INTERIM RECOVERY PLAN NO. 192

SMALL FLOWERED CONOSTYLIS (*CONOSTYLIS MICRANTHA*)

INTERIM RECOVERY PLAN

2004-2009

Gillian Stack[1] and Alanna Chant[2]
[1] Project Officer, WA Threatened Species and Communities Unit, CALM, PO Box 51 Wanneroo, 6946.
[2] Flora Conservation Officer, CALM's Geraldton District, PO Box 72, Geraldton 6531.

Photograph: Rebecca Evans

December 2004

Department of Conservation and Land Management
Western Australian Threatened Species and Communities Unit (WATSCU)
PO Box 51, Wanneroo, WA 6946

Natural Heritage Trust
Helping Communities Helping Australia

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 results from a review of, and replaces, No.7 *Conostylis micrantha* (Holland *et al.*1996). This Interim Recovery Plan will operate from December 2004 to November 2009 but will remain in force until withdrawn or replaced. It is intended that this IRP will be reviewed after five years.

This IRP was given regional approval on 14 February 2005 and approved by the Director of Nature Conservation on 25 February 2005 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 in December 2004.

ACKNOWLEDGMENTS

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

Eric Bunn	Senior Research Scientist (Propagation Science), Botanic Garden and Parks Authority
Anthony Desmond	Program Leader Nature Conservation, CALM's Midwest Region
Amanda Shade	Horticulturalist, Botanic Garden and Parks Authority

Thanks also to the 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:	*Conostylis micrantha*	**Common Name:**	Small Flowered Conostylis
Family:	Haemodoraceae	**Flowering Period:**	July - August
CALM Region:	Midwest	**CALM District:**	Geraldton
Shire:	Irwin, Greenough	**Recovery Team:**	Geraldton District Threatened Flora Recovery Team

Illustrations and/or further information: A. Brown, C. Thomson-Dans and N. Marchant (Eds) (1998) *Western Australia's Threatened Flora*, Department of Conservation and Land Management, Western Australia; S.D. Hopper *et al.* (1987) Haemodoraceae, *Flora of Australia*, Australian Biological Resources Study, Canberra.

Current status: *Conostylis micrantha* was declared as Rare Flora in September 1987under the Western Australian *Wildlife Conservation Act 1950*. It currently meets Red List category Vulnerable under World Conservation Union (IUCN) criterion D1 (IUCN 2000). *C. micrantha* is listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Four populations have been discovered within a Nature Reserve since 1996. The habitat of these populations is subject to low levels of weed invasion, and low intensity impact from rabbits. The main threats include edge effects, weeds, road, railway and firebreak maintenance, rabbits and inappropriate fire regimes.

An Interim Recovery Plan was developed for this species in 1996 (Holland *et al.* 1996). Information collected since that plan was completed has been incorporated into this plan and this document now replaces Holland *et al.* (1996).

Description: *Conostylis micrantha* is a small, tufted perennial herb to 30 cm in diameter with yellow-cream flowers that turn a brick red colour with age. The leaves are 24 - 31 cm long and circular in cross-section, with a few spreading, white hairs 3 to 9 mm long on the lower margins. The flowers are held on stems 5 to 13 cm long, with a hairy papery bract 3 to 8 mm long halfway up the stem. The tubular flower is 5 to 7.5 mm long, and divides into six lobes that are cream inside and golden yellow outside (Brown *et al.* 1998).

Habitat requirements: *Conostylis micrantha* is currently known over a range of approximately 35 km, to the north east of Dongara. It is found on white or grey sand in low heath with *Allocasuarina humilis*, *Dryandra fraseri* and *Hakea* species.

Critical habitat: The critical habitat for *Conostylis micrantha* comprises the area of occupancy of the known populations (wild and any future translocated), similar habitat within 200 metres of known populations, corridors of remnant vegetation that link populations, and additional nearby occurrences of similar habitat that do not currently contain the species but may have done so and may be suitable for translocations.

Habitat critical to the survival of the species, and important populations: Populations 1 and 6 occur on shire road reserves, and a number of plants occur in each. Populations 7, 9, 10 and 11 occur in a Nature Reserve, are not in decline and are subject to few threats. Populations 1, 6, 7, 9, 10 and 11 are therefore considered to be important populations. The area of occupancy of these important populations, similar habitat within 200m of those populations, remnant vegetation that links the populations, and similar vegetation on conservation estate that may have contained the species in the past are all considered to be habitat critical to the survival of this species.

Benefits to other species or ecological communities: *Conostylis dielsii* subsp. *teres* (Critically Endangered under the *Wildlife Conservation Act 1950*; Endangered under the EPBC Act) occurs in association with Populations 1, 2, 7, 9 and 10 of *Conostylis micrantha*. *Leucopogon marginatus* (Endangered under *Wildlife Conservation Act 1950* and under the EPBC Act) occurs with Populations 7, 9 and 10 of *C. micrantha*. *C. micrantha* also occurs with *Banksia scabrella* (Priority 4) at Populations 4, 5, 7 and 9; *Grevillea hirtella* (Priority 3) at Population 5; and *Grevillea erinacea* (Priority 3) at Population 9. Recovery actions such as weed and rabbit control will help protect these Declared Rare and Priority flora species as well as *C. micrantha*, and the ecological community in which the populations are located.

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. *C. micrantha* is not specifically listed under any international treaty, and therefore this plan does not affect Australia's obligations under any other international agreements.

Role and interests of indigenous people: The Aboriginal Sites Register maintained by the Department of Indigenous Affairs does not list any significant sites in the vicinity of the populations. Implementation of recovery actions under this plan includes consideration of the role and interests of indigenous communities in the region.

Social and economic impact: Important populations of *C. micrantha* occur on Shire road reserves and a Nature Reserve. The implementation of this recovery plan therefore has extremely limited potential for social or economic impact. Such

potential as there is occurs only on areas, such as road reserves, that are not specifically managed for conservation. Laying of poison oats for rabbit control will occur following liaison with land managers of nearby private properties. Recovery actions refer to continued liaison between stakeholders with regard to populations on Shire road reserve.

Evaluation of the plan's performance: The Department of Conservation and Land Management will evaluate the performance of this IRP in conjunction with the Geraldton District Threatened Flora Recovery Team. In addition to annual reporting on progress with listed actions and comparison against the criteria for success and failure, the plan is to be reviewed within five years of its implementation.

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

1. Relevant land managers have been made aware of the location and threatened status of the species.
2. Declared Rare Flora markers are in place at all populations except Population 8.
3. The Botanic Garden and Parks Authority (BGPA) currently hold 2 grams of seed and 3 plants in the Botanic Gardens. Propagation has been trialled from cuttings, rooted cuttings and division.
4. BGPA has introduced 3 clones of *Conostylis micrantha* to tissue culture, and has successfully transferred several rooted plants to soil.
5. A fire management strategy has been established for the Nature Reserve habitat of Populations 7-11.
6. Rabbit baiting was conducted at Populations 1, 2, 5, 6 and 7 in 1999. Follow-up baiting was undertaken at Populations 1, 2, 5 and 6 in 2000.
7. Some control of grass weeds has been undertaken at Population 1.
8. An information sheet that describes and illustrates the species has been produced.
9. Staff from CALM's Geraldton District regularly monitor populations of the species.
10. Staff from CALM's Geraldton District have undertaken surveys of suitable habitat and discovered new populations of this species (Populations 9, 10 and 11).
11. The Geraldton District Threatened Flora Recovery Team (GDTFRT) is overseeing the implementation of this IRP.

IRP objective: The objective of this Interim Recovery Plan is to maintain or enhance viable *in situ* populations to ensure the long-term preservation of the species 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 five year period of the plan.

Criteria for failure: The number of individuals within populations and/or the number of populations have decreased by ten percent or more over the five year period of the plan.

Recovery actions

1. Coordinate recovery actions
2. Map critical habitat
3. Liaise with relevant land managers
4. Monitor populations
5. Implement rabbit control when necessary
6. Implement weed control
7. Develop and implement a fire management strategy
8. Conduct further surveys
9. Collect seed
10. Promote awareness
11. Review the need for further recovery actions

1. BACKGROUND

History

The earliest collection of *Conostylis micrantha* housed at the Western Australian Herbarium was made in 1961 by R.D. Royce from an area east of Dongara. Clearing for agriculture around the Irwin River area began approximately 160 years ago when the town of Dongara was first established. Subsequent wide scale clearing has resulted in a loss of most areas of suitable habitat for *C. micrantha*. *C. micrantha* was declared to be Rare Flora under the *Wildlife Conservation Act 1950* in September 1987, after surveys confirmed the rarity of this species. Eleven populations are now known over a range of 35 km, and although many are small and threatened, four populations occur in a Class A nature reserve. The habitat in this reserve is subject to only low levels of weed invasion, and low level impact from rabbits. In addition, the levels of habitat disturbance are minimized in the reserve during firebreak maintenance.

An Interim Recovery Plan (IRP) was developed for the species in 1996 (Holland *et al.* 1996). Information collected since that plan was completed has been incorporated into this plan and this document now replaces Holland *et al.* (1996).

Description

Conostylis micrantha is a small, tufted perennial herb to 30 cm in diameter with yellow-cream flowers that turn a brick red colour with age. The leaves are 13 to 24 cm long and circular in cross-section, with a few spreading, white hairs 3 to 9 mm long on the lower margins. The flowers are held on stems 5 to 13 cm long, with a hairy papery bract 3 to 8 mm long halfway up the stem (Hopper *et al.* 1987). The tubular flower is 5 to 7.5 mm long, and divides into six lobes that are cream inside and golden yellow outside (Brown *et al.* 1998).

The species is related to *C. teretifolia*, which is common in the northern heaths from Moore River north to Arrowsmith River (Holland *et al.* 1996). *C. micrantha* differs from *C. teretifolia* in having longer leaf hairs that are confined to the base of the leaf. It also flowers earlier and its smaller flowers (the smallest in the genus) are arranged in a forked, flattened, many flowered head rather than a few-flowered simple head as in *C. teretifolia* (Hopper *et al.* 1987).

Distribution and habitat

C. micrantha occurs in an area north east of Dongara, over a range of approximately 35 km. A total of 310 plants are known from ten populations (note: two populations have been amalgamated), which occur on Shire road reserve, rail reserve and nature reserve. It is found on white or grey sand in low heath, and is quite inconspicuous when not in flower. Associated species include *Allocasuarina humilis*, *Hakea trifurcata*, *Hibbertia hypericoides* and *Dryandra fraseri*.

Biology and ecology

The genus *Conostylis* contains 45 species, all of which are endemic to the south-west of Western Australia. A number of species are grown as ornamentals and *C. micrantha* has the potential to be of horticultural significance.

The genus *Conostylis* is comprised of a mixture of insect and bird-pollinated species (Hopper *et al.* 1987). The pollinators of *C. micrantha* are as yet unknown.

Conostylis micrantha was present in an area burnt 2-3 years previously, and this suggests that it regenerates successfully after fire. It is likely that it regenerates from subterranean regenerative buds

emerging from horizontal rhizomes (Gill 1981) and that soil-stored seed germinates following summer fire, as in other species of *Conostylis*. The supposition that germination is stimulated by fire is supported by the results of germination trials conducted at the Botanic Garden and Parks Authority (BGPA), which indicated that there was no germination without treatment, and 65% germination with smoke treatment (Bob Elkins[1] personal communication).

Threats

Conostylis micrantha was declared as Rare Flora in September 1987 under the *Wildlife Conservation Act 1950*. It currently meets Red List (IUCN 2000) category Vulnerable according to Criterion D1, as there are less than 1000 mature individuals. *C. micrantha* is listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Four populations have been discovered within a Nature Reserve since 1996, and these are subject to relatively low levels of threat. The main threats are edge effects, weeds, road, railway and firebreak maintenance, rabbits and inappropriate fire regimes.

- **Edge effects** impact on all six populations restricted to narrow road and rail reserves, with their high perimeter to area ratios (Populations 1 to 6). Edge effects of most significance result from management practices on adjacent land (Lynch 1987; Saunders *et al*. 1987; Taylor 1987). Effects include the proximity of a weed seed source, increased wind speed, fertiliser and herbicide spray drift and runoff, modified hydrology, and altered disturbance regimes, including fire. The fragmentation of the corridors, combined with edge effects, results in the vegetation being subject to high levels of stress and periodic acute disturbances.

- **Weed invasion** is advanced in all road verge populations (Populations 1 to 6) as a result of edge effects such as increased nutrient levels (fertiliser runoff, rabbit droppings) and soil disturbance (rabbits, earthworks). Species include [*]*Avena fatua* (wild oats), **Ehrharta longiflora* (annual veldt grass), **Arctotheca calendula* (cape weed), **Brassica tournefortii* (wild turnip), and other introduced annual grass species. *Conostylis micrantha* is both directly and indirectly affected by weeds due to:

  - direct competition, inhibiting the growth of *C. micrantha* and displacing it where it once grew,
  - a decrease in the diversity of the habitat of *C. micrantha*,
  - altered nutrient cycling,
  - altered soil acidity, and
  - increased fire hazard due to easy ignition of the high fuel loads that are produced annually, and the formation of a continuous fuel bed permitting a fire to spread quickly.

- **Road, rail and firebreak maintenance** threatens all road and rail reserve populations, and firebreak maintenance could affect most of the Nature Reserve populations. Threats include grading, chemical spraying, construction of drainage channels and the mowing of roadside vegetation. Several of these activities also encourage weed invasion.

- **Rabbits** have a high level of impact on all road verge populations (Populations 1 to 6). Rabbits do not appear to graze adult plants except in very dry seasons. However, the very sandy soils of *Conostylis micrantha* habitat are subject to extensive digging, sometimes to the point of causing subsidence. Rabbits also encourage weed invasion through disturbing soil, adding nutrients to soil, and introducing weed seeds.

- **Inappropriate fire regimes** during the reproductive phase of *Conostylis micrantha* (ie. flowering, pollination, seed growth and seed dispersal) may result in low/nil seedling recruitment. High fire

[1] Bob Elkins, Technical Assistant (W.A. Seedbank), BGPA
[*] asterisk designates an introduced (non-native) species

frequency may also lead to the degradation of the habitat of *C. micrantha* due to a depletion of soil seed banks and a temporary increase in the availability of nutrients for weed establishment (Panetta and Hopkins 1991). However, appropriate irregular summer fire may be an important part of the life cycle of this species and be necessary for regeneration.

- **Clearing** for oil drilling is a potential threat to Population 1, as an oil company has operations on the adjacent private property. Access tracks link the drill sites to the road verge near *C. micrantha* plants. Vehicles departing from those tracks could cause direct damage and also indirect habitat degradation such as soil compaction, changes to drainage and destruction of associated vegetation.

Summary of population information and threats

Pop. No. & Location	Land Status	Year/No. plants	Condition	Threats
1. East of Dongara	Shire Road Reserve	1988 40+ 1995 48 1996 550+ 1998 93+ 1999 120+ 2000 100+ 2003 100+	Healthy (1999) Moderate (2003)	Weeds, road and firebreak maintenance, rabbits, inappropriate fire, access for oil drilling
2. East of Dongara	Shire Road Reserve	1988 50+ 1995 7 1996 12 1998 0 1999 1 2000 6 2001 8 2003 3	Healthy (1999) Moderate (2001) Poor (2003)	Weeds, road maintenance, rabbits, inappropriate fire
3. East of Dongara	Shire Road Reserve	1988 40+ 1992 7 1995 4 1996 7 1998 merged into Population 1	In 1998 Pop. 1 was found to continue south & incorporate Pop. 3.	Weeds, road and firebreak maintenance, rabbits, inappropriate fire
4. East of Dongara	Shire Road Reserve and Railway Reserve	1988 15+ 1992 14 1993 17 1995 0 1996 0 1999 0 2000 0	Absent	Weeds, road and railway maintenance, rabbits, inappropriate fire
5. East of Dongara	Shire Road Reserve	1988 2 1993 2 1995 0 1996 0 1999 0 2001 0	Absent	Weeds, road and firebreak maintenance, rabbits, inappropriate fire
6. East of Dongara	Shire Road Reserve	1992 9+ 1993 6 1995 6 1996 27 1998 108 1999 110 2001 110+ 2003 12	Healthy (1999) Moderate (2001)	Weeds, road and firebreak maintenance, rabbits, inappropriate fire
7. East of Dongara	Nature Reserve	1996 9 1998 20+ 1999 30+ 2000 80+	Healthy (2000)	Firebreak maintenance, inappropriate fire
8. East of Dongara	Shire Gravel Reserve	1997 1 2003 0	Healthy (2000)	Firebreak maintenance, weeds, inappropriate fire
9. East of Dongara	Nature Reserve	2000 35+ 2001 40+	Healthy (2001)	Firebreak maintenance, inappropriate fire
10. East of Dongara	Nature Reserve	2000 29	Healthy (2000)	Firebreak maintenance, inappropriate fire
11. East of Dongara	Nature Reserve	2003 46	Healthy (2003)	Firebreak maintenance, inappropriate fire

Guide for decision-makers

Section 1 provides details of current and possible future threats. Any on-ground works (clearing, firebreaks, roadworks etc) in the immediate vicinity of *Conostylis micrantha* will require assessment. On-ground works should not be approved unless the proponents can demonstrate that they will not have an impact on the species, or on its habitat or potential habitat.

Critical habitat and important populations

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 (EPBC Act).

Conostylis micrantha is listed as Vulnerable. Populations 1, 6, 7, 9, 10 and 11 are considered to be important populations. The following habitat is considered to constitute critical habitat:

- the area of occupancy of Populations 1 and 6 (which occur on road reserves, but contain a number of plants);
- the area of occupancy of Populations 7, 9, 10 and 11 (which occur in a Nature Reserve, where threats may be effectively minimised through management practices);
- areas of similar habitat within 200 metres of important populations, i.e. white or grey sand in heath (these provide potential habitat for natural range extension);
- areas of remnant vegetation that link populations (these are necessary to allow pollinators to move between populations); and
- additional occurrences of similar habitat on conservation estate that do not currently contain the species but may have done so in the past (these represent possible translocation sites).

Benefits to other species or ecological communities

Conostylis dielsii subsp. *teres* (Critically Endangered under *Wildlife Conservation Act 1950*, Endangered under EPBC Act) occurs in association with Populations 1, 2, 7, 9 and 10 of *C. micrantha*. *Leucopogon marginatus* (Endangered under *Wildlife Conservation Act 1950* and under EPBC Act) occurs with Populations 7, 9 and 10 of *C. micrantha*. *C. micrantha* also occurs with *Banksia scabrella* (Priority 4) at Populations 4, 5, 7 and 9; *Grevillea hirtella* (Priority 3) at Population 5; and *Grevillea erinacea* (Priority 3) at Population 9. Recovery actions such as weed and rabbit control will help protect these Rare Flora and Priority taxa as well as *C. micrantha*, and the ecological community in which the populations are located.

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. *C. micrantha* is not specifically listed under any international treaty, and therefore this plan does not affect Australia's obligations under any other international agreements.

Role and interests of indigenous people

The Aboriginal Sites Register maintained by the Department of Indigenous Affairs does not list any significant sites in the vicinity of these populations. Implementation of recovery actions under this plan will include consideration of the role and interests of indigenous communities in the region, and this is discussed in the recovery actions.

Social and economic impacts

Important populations of *Conostylis micrantha* occur on Shire road reserves, and a Nature Reserve. The implementation of this recovery plan has limited potential for social or economic impact where populations occur on land not specifically managed for conservation, such as road reserves. Laying of poison oats for rabbit control will occur after liaison with landholders of nearby private property. Recovery actions refer to continued liaison between stakeholders with regard to populations on Shire road reserves and those on rail reserves.

Evaluation of the plan's performance

CALM will evaluate the performance of this IRP in conjunction with the Geraldton District Threatened Flora Recovery Team. In addition to annual reporting on progress with listed actions and comparison against the criteria for success and failure, the plan is to be reviewed within five years of its implementation.

2. RECOVERY OBJECTIVE AND CRITERIA

Objectives

The objective of this Interim Recovery Plan is to maintain or enhance important *in situ* populations to ensure the long-term preservation of the species in the wild.

Criteria for success: The number of individuals within important populations and/or the number of important populations have remained stable or increased by ten percent or more over the five year period of the plan.

Criteria for failure: The number of individuals within important populations and/or the number of populations have decreased by ten percent or more over the five year period of the plan.

3. RECOVERY ACTIONS

Existing recovery actions

The Shire of Irwin, and Westrail have been informed of the presence of *Conostylis micrantha* on their lands. The notification details the Declared Rare status of *C. micrantha* and associated legal obligations. A similar notification was sent in 1998 to the oil company operating on property adjacent to Population 1. On-site liaison has also occurred between representatives of CALM and the oil company.

Declared Rare Flora (DRF) markers have been installed at all populations except Population 8, which has not yet been relocated. These markers alert road and rail maintenance workers to the presence of each population, and help to ensure that disturbance to habitat is minimized. Populations 7, 9 and 10 occur near firebreaks within the Nature Reserve, so they have also been marked to protect them from grading.

A number of different propagation techniques for *Conostylis micrantha* have been trialed by BGPA. There has generally been little success with cuttings, with eight plants resulting from 97 attempts, and no plants resulting from 22 attempts with rooted cuttings. Divisions have proved more successful, with 13 plants resulting from 64 divisions. Most propagated plants have since been used for divisions or have died, up to six years later. BGPA also hold 2 g of seed, which showed nil germination with no treatment, but 65% germination after smoke treatment (B. Elkins personal communication). Three *C. micrantha* plants produced from seed germination trials at BGPA's seed store have been planted into the Botanic Garden (A. Shade[2] personal communication).

[2] Amanda Shade, Horticulturalist, Botanic Garden and Parks Authority

C. micrantha was introduced into tissue culture by BGPA in 1997. The species proved difficult to culture, with very low rooting response and a poor response to cryostorage. However, three clones do exist in cool storage, and a few plants have been successfully transferred to soil (E. Bunn[3] personal communication).

Fire management has been addressed at the nature neserve in which *Conostylis micrantha* occurs, and Interim Management Guidelines are in place. Fire management strategies form an important part of these guidelines, and address placement of firebreaks, firebreak maintenance and prescribed burning rotations.

Geraldton District staff conducted rabbit baiting with 1080 oats at Populations 1, 2, 5, 6 and 7 in 1999, in an attempt to reduce rabbit numbers and their impact on the habitat at those sites. Rabbits do not graze the *Conostylis micrantha* plants unless alternative food sources are very scarce, but numerous or large warrens can cause areas to collapse and result in destruction of habitat and plants. Rabbits also encourage weed establishment, and this is very noticeable in some populations (eg Population 2). Further baiting was undertaken at Populations 1, 2, 5 and 6 in 2000.

Preliminary weed control trials were carried out at Population 1. The effect of Fusilade was tested on a treatment plot and a control plot. *Conostylis micrantha* plants were covered with plastic containers during spraying. The Fusilade achieved good grass weed control, and had limited effects on native species with some death of *Austrostipa elegantissima* (a native grass). There was some death of *Schoenus clandestinus* (a small sedge), but this species also 'browned off' in the control plot, suggesting some other factor may have been at least partially responsible (Obbens 1997).

Grass weeds at Population 1 were sprayed with Fusilade by Geraldton District staff in 2000. Some broadleaf weeds were also present but were left untreated to avoid damage to associated native vegetation.

A double-sided information sheet has been produced, and includes a description of *Conostylis micrantha*, its habitat, threats, recovery actions and photos. This will be reprinted, and distribution to community members through local libraries, wildflower shows and other avenues will be continued. It is hoped that this may result in the discovery of new populations, and raise community awareness of the value of native flora.

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

Staff from CALM's Geraldton District have undertaken surveys of suitable habitat and discovered new populations of this species (Populations 9, 10 and 11).

The Geraldton District Threatened Flora Recovery Team (GDTFRT) is overseeing the implementation of this IRP.

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.

[3] Eric Bunn, Senior Research Scientist (Propagation Science), Botanic Garden and Parks Authority

1. Coordinate recovery actions

The Geraldton District Threatened Flora Recovery Team will coordinate recovery actions for *Conostylis micrantha* and other Declared Rare Flora in their Districts. 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 GDTFRT
Cost: $1,300 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 redressed 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 GDTFRT
Cost: $2,000 in the first year

3. Liaise with relevant land managers

Staff from CALM's Geraldton District will continue to liaise with relevant land managers to ensure that populations are not accidentally damaged or destroyed. This will include liaison with the oil company operating near Population 1 and the Tree Society who share the care, control and management of the nature reserve with the Conservation Commission. Input and involvement will also be sought from any Aboriginal groups that have an active interest in areas that are habitat for *Conostylis micrantha*.

Action: Liaise with relevant land managers
Responsibility: CALM (Geraldton District) through the GDTFRT
Cost: $1,500 per year

4. Monitor populations

Annual monitoring of factors such as habitat degradation (including weed invasion, salinity and plant diseases such as *Phytophthora cinnamomi*), population stability (expansion or decline), pollination activity, seed production, recruitment, longevity and predation is essential. The visibility of DRF markers will also be monitored to ensure they remain effective, and have not faded or been covered by vegetation growth. Populations burnt in fires will be monitored for regeneration, and data recorded to improve knowledge of the biology of this species.

Action: Monitor populations
Responsibility: CALM (Geraldton District) through the GDTFRT
Cost: $1,100 per year

5. Implement rabbit control when necessary

The level of threat posed by rabbits varies from year to year with climatic conditions and rabbit numbers. When monitoring indicates the rabbit numbers are high, baiting using 1080 oats will be

undertaken in summer months when less green feed is available as an alternative food source. This will occur in cooperation with neighbours.

Action: Implement rabbit control when necessary
Responsibility: CALM (Geraldton District) through the GDTFRT; relevant land managers
Cost: $700 in first, third and fifth years

6. Implement weed control

Populations 1 and 6 are important populations that are affected by the invasion of **Avena fatua* (wild oats), **Arctotheca calendula* (cape weed), and other introduced annual grass species. Weeds impact on *Conostylis micrantha* by competing for resources, degrading habitat, exacerbating grazing pressure, and increasing the risk and severity of fire. As *Conostylis micrantha* is a small plant, both the health of existing plants and recruitment of new individuals are likely to be affected. Weed control will be undertaken at Populations 1 and 6 in consultation with the land managers. This will be by hand weeding or localised application of herbicide during the appropriate season to minimise the effect of herbicide on the species and the surrounding native vegetation. All applications of weed control will be followed by a report on the method, timing and success of the treatment against weeds, and the effect on *C. micrantha* and associated native plant species. Copies will be retained at the District and sent to Wildlife Branch.

Action: Implement weed control
Responsibility: CALM (Geraldton District) through the GDTFRT; relevant land managers
Cost: $1,000 per year

7. Develop and implement a fire management strategy

It is thought likely that this species requires occasional hot summer fire (December- April) for recruitment from soil stored seed, but frequent fires during the flowering and seeding phase (July-October) may prevent the accumulation of sufficient soil-stored seed for the next wave of recruitment to occur.

Fire also promotes the introduction and proliferation of weed species. Fire should therefore be prevented from occurring in the area of populations, except where it is being used experimentally as a recovery tool. A fire management strategy that defines fire control measures and fire frequency will be developed in consultation with land managers, for populations for which there is not yet a strategy in place. A fire management strategy has already been established as part of the management guidelines for the Nature Reserve in which *Conostylis micrantha* occurs.

Trials will be conducted to monitor post-fire response of this species and associated species. The length of time to first flowering and first seedset will be recorded. Information obtained through these trials will be used to improve the fire management strategy.

Action: Develop and implement a fire management strategy
Responsibility: CALM (Geraldton District) and relevant land managers through the GDTFRT
Cost: $4,900 in first year, and $2,100 in subsequent years

8. Conduct further surveys

Community volunteers will be encouraged to be involved with further surveys to be conducted during the flowering period of the species (July-August). These surveys will be supervised by CALM staff. Records of

areas surveyed will be sent to Wildlife Branch and retained at the District, even if *Conostylis micrantha* is not located.

Action: Conduct further surveys
Responsibility: CALM (Geraldton District) through the GDTFRT
Cost: $1,200 per year in the first, third and fifth years

9. Collect seed

It is necessary to store germplasm as a genetic resource, ready for use in translocations and as an *ex situ* genetic 'blueprint' of the species. The germplasm stored will include seed and tissue culture material. Several clones of *Conostylis micrantha* already exist in tissue culture. Some seed has been collected by BGPA, but additional collections are required from all populations to maintain adequate representation of the genetic diversity of this species.

Action: Collect seed
Responsibility: CALM (TFSC, Geraldton District) through the GDTFRT
Cost: $2,400 in the first, third and fifth years

10. Promote awareness

The importance of biodiversity conservation and the need for the long-term protection of wild populations of this species will be promoted to the community through poster displays and the local print and electronic media. Formal links with local naturalist groups and interested individuals will also be encouraged. An information sheet has been produced, and includes a description of the plant, its habitat, threats, recovery actions and photos. This will be distributed to the public through CALM's Geraldton District office and at the office and library of the Shires of Irwin and Greenough. Such information distribution may lead to the discovery of new populations.

Action: Promote awareness
Responsibility: CALM (Geraldton District) through the GDTFRT
Cost: $1,700 in first year, and $1,100 per year in subsequent years

11. Review the need for further recovery actions

At the end of the fourth year of its five-year term this Interim Recovery Plan will be reviewed and the need for further recovery actions or to update the plan will be assessed.

Action: Review the need for further recovery actions
Responsibility: CALM (WATSCU, Geraldton District) through the GDTFRT
Cost: $1,000 in the fifth year

4. TERM OF PLAN

This Interim Recovery Plan will operate from December 2004 to November 2009 but will remain in force until withdrawn or replaced. If the species is still ranked Vulnerable after five years, the need to review the plan or further recovery actions or will be determined.

5. REFERENCES

Brown, A., Thomson-Dans, C. and Marchant, N. (Eds) (1998). *Western Australia's Threatened Flora*. Department of Conservation and Land Management, Western Australia.

CALM (2003 onwards). *Western Australian Herbarium FloraBase 2 – Information on the Western Australian Flora*. Department of Conservation and Land Management, Western Australia. Accessed 2003. http://www.calm.wa.gov.au/science/

CALM (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.

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

Gill, A.M. (1981). Coping with fire. In *The Biology of Australian Plants* (eds J.S. Pate and A.J. McComb). University of Western Australia Press, Nedlands.

Holland, E., Kershaw, K. and Brown, A. (1996). Interim Recovery Plan No. 7 *Conostylis micrantha* 1996-1999. Department of Conservation and Land Management. Perth, Western Australia.

Hopper**,** S.D., Purdie, R.W., George, A.S. and Patrick, S.J. (1987). Conostylis. *Flora of Australia* 45: 57-110. Australian Biological Resources Study, Canberra.

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

Lynch, J.F. (1987*). Responses of breeding bird communities to forest fragmentation*. Pp. 123-40 in Nature Conservation: The Role of Remnants of Native Vegetation ed by D.A. Saunders, G.W. Arnold, A.A Burbidge and A. J.M. Hopkins. Surrey Beatty and Sons, Chipping Norton, NSW.

Obbens, F. (1997). *Monitoring and Preliminary Weed Control on Populations of Critically Endangered Flora*. Department of Conservation and Land Management, Western Australia.

Panetta, F.D. and Hopkins, A.J.M. (1991). *Weeds in Corridors: Invasion and Management*. Pp 341 – 351 in Nature Conservation 2 The Role of Corridors ed by D.A. Saunders and R.J. Hobbs. Surrey Beatty and Sons Pty Limited, Chipping Norton, NSW.

Saunders, D.A.; Arnold, G.W.; Burbidge, A.A and Hopkins, A.J.M. (1987). *The role of remnants of native vegetation in nature conservation: future directions.* Pp 387-92 in Nature Conservation: The Role of Remnants of Native Vegetation ed by D.A. Saunders, G.W. Arnold, A.A Burbidge and A.J.M. . Surrey Beatty and Sons, Chipping Norton, NSW.

Taylor, S.G. (1987). *Conservation strategies for human dominated landscapes: the South Australian example*. Pp 313-22 in Nature Conservation: The Role of Remnants of Native Vegetation ed by D.A. Saunders, G.W. Arnold, A.A Burbidge and A.J.M. Hopkins. Surrey Beatty and Sons, Chipping Norton, NSW.

6. TAXONOMIC DESCRIPTION

Excerpt from: Hopper**,** S.D., Purdie, R.W., George, A.S. and Patrick, S.J. (1987). Conostylis. *Flora of Australia* 45: 57, 92-94. Australian Biological Resources Study, Canberra.

Conostylis micrantha

Tufts to 30 cm diam. Leaves terete, 13-24 cm long, 0.7-1.2 mm diam., glabrous except lower margins, green; hairs few, 3-9 mm long, spreading, flexuose, white, flattened at base, with minute marginal serrations. Inflorescence a shortly bifurcate many-flowered flattened head; scape 5-13 cm long, with a median scarious hirsute bract 3-8 mm long. Perianth 5-7.5 mm long, finely tomentose, pale yellowish cream ageing to brick-red; lobes 2.5-4.5 mm long, cream inside, golden yellow towards base. Stamens uniseriate; anthers 1-1.7 mm long, somewhat longer than filaments. Style 3-4 mm long.

Confined to sandplain uplands N of the Irwin R., W.A. Grows in heath. Flowers July-Aug.

Allied to *C. teretifolia*, But leaf hairs longer and confined to the base, flowers earlier, and has smaller flowers (the smallest in the genus) arranged in a shortly bifurcate many-flowered flattened head similar to species of *Phlebocarya*.

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	800	500		800	500		800	500		800	500		800	500	
Map critical habitat	1,500		500												
Liaise with land managers	800		700	800		700	800		700	800		700	800		700
Monitor populations	800		300	800		300	800		300	800		300	800		300
Implement rabbit control, if req'd	400		300				400		300				400		300
Implement weed control	600		400	600		400	600		400	600		400	600		400
Develop and implement a fire management strategy	3,100	900	900	1200	300	600	1,200	300	600	1,200	300	600	1,200	300	600
Conduct further surveys	500	400	300				500	400	300				500	400	300
Collect seed	1,000		1,400				1,000		1,400				1,000		1,400
Promote awareness	1,100		600	1,100			1,100			1,100			1,100		
Review the need for further recovery actions													400	600	
Total	10,600	1,800	5,400	5,300	800	2,000	7,200	1,200	4,000	5,300	800	2,000	7,600	1,800	4,000
Yearly Total		**17,800**			**8,100**			**12,400**			**8,100**			**13,400**	

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

Total CALM: $36,000
Total Other: $6,400
Total External Funding: $17,400
Total Costs: $59,800