness

The importance of biodiversity conservation, the preservation of Declared Rare species generally and the existence of *Caladenia elegans* in particular will be promoted to the public. Awareness will be encouraged in the community by a publicity campaign through the local print and electronic media and poster displays. Formal links with local naturalist groups and interested individuals will also be encouraged.

An information sheet for *Caladenia elegans* has been produced and distributed. A mail-out information flier for distribution in the Northampton area will also be produced. These fliers are aimed at local residents to provide information and a contact if they locate the species.

Action: Promote awareness
Responsibility: CALM (Geraldton District, Corporate Relations) through the GDTFCRT
Cost: $1,400 in the first and second years; $1,300 in third year and $1,200 per year thereafter

19. Develop and implement a Translocation Proposal

Although translocations are generally undertaken under full Recovery Plans, but given the high level of threat to known populations of *Caladenia elegans*, a Translocation Proposal will be developed and implemented within the time frame of this IRP. Information on the translocation of threatened animals and plants in the wild is provided in CALM's Policy Statement No. 29 *Translocation of Threatened Flora and Fauna*. All Translocation Proposals require endorsement by CALM's Director of Nature Conservation.

Action: Develop and implement a Translocation Proposal
Responsibility: CALM (Science Division, Geraldton District) and BGPA and the GDTFCRT
Cost: $13,300 in the second year and $6,200 in subsequent years.

20. Review the need for a full Recovery Plan

At the end of the fourth year of the five-year term of this Interim Recovery Plan, the need for further recovery will be assessed. If the taxon is still ranked Critically Endangered, the need to develop a full Recovery Plan, or to update this IRP will be assessed.

Action: Review the need for a full Recovery Plan
Responsibility: CALM (WATSCU, Geraldton District) through the GDTFCRT
Cost: $23,700 in the fifth year (if required)

4. TERM OF PLAN

This Interim Recovery Plan will operate from July 2004 to June 2009 but will remain in force until withdrawn or replaced. If the taxon is still ranked Critically Endangered after five years, the need to review this IRP or to replace it with a full Recovery Plan will be determined.

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6. TAXONOMIC DESCRIPTION

Hopper, S.D. and Brown, A.P. (2001) Contributions to Western Australian Orchidology: 2. New taxa and circumscriptions in *Caladenia* (Spider, Fairy and Dragon Orchids of Western Australia). *Nuytsia* 14 (1/2), 221-224.

Caladenia elegans Hopper & A.P. Br., *sp. nov.*: *Plant* solitary or in small clumps. *Leaf* erect, linear, 6-12cm x 3-7 mm, pale green, basal third usually irregularly blotched with red-purple. *Scape* 20-30 cm tall. *Flowers* 1 or 2(3), c. 5-8 cm across, bright lemon yellow with dark maroon lines, spots and blotches; floral odour like burning metal. *Sepals and petals* stiffly held near base with a lax apex, linear-lanceolate in basal 1/5, then abruptly narrowing to a dark maroon densely glandular long-acuminate filamentous apex lacking a tumescent osmophore; glandular hairs elongate, cylindrical. *Dorsal sepal* erect and slightly incurved, 5.5-10 cm x 2.5-3 mm. *Lateral sepals* spreading obliquely downwards, becoming vertical, 7-11 cm x 2.5-4 mm. *Petals* spreading horizontally, then downcurved to vertical, 6.5-8.5 cm x 2.5-3 mm. *Labellum* usually cream with prominent maroon radiating basal lines often becoming irregular spots and blotches towards the recurved apex, stiffly articulate on a claw c. 1.5 mm wide; lamina linear-rhomboidal to triangular in outline when flattened, 12-15 x 8-10 mm, obscurely 3-lobed, erect with entire margins in basal third, nearly horizontal in middle third, apical third sharply recurved, margins at widest point scarcely curved upwards and terminated by slightly ascending margins and calli, distal margins dentate with broadly truncate forwardly uncinate white to pale yellow marginal calli decrescent towards the apex. *Lamina calli* in 6-13 pairs in 2 rows extending about half the length of the labellum, creamy-white, rarely with pale pink markings, glossy on top, broadly anvil-shaped; the longest c. 1 mm tall, slightly decrescent distally, *Column* 10-12 x 5-7 mm, narrowly winged, creamy yellow with red blotches, sparsely hirsute with short glandular hairs on outer surface. *Anther* c. 2-2.5 x 2-2.5 mm, pale yellow or greenish-yellow. *Pollinia* c. 2 mm long, yellow. *Stigma* c. 2.5 mm wide. *Capsule* not seen.

SUMMARY OF RECOVERY ACTIONS AND COSTS

Recovery Action	Year 1			Year 2			Year 3			Year 4			Year 5		
	CALM	Other	Ext.	CALM	Other	Ext.	CALM	Other	Ext.	CALM	Other	Ext.	CALM	Other	Ext.
Coordinate recovery actions	1400	300	400	1400	300	400	1400	300	400	1400	300	400	1400	300	400
Map critical habitat	500		1500												
Formally notify land owners	100														
Undertake weed control	1000		500	1000		500	1000		500	1000		500	1000		500
Develop and implement a drainage strategy for Population 1	To be determined														
Fence Populations 9 and 11	200		7600												
Rehabilitate habitat at Population 11	900		6200	900		1500									
Conduct further surveys	1100	1100	1300	1100	1100	1300	1100	1100	1300	1100	1100	1300	1100	1100	1300
Control feral animals that impact the species	1500		1000	1500		1000	1500		1000	1500		1000	1500		1000
Liaise with land managers	500		300	500		300	500		300	500		300	500		300
Seek long-term protection of habitat				1000		500	1000		500						
Collect seed and fungi		2000	1200		2000	1200		2000	1200		2000	1200		2000	1200
Develop and implement a fire management strategy	900		1700	100		1000	100		1000	100		1000	100		1000
Seek to erect weed barriers, and continue to rehabilitate buffer at Population 6	1100		6500	1100		1300	1100		1300						
Monitor populations	500		500	500		500	500		500	500		500	500		500
Monitor salinity and groundwater levels			2500			2500			1500			1500			1500
Obtain biological and ecological information	7000		11100	7000		11100	7000		11100						
Promote awareness	600		800	600		800	600		700	600		600	600		600
Develop and implement a Translocation Proposal				1000	2000	10300	400	600	5200	400	600	5200	400	600	5200
Review the need for a full Recovery Plan													15300		8400
Total	17300	3400	43100	17700	5400	34200	16200	4000	26500	7100	4000	13500	22400	4000	21900
Yearly Total		**63,800**			**57,300**			**46,700**			**24,600**			**48,300**	

NHT = External funding (funding to be sought), Other = funds contributed by NHT, in-kind contribution and BGPA.

Total CALM:	$80,700
Total Other:	$20,800
Total External Funding:	$139,200
TOTAL COSTS:	**$240,700**