KULIN CONOSTYLIS

(*Conostylis rogeri*)

INTERIM RECOVERY PLAN

2008-2013

April 2008

Department of Environment and Conservation
Kensington

Australian Government

Government of Western Australia

Department of Environment and Conservation
Our environment, our future

FOREWORD

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

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.

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

This IRP will operate from April 2008 to March 2013 but will remain in force until withdrawn or replaced. It is intended that, if the taxon is still ranked Vulnerable (VU), this IRP will be reviewed after five years and the need for further recovery actions assessed.

This IRP was approved by the Director of Nature Conservation on 30 April 2008. The allocation of staff time and provision of funds identified in this IRP is dependent on budgetary and other constraints affecting DEC, as well as the need to address other priorities.

Information in this IRP was accurate in April 2008.

This IRP was prepared with financial support from the Australian Government to be adopted as a National Recovery Plan under the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

IRP PREPARATION

This IRP was prepared by Craig Douglas[1], Bethea Loudon[2] and Kym Pryor[3]

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ACKNOWLEDGMENTS

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

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Robert Buehrig	Former Senior Technical Officer, Dwellingup Work Centre, DEC
Anne Cochrane	Senior Research Scientist, Albany Research Station, DEC
Andrew Crawford	Technical Officer, Threatened Flora Seed Centre, DEC
Bob Elkins	Technical Assistant, Botanic Gardens and Parks Authority
Kim Kershaw	Former Conservation Officer, Great Southern District, DEC
Carly Naughton	Vegetative Propagation Horticulturist, Botanic Gardens and Parks Authority
Amanda Shade	Assistant curator of displays and development, Botanic Gardens and Parks Authority

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

Cover photograph by Steve Hopper.

CITATION

This IRP should be cited as:

Department of Environment and Conservation (2008). Kulin Conostylis (*Conostylis rogeri*) Interim Recovery Plan 2008-2013. Interim Recovery Plan No. 259. Department of Environment and Conservation, Western Australia.

SUMMARY

Scientific Name	***Conostylis rogeri***	**Common Name**	Kulin Conostylis
Family	Haemodoraceae	**Flowering Period**	September - October
DEC Region	Wheatbelt	**DEC District**	Great Southern
Shires	Kulin, Dumbleyung and Lake Grace	**Recovery Team**	Great Southern District Threatened Flora Recovery Team

Illustrations and/or further information: Atkins, K. (2008) *Declared Rare and Priority Flora List for Western Australia.* Department of Environment and Conservation, Western Australia; Brown, A., Thompson-Dans, C. and Marchant N. (1998) *Western Australia's Threatened Flora*. Department of Conservation and Land Management, Western Australia. pp 75; Western Australian Herbarium (2007) *FloraBase 2 – Information on the Western Australian Flora* (accessed 2007). Department of Environment and Conservation, Western Australia. http://florabase.calm.wa.gov.au/; Hopper, S.D. (1987) *Flora of Australia*. Volume 45, Hydatellaceae to Liliaceae. Canberra: Australian Government Publishing Services. pp 57-110.

Current status: *Conostylis rogeri* was declared as Rare Flora under the Western Australian *Wildlife Conservation Act 1950* in 1987 and is ranked as Vulnerable (VU) under World Conservation Union (IUCN 2001) Red List criterion D2, based on the species being found over a very narrow geographical range with an area of occupancy that is less than 20 km^2. The main threats are inappropriate fire regimes, fragmentation of natural habitat, weed invasion, grazing, firebreak maintenance and the lack of biological information. The species is listed as Vulnerable (VU) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999).

Description: *Conostylis rogeri* is a small, tufted plant with flat green leaves 2.5 to 5 cm long by 0.6 to 1.5 mm wide. White, woolly hairs spread in two alternate rows on each leaf margin (Hopper 1987). Flowers, up to 15 mm long, with all six stamens at the same level, are held on leafless flower stalks 0.5 to 2.5 cm long. The style is 5 to 10 mm long. The placenta is shaped like a shield, with a few hanging ovules (Brown *et. al.* 1998).

Habitat requirements: *Conostylis rogeri* is confined to the southern Wheatbelt of Western Australia where it occurs in sand overlying laterite amongst low dense heath and scattered mallee. Associated species include *Dryandra ferruginea*, *Banksia sphaerocarpa*, *Banksia violacea*, *Allocasuarina humilis*, *Eremaea pauciflora*, *Grevillea cagiana*, *Melaleuca pungens*, *Allocasuarina pinaster* and *Petrophile ericifolia*.

Habitat critical to the survival of the species, and important populations: Given that *Conostylis rogeri* is known from just two areas it is considered that all populations are important to the survival of the species.

Habitat critical to the survival of *Conostylis rogeri* includes the area of occupancy of important populations, areas of similar habitat surrounding important populations (i.e. rises with sand overlying laterite), additional occurrences of similar habitat that may contain important populations of the species, and the local catchment for the surface and/or groundwater that maintains the habitat of the species.

Benefits to other species or ecological communities: Six Priority flora taxa occur with *Conostylis rogeri* - *Eremophila veneta* (Priority 4, Endangered under EPBC Act 1999), *Eucalyptus latens* (Priority 4), *Daviesia elongata* subsp. *implexa* (Priority 3), *Dryandra epimicta* (Priority 2), *Synaphea flexuosa* (Priority 2) and *S. tripartita* (Priority 2). Recovery actions implemented to improve the quality or security of the habitat of *Conostylis rogeri* will also assist in protecting these taxa.

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. *Conostylis rogeri* is not listed under any specific international treaty and this IRP does not affect Australia's obligations under any other international agreements.

Indigenous Consultation: Involvement of the Indigenous community is being sought through the South West Aboriginal Land and Sea Council (SWALSC) and the Department of Indigenous Affairs to determine whether there are any issues or interests identified in the plan. A search of the Department of Indigenous Affairs Aboriginal Heritage Sites Register has identified that there are no sites of Aboriginal significance at or near populations of the species covered by this IRP. Where no role is identified for the indigenous community associated with this species in the development of the recovery plan, opportunities may exist through cultural interpretation and awareness of the species. Indigenous involvement in the implementation of recovery actions will be encouraged.

Continued liaison between DEC and the indigenous community will identify areas in which collaboration will assist implementation of recovery actions.

Social and economic impact: The implementation of this IRP is unlikely to cause significant adverse social or economic impacts as all populations are located in Nature Reserves managed by DEC.

Affected interests: There are no stakeholders known to be potentially affected by the implementation of this plan.

Evaluation of the plan's performance: DEC, in conjunction with the Great Southern District Threatened Flora Recovery Team (GSDTFRT), will evaluate the performance of this IRP. In addition to annual reporting on progress and evaluation against the criteria for success and failure, the plan will be reviewed after four years of implementation.

Completed Recovery Actions

Seed collections are stored with the Botanic Gardens and Parks Authority (BGPA).
In 2004, remnant vegetation on Private Property containing *Conostylis rogeri* was incorporated into an adjacent reserve.
In 2001, six plants were removed from a sand pit in Hopkins Nature Reserve so that the area could be rehabilitated. These plants were re-planted following rehabilitation.
In 1996 and 2006, extensive surveys were conducted for new populations of *Conostylis rogeri* in nature reserves, water reserves and rail and road reserves.

Ongoing and future recovery actions

1. The GSDTFRT is overseeing the implementation of this IRP, and will include it in its annual report to the DEC's Corporate Executive and funding bodies.
2. Staff from the DEC's Great Southern District are monitoring all populations.

IRP objective: The objective of this IRP is to abate identified threats and 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 populations has increased and/or the number of mature individuals in populations has increased by ten percent or more over the term of the plan.
Criteria for failure: The number of populations has decreased and/or the number of mature individuals in populations has decreased by ten percent or more over the term of the plan.

Recovery actions

1. Coordinate recovery actions
2. Monitor populations
3. Collect seed and other plant material to preserve genetic diversity
4. Develop and impliment fire and disturbance trials
5. Obtain biological and ecological information
6. Conduct further surveys
7. Promote awareness
8. Map habitat critical to the survival of *Conostylis rogeri*
9. Develop and implement a fire management strategy
10. Review the Plan and need for further recovery actions

1. BACKGROUND

History

Conostylis rogeri was first collected by Dr Roger Hnatiuk in 1977 (Population 1) and was described by Steve Hopper in 1987 (Hopper 1987).

During extensive surveys in 1996, Robert Buehrig discovered a population of *Conostylis rogeri* at North Tarin Rock Nature Reserve, 27 kilometres south of the original collecting site (Buehrig 1997). In 1997, a further population of *C. rogeri* was discovered on Private Property adjoining the eastern border of the reserve. The acquisition of this land for incorporation into the Nature Reserve was completed in 2004. Further surveys conducted at the site in September 2006 located another 3 populations and 2 subpopulations. These discoveries brought the number of populations at this site to six, and the total number of known populations to seven.

While over 1000 plants are known to exist, exact plant numbers in the reserves have been difficult to establish due to a scattered distribution. However it is estimated that up to 5400 plants may exist within Hopkins Nature Reserve alone, with a further number at North Tarin Rock (Buehrig 1997).

Description

Conostylis rogeri is a small, tufted plant with flat green leaves 2.5 to 5 cm long by 0.6 to 1.5 mm wide. White, woolly hairs spread in two alternate rows on each leaf margin (Hopper 1987). Flowers, up to 15 mm long with all six stamens at the same level, are held on leafless flower stalks 0.5 to 2.5 cm long. The style is 5 to 10 mm long. The placenta is shaped like a shield, with a few hanging ovules (Brown *et. al.* 1998).

Conostylis rogeri is similar to *Conostylis pusilla* and forms of *C. setigera* in leaf morphology. However, *C. rogeri* is distinguished by having all stamens at the same level and the anthers being much longer than the filaments (Hopper 1987).

Distribution and habitat

Conostylis rogeri has a restricted geographic range of approximately 69 km^2 in the southern Wheatbelt of Western Australia.

Habitat comprises low dense heath and scattered mallee in sand overlaying laterite. Associated species include *Dryandra ferruginea*, *Banksia sphaerocarpa*, *Banksia violacea*, *Allocasuarina humilis*, *Eremaea pauciflora*, *Grevillea cagiana*, *Melaleuca pungens*, *Allocasuarina pinaster* and *Petrophile ericifolia*.

Summary of population land vesting, purpose and tenure

Pop. No. & Location	DEC District	Shire	Vesting	Purpose	Manager
1d. SE of Kulin	Great Southern	Kulin	Conservation Commission of Western Australia	Conservation of Flora and Fauna	DEC
1e. SE of Kulin	Great Southern	Kulin	Conservation Commission of Western Australia	Conservation of Flora and Fauna	DEC
2. NE of Kukerin	Great Southern	Dumbleyung	Conservation Commission of Western Australia	Conservation of Flora and Fauna	DEC
3a. NE of Kukerin	Great Southern	Dumbleyung	Conservation Commission of Western Australia	Conservation of Flora and Fauna	DEC

3b. NE of Kukerin	Great Southern	Dumbleyung	Conservation Commission of Western Australia	Conservation of Flora and Fauna	DEC
4a. NE of Kukerin	Great Southern	Lake Grace	Conservation Commission of Western Australia	Conservation of Flora and Fauna	DEC
4b. NE of Kukerin	Great Southern	Lake Grace	Conservation Commission of Western Australia	Conservation of Flora and Fauna	DEC
5. NE of Kukerin	Great Southern	Lake Grace	Conservation Commission of Western Australia	Conservation of Flora and Fauna	DEC
6. NE of Kukerin	Great Southern	Lake Grace	Conservation Commission of Western Australia	Conservation of Flora and Fauna	DEC
7. NE of Kukerin	Great Southern	Dumbleyung	Conservation Commission of Western Australia	Conservation of Flora and Fauna	DEC

Populations in **bold text** are considered to be Important Populations

Biology and ecology

The genus *Conostylis* contains a mixture of insect and bird pollinated species (Hopper 1987). However, very little is known about the pollination of *C. rogeri* or the biological characteristics that may have lead to its rare status.

Conostylis seeds are believed to germinate easily if mature seed is used. Many species are also easily raised by cuttings taken between Autumn and Spring (Fox *et al.* 1987).

In a study on the germination of four native Western Australian *Conostylis* species using plant-derived smoke, it was found that the application of smoke water substantially improved germination (Tieu *et al.* 1999).

Robert Buehrig (1997) found that, although it is not uncommon for the species to grow on disturbed firebreaks and tracks, it is not always the case.

Due to limited population monitoring data, the full flowering period of *Conostylis rogeri* is uncertain. Surveys have recorded the species to be flowering in September and October, with fruit present between mid December and January.

Threats

Conostylis rogeri was declared as Rare Flora under the Western Australian *Wildlife Conservation Act 1950* in 1987 and is currently ranked as Vulnerable (VU) under World Conservation Union (IUCN 2001) Red List criterion D2, based on the species being found over a very narrow geographical range with an area of occupancy that is less than 20km^2. The main threats are inappropriate fire regimes, fragmentation of natural habitat, weed invasion, grazing, firebreak maintenance and the lack of biological information. The species is listed as Vulnerable (VU) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999).

- **Inappropriate fire regimes** may adversely affect all populations. Frequent fires are likely to result in population decline as plants require time to mature and replenish soil seed reserves.
- **Fragmentation of natural habitat.** Due to extensive clearing of habitat surrounding the reserves where *Conostylis rogeri* is known to occur it is unlikely that other populations will be found.
- **Weed invasion** is a minor threat to some populations. Weeds compete for resources, reducing the health, fecundity and natural recruitment. Heavy weed infestation also generates high fuel loads that can potentially increase the frequency and intensity of fire.
- **Grazing** by rabbits and/or kangaroos has been recorded as a minor threat to all populations. The palatability of both mature plants and seedlings means that both are threatened by grazing.
- **Firebreak maintenance** is possibly a threat to parts of populations.
- **Lack of biological and ecological information.** Little is known about the biology and ecology of *Conostylis rogeri* (Buehrig 1997). Knowledge crucial to the species' conservation such as pollinator species, quantity of seed set, viability, conditions necessary for germination, germination success, time till maturation, response of the species to disturbances such as fire, and other life history traits are currently unknown.

Summary of population information and threats

Pop. No & Location	DEC District	Land Status	Year / No. plants	Condition	Threats
1a. SE of Kulin	Great Southern	Nature Reserve	1978_{Aug} 75 1978_{Sep} 75 1989 60 2006 359+	Healthy	Inappropriate fire regimes, grazing, weeds
1b. SE of Kulin	Great Southern	Nature Reserve	1978 75 1989 100 1996 49 2006 248+	Healthy	Inappropriate fire regimes, grazing, weeds
1c. SE of Kulin	Great Southern	Nature Reserve	1978 10 1989 40 2006 64+	Healthy	Inappropriate fire regimes, grazing, weeds
1d. SE of Kulin	Great Southern	Nature Reserve	1996 27 2006 71+	Healthy	Inappropriate fire regimes, grazing, weeds
1e. SE of Kulin	Great Southern	Nature Reserve	2006 128+	Unknown	Inappropriate fire regimes, grazing, weeds
2. NE of Kukerin	Great Southern	Nature Reserve	1996 6 2006 41+	Moderate	Firebreak maintenance, grazing, inappropriate fire regimes
3a. NE of Kukerin	Great Southern	Nature Reserve	1996 158 2006 25+	Healthy - Poor	Firebreak maintenance, grazing, weeds, inappropriate fire regimes
3b. NE of Kukerin	Great Southern	Nature Reserve	2006 20+	Healthy	Threats unknown
4a. NE of Kukerin	Great Southern	Nature Reserve	1997 NA 2006 16+	Healthy - Moderate	Inappropriate fire regimes
4b. NE of Kukerin	Great Southern	Nature Reserve	2006 16+	Healthy	Threats unknown
5. NE of Kukerin	Great Southern	Nature Reserve	2006 54+	Healthy	Threats unknown
6. NE of Kukerin	Great Southern	Nature Reserve	2006 7+	Healthy	Threats unknown
7. NE of Kukerin	Great Southern	Nature Reserve	2006 13+	Healthy	Threats unknown

NB. **No. plants** denoted with + refers to partial survey where more plants than were counted are likely to exist; NA used where information on the number of plants is not available. Populations in **bold text** are considered to be Important Populations

Guide for decision-makers

Section 1 provides details of current and possible future threats. Development and/or land clearing, in the immediate vicinity of any population of *Conostylis rogeri* requires assessment. No development or clearing applications should be approved unless the proponents can demonstrate that their actions will not have a significant impact on the species, its habitat or potential habitat, or on the local surface hydrology, such that drainage in the species habitat may be altered.

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

Given that *Conostylis rogeri* is known from just two areas it is considered that all populations are important to the survival of the species.

Habitat critical to the survival of *Conostylis rogeri* includes the area of occupancy of important populations, areas of similar habitat surrounding important populations (i.e. rises with sand overlying laterite), additional occurrences of similar habitat that may contain important populations of the species, and the local catchment for the surface and/or groundwater that maintains the habitat of the species.

Benefits to other species or ecological communities

Six Priority Flora taxa occur with *Conostylis rogeri* (see table below). Recovery actions implemented to improve the quality or security of the habitat of *C. rogeri* will also assist in protecting these taxa.

Conservation listed flora species occurring in the habitat of *Conostylis rogeri*

Species name	Conservation Status (Western Australia)	Conservation Status (EPBC Act, 1999)
Daviesia elongata subsp. *implexa*	Priority 3	
Dryandra epimicta	Priority 2	
Eremophila veneta	Priority 4	Endangered
Eucalyptus latens	Priority 4	
Synaphea flexuosa	Priority 2	
Synaphea tripartita	Priority 2	

For a description of the Priority categories see Atkins (2005)

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. *Conostylis rogeri* is not listed under any specific international treaty, and this IRP does not affect Australia's obligations under any other international agreements.

Indigenous Consultation

Involvement of the Indigenous community is being sought through the South West Aboriginal Land and Sea Council (SWALSC) and the Department of Indigenous Affairs to determine whether there are any issues or interests identified in the plan. A search of the Department of Indigenous Affairs Aboriginal Heritage Sites Register has identified that there are no sites of Aboriginal significance at or near populations of the species covered by this IRP. Where no role is identified for the indigenous community associated with this species in the development of the recovery plan, opportunities may exist through cultural interpretation and awareness of the species. Indigenous involvement in the implementation of recovery actions will be encouraged.

Continued liaison between DEC and the indigenous community will identify areas in which collaboration will assist implementation of recovery actions.

Social and economic impact

The implementation of this IRP is unlikely to cause significant adverse social or economic impacts, as all populations are located in Nature Reserves managed by DEC.

Affected interests

There are no external stakeholders known to be potentially affected by the implementation of this plan as all populations occur on lands vested in the Conservation Commission and managed by DEC.

Evaluation of the plan's performance

DEC, in conjunction with the Great Southern District Threatened Flora Recovery Team (GSDTFRT), will evaluate the performance of this IRP. In addition to annual reporting on progress and evaluation against the criteria for success and failure, the plan will be reviewed after the first four years of implementation.

2. RECOVERY OBJECTIVE AND CRITERIA

Objectives

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

Criteria for success: The number of populations have increased and/or the number of mature individuals in populations have increased by ten percent or more over the term of the plan.
Criteria for failure: The number of populations have decreased and/or the number of mature individuals in populations have decreased by ten percent or more over the term of the plan.

3. RECOVERY ACTIONS

Completed recovery actions

In 1996, surveys for new populations of *Conostylis rogeri* were conducted by consultant Robert Buehrig in Nature Reserves, Water Reserves and rail and road reserves. Areas surveyed included Koolberrin Nature Reserve (NR), Plain Hills NR, Merilup NR, Kondinin Saltmarsh NR, Bendering NR, North Karlgarin NR, Karlgarin Hill NR, Dragon Rocks NR, Flat Rock NR, Hodgson Bin NR, Reserve 22247 east of Harrismith, along the rail line in Tarin Rock NR and Water and Flora Conservation Reserve 16776.

In May 2001, six plants in a sand pit that was to be rehabilitated (Subpopulation 1c) were removed and replanted back into the site when works were complete (June 2001). Only one of the six plants survived to flower in 2001.

In 2004, a stand of remnant vegetation containing *Conostylis rogeri* on Private Property bordering the eastern side of North Tarin Rock Nature Reserve was incorporated into the reserve, securing an extended area of habitat for the species.

The Botanic Gardens and Parks Authority (BGPA) have 0.75g of seed collected from the Hopkins Nature Reserve population in 1998. No live collections of *Conostylis rogeri* are held by the BGPA and attempts to germinate seed in 2006 failed (Amanda Shade pers. comm.). DEC's Threatened Flora Seed Centre does not currently hold any collections of *C. rogeri*.

Ongoing and future recovery actions

The Great Southern District Threatened Flora Recovery Team (GSDTFRT) is overseeing the implementation of this IRP and will include it in its annual report to the DEC's Corporate Executive and funding bodies.

Staff from the DEC's Great Southern District are monitoring all known populations.

Where recovery actions are implemented on lands other than those managed by DEC, permission has been or will be sought from land managers prior to actions being undertaken. The following recovery actions are roughly in order of descending priority, influenced by their timing over the term of the plan. However this should not constrain addressing any recovery action if funding is available and other opportunities arise.

1. Coordinate recovery actions

The GSDTFRT will continue to coordinate the implementation of recovery actions for *Conostylis rogeri* and will include information on progress in their annual reports to DEC's Corporate Executive and funding bodies.

Action: Coordinate recovery actions
Responsibility: GSDTFRT
Cost: $1,400 per year.

2. Monitor populations

Monitoring of factors such as weed invasion, habitat degradation, population stability (expansion or decline), pollinator activity, seed production, recruitment, and longevity is essential. All populations will be inspected annually and Rare Flora Report Forms completed.

Action: Monitor populations
Responsibility: DEC (Great Southern District) through the GSDTFRT
Cost: $1,500 per year.

3. Collect seed and other plant material to preserve genetic diversity

The collection of *Conostylis rogeri* seed, taken from a single subpopulation nine years ago, is likely to be nearing the end of its 'shelf life'. Collection of seed and other genetic material is a priority to guard against extinction should the wild populations be lost. Collections should aim to sample as many populations as possible to maximise the range of genetic diversity and should cover both known locations. The "Germplasm Conservation Guidelines for Australia" produced by the Australian Network for Plant Conservation (ANPC) may be used as a guide to this process (ANPC 1997).

Action: Collect seed and other plant material to preserve genetic diversity
Responsibility: DEC (TFSC, Great Southern District) and BGPA through the GSDTFRT
Cost: $4,400 in years 1-3.

4. Develop and implement disturbance trials

DEC's Great Southern District will, in consultation with relevant authorities and DEC's Science Division, conduct research into the effectiveness of fire, smoke water and mechanical disturbance in stimulating germination of soil stored *Conostylis rogeri* seed. The results of trials will be monitored regularly and, if successful, a larger scale operation undertaken. Attention will be given to each of the following to ensure maximum recruitment while at the same time maintaining the integrity of populations.

a) burning discrete dead plants.
b) raking of the soil near dead plants.

Action: Develop and implement disturbance trials
Responsibility: DEC (Science Division, Great Southern District) through the GSDTFRT and relevant authorities.
Cost: $2,500 in years 2-4

5. Obtain biological and ecological information

Improved knowledge of the biology and ecology of *Conostylis rogeri* will provide a better scientific basis for the management of wild populations. An understanding of the following is particularly necessary for effective management:

1. The phenology and seasonal growth of the species.
2. Pollination biology of *Conostylis rogeri* and the requirements of pollinators.
3. Soil seed bank dynamics, including seed viability and size of soil seed banks.
4. Conditions necessary for germination of soil-stored seed and the role of fire and soil disturbance in germination and recruitment.
5. Longevity of plants and time taken to reach maturity.
6. Appropriate herbicides for weed control that will not adversely affect *Conostylis rogeri*.

Action: Obtain biological and ecological information
Responsibility: DEC (Science Division, Great Southern District) through the GSDTFRT
Cost: $15,000 in years 1 and 2 and $10,000 in years 3 and 4.

6. Conduct further surveys

Further surveys for *Conostylis rogeri* will be undertaken in Nature Reserve 14001 and other reserves in the Kulin to Tarin Rock area that have similar habitat.

Surveys will be done during the species' flowering period between September and October. Volunteers from the local community, wildflower societies and naturalists clubs will be involved in the surveys and supervised by DEC staff.

Action: Conduct further surveys
Responsibility: DEC (Great Southern District) through the GSDTFRT
Cost $3,500 per year.

7. Promote awareness

The importance of biodiversity conservation and the protection of *Conostylis rogeri* will be promoted to the public. This will be achieved through an information campaign using local print and electronic media, and by setting up poster displays. An A4 sized information sheet that provides a description of the species and information about threats and recovery actions will be developed and distributed to local land owners, relevant authorities and volunteer organizations, libraries and schools. It is hoped that the poster will result in the discovery of new populations. Formal links with local naturalist groups and interested individuals will also be encouraged.

To minimize the risk of accidental or deliberate destruction, the exact location of *Conostylis rogeri* be kept from the general public. Such information will, however, be given to relevant landowners, Shire staff and government authorities where appropriate.

Action: Promote awareness
Responsibility: DEC (Great Southern District, Species and Communities Branch (SCB) and Strategic Development and Corporate Affairs Division) through the GSDTFRT
Cost: $1,600 in year 1 and $1,000 in years 3 and 5.

8. Map habitat critical to the survival of *Conostylis rogeri*

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

Action: Map habitat critical to the survival of *Conostylis rogeri*
Responsibility: DEC (Great Southern District) through the GSDTFRT
Cost: $3,000 in the second year.

9. Develop and implement a fire management strategy

A fire management strategy with information on optimum fire intensity, frequency and season will be developed to maximize population size and health. The strategy will include recommendations on fire frequency, precautions to prevent and manage wildfire, and the location, method of construction and maintenance of firebreaks.

Action: Develop and implement a fire management strategy
Responsibility: DEC (Great Southern District) through the GSDTFRT and relevant authorities.
Cost: $2,500 in year 1 and $1,500 in years 2-5.

10. Review the Plan and need for further recovery actions

At the end of the fifth year of the five-year term, the IRP will be reviewed and the need for further recovery actions assessed.

Action: Review the Plan and need for further recovery actions
Responsibility: DEC (SCB, Great Southern District) through the GSDTFRT
Cost: $1,500 in the fifth year.

Summary of recovery actions

Recovery Actions	Priority	Responsibility	Completion date
Coordinate recovery actions	High	GSDTFRT	Ongoing
Monitor populations	High	DEC (Great Southern District) through the GSDTFRT	Ongoing

Collect seed and other plant material to preserve genetic diversity	High	DEC (TFSC, Great Southern District) and BGPA through the GSDTFRT	2011
Develop and implement disturbance trials	High	DEC (Science Division, Great Southern District) through the GSDTFRT and relevant authorities	2012
Obtain biological and ecological information	High	DEC (Science Division, Great Southern District) through the GSDTFRT	2012
Conduct further surveys	High	DEC (Great Southern District) through the GSDTFRT	Ongoing
Promote awareness	Moderate	DEC (Great Southern District, Species and Communities Branch (SCB) and Strategic Development and Corporate Affairs Division) through the GSDTFRT	2013
Map habitat critical to the survival of *Conostylis rogeri*	Moderate	DEC (Great Southern District) through the GSDTFRT	2010
Develop and implement a fire management strategy	Moderate	DEC (Great Southern District) through the GSDTFRT and relevant authorities	Developed by 2008 with implementation ongoing
Review the Plan and need for further recovery actions	Moderate	DEC (SCB, Great Southern District) through the GSDTFRT	2013

4. TERM OF PLAN

Western Australia

This IRP will operate from April 2008 to March 2013 but will remain in force until withdrawn or replaced. If the species is still ranked VU after five years, the need for further recovery actions and an update of this IRP will be assessed.

Commonwealth

In accordance with the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) this adopted recovery plan will remain in force until revoked.

The recovery plan must be reviewed at intervals of not longer than 5 years.

5. REFERENCES

Atkins, K. (2008) *Declared Rare and Priority Flora List for Western Australia.* Department of Environment and Conservation, Western Australia.

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6. TAXONOMIC DESCRIPTION

Excerpt from: Hopper, S.D. (1987) *Flora of Australia*. Volume 45, Hydatellaceae to Liliaceae. Canberra: Australian Government Publishing Services. pp 57-110.

Tufts small. Leaves flat, 2.5-5 cm long, 0.6-0.5 mm wide, green, glabrous except marginal hairs spreading in 2 alternate ranks on each margin; hairs 1-3.5 mm long, white, flexuose, simple but minutely spinulose. Flower solitary; scape 0.5-2.5 cm long. Perianth 10-12.5 mm long, tomentose with plumose hairs, pale yellow; lobes 5-7.5 mm long. Stamens uniseriate; anthers 3-4.5 mm long, longer than filaments. Style 5-10 mm long; placenta peltate, with a few pendulous ovules.

A diminutive species characterized by its solitary flowers, with ovules few and pendulous from a peltate placenta. Similar to *Conostylis pusilla* and forms of *C. setigera* in leaf morphology but the stamens are uniseriate with anthers much longer than filaments. Relationships are not clear.