INTERIM RECOVERY PLAN NO. 119

NET-VEINED GYROSTEMON (*GYROSTEMON RETICULATUS*)

INTERIM RECOVERY PLAN

2002-2007

Gillian Stack and Val English

Photograph: Val English

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

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 (the Department) 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.

The Department 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This Interim Recovery Plan will operate from August 2002 to July 2007 but will remain in force until withdrawn or replaced.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.

This IRP was approved by the Director of Nature Conservation on 11 July 2003. The provision of funds identified in this Interim Recovery Plan is dependent on budgetary and other constraints affecting the Department, as well as the need to address other priorities.

Information in this IRP was accurate at August 2002.

SUMMARY

Scientific Name:	***Gyrostemon reticulatus***	**Common Name:**	Net-veined Gyrostemon
Family:	Gyrostemonaceae	**Flowering Period:**	September
Dept Region:	Midwest	**Dept District:**	Geraldton
Shire:	Mullewa	**Recovery Teams:**	Geraldton and Merredin District Threatened Flora Recovery Teams

Illustrations and/or further information: A. Brown, C. Thomson-Dans and N. Marchant (Eds). (1998) *Western Australia's Threatened Flora*; A.S. George (1982) *Flora of Australia* 8: 393.

Current status: *Gyrostemon reticulatus* was declared as Rare Flora in August 2001, in the absence of information about the size and condition of the populations. Following survey it was found to meet World Conservation Union (IUCN, 2000) Red List Category 'CR' under criteria B1ab(iii)+2ab(iii) due to the severe fragmentation of populations, extremely small range and continuing decline in the quality of habitat. The main threats are very limited range, accidental damage during firebreak maintenance, inundation and inappropriate fire regimes.

Critical habitat: The critical habitat for *Gyrostemon reticulatus* comprises the area of occupancy of the known populations; 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 requirements: *Gyrostemon reticulatus* is currently known from a range of approximately 2 km in an area south east of Mullewa, but has historically been recorded from areas near Canna, Wubin and Kalannie. It grows in very dense shrubland with several *Melaleuca* species, *Acacia acuminata* and *Allocasuarina campestris* on yellow-brown sandy slopes.

Existing Recovery Actions: The following recovery actions have been or are currently being implemented:
1. Land managers have been made aware of the location and threatened status of the species.
2. A number of articles have been published that promote the significance of the rediscovery of the species.
3. Staff from the Department's Geraldton District regularly monitor populations of the species.
4. Declared Rare Flora markers have been installed near the track at Population 1.
5. Population 1 has been fenced, and vegetation is being re-established in areas of paddock adjacent to the population.
6. Approximately 1040 seeds were collected from Population 2 in 2001 and are stored in the Department's Threatened Flora Seed Centre.
7. The area around Kalannie was surveyed for this species in 1990, but before preferred habitat was known.
8. Staff from the Department's Geraldton District are overseeing the implementation of this IRP and will include information on progress in an annual report to the Department's Corporate Executive and funding bodies.

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 species in the wild.

Recovery criteria
Criterion for success: The number of individuals within populations and/or the number of populations have increased.
Criterion for failure: The number of individuals within populations and/or the number of populations have decreased (Note: As *Gyrostemon reticulatus* is believed to be a disturbance opportunist, reproductive biology will be taken into account when assessing success or failure).

Recovery actions

1. Coordinate recovery actions	7. Collect seed and cutting material.
2. Seek long-term protection of habitat.	8. Obtain biological and ecological information.
3. Conduct further surveys.	9. Develop and implement a fire management strategy.
4. Monitor populations.	10. Undertake and monitor translocation, if required.
5. Promote awareness.	11. Review the need for a full Recovery Plan.
6. Stimulate the germination of soil-stored seed.	

1. BACKGROUND

History

C.A. Gardner first collected *Gyrostemon reticulatus* near Canna in 1933. It was then collected from near Wubin and Kalannie by W. Blackall in 1938, but was not collected again for a long time, and was Presumed Extinct for many years. A specimen was collected in 1990, but its identity was not confirmed as *Gyrostemon reticulatus* until March 2000. When this specimen was collected there were only a few plants present, and these were at least ten years old but still flowering and fruiting. The area was burnt on 31 July 2000 and initially no plants could be found following the fire. However, the species was relocated and surveyed in August 2001, and over 500 plants occurred in the population at that time. The associated species in the habitat were not regenerating as favorably following fire, probably due to drought. There are also three plants known from an area approximately two kilometres away, in a position that had experienced major soil disturbance several years ago. These plants are very close to water tanks, and receive water through leakage. They are very green, larger and more 'leggy' than those in Population 1.

Description

Gyrostemon reticulatus is an erect shrub to 1 m tall. It has rather crowded, persistent linear leaves, 11 to 35 mm long. They are circular in cross-section and sometimes have hooked tips. The male and female flowers are on separate plants. The solitary flowers have pointed calyx lobes. Male flowers have 12 to 14 stamens, which end in sharp points, and are arranged in a whorl. The female flowers have 5 to 7 carpels with narrow, flattened stigmas about 1 mm long. The stalked, solitary fruit is spherical, and the 3mm long carpels are semi-circular and narrow towards the margin with patterned surfaces (Brown *et al*. 1998).

This species is distinguished from *Gyrostemon australasicus* by its reticulate carpels with narrow keels, and by the generally higher number of stamens (usually 9 to 12 or 14 in *G. australasicus*) (Brown *et al.* 1998).

Distribution and habitat

Gyrostemon reticulatus is currently known from an extremely narrow geographic range of approximately 2 km in an area south east of Mullewa, but has historically been recorded from areas near Canna, Wubin and Kalannie. It grows on the disturbed edges of very dense shrubland with several *Melaleuca* species, *Acacia acuminata* and *Allocasuarina campestris* on yellow-brown sandy slopes. As there is evidence that this species behaves as a fire ephemeral, it is most likely to be found shortly after a fire event in this type of habitat, while the vegetation is still relatively open.

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 *Gyrostemon reticulatus* comprises:

- the area of occupancy of known populations;
- areas of similar habitat within 200 metres of known populations, i.e. very dense shrubland on yellow-brown sandy soils (these provide potential habitat for natural range extension);
- corridors of remnant vegetation that link populations (these are necessary to allow pollinators to move between populations); and
- additional occurrences of similar habitat i.e. very dense shrubland on yellow-brown sandy soils, that do not currently contain the species but may have done so in the past (these represent possible translocation sites).

Biology and ecology

Gyrostemon reticulatus is dioecious – that is, its male and female flowers occur on separate plants. A large amount of fruit is set per plant, with 6 or 7 seeds per fruit. This ripens progressively, with some fruit mature while the plant still bears fresh flowers. The top flowers brown first in drought.

Population 1 was known to have only a few old but still fruiting plants present prior to the fire in 2000. There are now over 500 plants in that population. Population 2 occurs on a site that experienced soil disturbance several years ago. While these observations suggest germination of this species is triggered by soil disturbance (Population 2) and fire (Population 1), seed did not respond within two months to smoke water or seed coat nicking in the laboratory situation even though the seed appeared viable (personal communication, A. Crawford[1]). It is thought that there is an unknown dormancy trigger, which has been observed in other species of the same family. Research is currently underway into the nature of the dormancy triggers that exist in the Gyrostemonaceae[2].

Gyrostemon reticulatus may possibly resprout after fire, as 13 months after the fire at Population 1, some plants had a stem diameter of ca. 15mm, and had small scars at the base which may have been fire scars. However, most plants present at that time appeared to have grown from seed post-fire, and were already in flower or early fruit. Observations indicate that senescence may occur after more than 10 years.

A land manager who has looked for this plant in the past has observed that it occurs on the edges of vegetation, near tracks or firebreaks, not within dense bush. However, plants at Population 1 have germinated throughout much of the patch of vegetation that was burnt. This suggests that it is likely to be a fire ephemeral as it produces extremely large quantities of seed very quickly after fire, declines in numbers as the surrounding vegetation matures and becomes more dense, and remains primarily as a long-term seed store in the soil. In addition, a few plants appear to have survived near the firebreak and have kept producing seed.

The seed has a relatively large aril, which suggests that it is ant dispersed.

Threats

Gyrostemon reticulatus was presumed extinct for many years until it was rediscovered in March 2000. It was not surveyed until its nomination as extant Rare Flora in 2000, when it was ranked as Vulnerable (VU) in the absence of information about the size or condition of the population. It was surveyed in 2001, and currently meets World Conservation Union (IUCN, 2000) Red List Category 'CR' under criteria B1ab(iii)+2ab(iii) due to the severe fragmentation of populations, extremely small range and continuing decline in the quality of habitat. The main threats are very limited range, accidental damage during firebreak maintenance, inundation and inappropriate fire regimes, however other threats that are likely to be of lesser significance are also discussed below:

- **Very limited range** is a threat to the species as catastrophic events have the potential to cause extinction.

- **Accidental damage** during firebreak maintenance is a threat to Population 1, as the majority of plants in the population are located adjacent to a fire break.

- **Inundation** is a threat at Population 2, and will potentially undermine the root structure of the plants.

- **Inappropriate fire regimes** may affect the viability of populations. The species has regenerated well from seed after fire at Population 1, but too frequent fire is likely to kill the majority of plants before they reach maturity and set new seed. However, it is customary for fires to be very infrequent in bushland in agricultural areas, and this has the potential to inhibit effective regeneration of the species.

- **Grazing** is a potential threat to Population 1 as stock may in the future have access to the site. Although the adjacent paddock is under cropping at present, this is likely to rotate to stock in the future.

[1] Andrew Crawford, Seed collector, the Department's Threatened Flora Seed Centre
[2] Katherine Baker, PhD student, University of Western Australia

- **Rising salinity** is a potential threat to Population 2 as the landscape is very highly cleared, and this population is very close to a creekline.
- **Lack of appropriate disturbance** to stimulate regeneration is a threat to Population 2. It is unlikely that the plants in this population will be subject to a disturbance such as fire that will stimulate regeneration, as there are no associated species to help carry a burn.

Summary of population information and threats

Pop. No. & Location	Land Status	Year/No. plants	Condition	Threats
1. SE of Mullewa	Private Property	2001 500+	Moderate	Accidental damage during firebreak maintenance, grazing, inappropriate fire
2. SE of Mullewa	Unvested Reserve	2001 3	Poor – no associated native species in immediate vicinity	Inundation, inappropriate fire

Guide for decision-makers

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

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 species in the wild.

Criterion for success: The number of individuals within populations and/or the number of populations have increased.
Criterion for failure: The number of individuals within populations and/or the number of populations have decreased
(Note: As *Gyrostemon reticulatus* is believed to be a disturbance opportunist, reproductive biology will be taken into account when assessing success or failure).

3. RECOVERY ACTIONS

Existing recovery actions

All relevant land managers have been notified of the location and threatened status of the species. The notification details the Declared Rare status of *Gyrostemon reticulatus* and the associated legal responsibilities.

A number of articles that promote the significance of the rediscovery of *Gyrostemon reticulatus* have been published in newsletters, journals and local papers.

Yellow Declared Rare Flora markers have been installed on the track near Population 1. Their purpose is to alert people working in the vicinity to the presence of DRF and the need to avoid work that may cause damage to plants or habitat.

Population 1 has been fenced by the land owner. The site was grazed prior to 1996, but the area is still well vegetated. In addition, the land owner is also re-establishing vegetation in areas of the paddock that are adjacent to the population.

Approximately 1040 seeds were collected in November 2001 and are stored in the Department's Threatened Flora Seed Centre (TFSC) at –18°C. Staff of the TFSC test the viability of seed soon after collection and again after one year in storage. The initial germination rate of *Gyrostemon reticulatus* seed was nil after two months, which is thought to be due to unbroken dormancy (unpublished data A. Cochrane[3]). Research into the nature of dormancy in the Gyrostemonaceae is in progress, and information about successful germination techniques will be provided to the Department's TFSC when available (personal communication K. Baker).

The Kalannie area was surveyed unsuccessfully for *Gyrostemon reticulatus* by Frans Molleman in 1990. However, this was before habitat information was available.

Staff from the Department's Geraldton District regularly monitor both populations of this species.

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

Future recovery actions

Where populations occur on lands other than those managed by the Department, permission will be sought from appropriate land managers prior to recovery actions being undertaken.

1. Coordinate recovery actions

The GDTFRT will continue to oversee the implementation of the recovery actions for *Gyrostemon reticulatus* and will include information on progress in its annual report to the Department's Corporate Executive and funding bodies.

Action: Coordinate recovery actions
Responsibility: The Department (Geraldton District) through the GDTFRT
Cost: $500 per year

2. Seek long-term protection of habitat

Staff from the Department's Geraldton District will continue liaison with land managers and landowners to ensure that populations are not accidentally damaged or destroyed. In addition, ways and means of improving the security of populations and their habitat will be investigated. This may include conservation covenants with a range of agencies, the Land for Wildlife scheme, and possibly land purchase if the land becomes available. Protection from threat of clearing will also be sought for remnant vegetation adjacent to Population 2.

Action: Seek long-term protection of habitat
Responsibility: The Department (Geraldton District) through the GDTFRT
Cost: $1,000 per year

3. Conduct further surveys

Community volunteers will be encouraged to be involved in further surveys conducted by Departmental staff during the species' flowering period (September-October). Survey areas are likely to include the areas around Kalannie and Wubin, as well as other suitable habitat near Mullewa and Canna. Surveys will be focused in areas that have been recently burnt or otherwise disturbed, as it appears likely that if the species does occur elsewhere it will be in greatest numbers in recently disturbed sites.

Action: Conduct further surveys
Responsibility: The Department (Geraldton and Merredin Districts) through the GDTFRT
Cost: $3,000 per year

[3] Anne Cochrane, Manager, the Department's Threatened Flora Seed Centre

4. Monitor populations

Annual monitoring of factors such as habitat degradation, wind damage, population stability (expansion or decline), weed invasion, pollination activity, seed production, recruitment, longevity and predation is essential. Special attention will be paid to any indicators of rising salinity, particularly near Population 2, as it occurs within a few hundred metres of a creekline in a heavily cleared landscape. A Digital Elevation Model (a computer landscape model) will be utilized to monitor salinity threat and impact if such data are available through work such as the Landmonitor Project.

Action: Monitor populations
Responsibility: The Department (Geraldton District) through the GDTFRT
Cost: $2,000 per year

5. 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, which includes a description of the plant, its habitat, threats, recovery actions and photos will be produced.

A reply paid postal drop illustrating *Gyrostemon reticulatus* and describing its distinctive features and habitat will be produced and distributed by the Department's Geraldton and Merredin District offices to local farmers and other residents in Shires containing possible habitat of the species. Postal drops aim to stimulate interest, provide information about threatened species and provide a name and number to contact if new populations are found by members of the community.

Action: Promote awareness
Responsibility: The Department (Geraldton and Merredin Districts) through the GDTFRT and the Merredin District Threatened Flora Recovery Team
Cost: $1,900 in first year, $1,200 in second year and $900 in subsequent years

6. Stimulate the germination of soil-stored seed

Burning, smokewater and/or soil disturbance, or other treatments may be effective in stimulating the germination of soil-stored seed. These trials will be conducted in the area adjacent to Population 2, and in other areas considered possible or likely to support soil-stored seed of *Gyrostemon reticulatus,* in consultation with the current land managers.

Action: Stimulate the germination of soil-stored seed
Responsibility: The Department (Geraldton District) through the GDTFRT
Cost: $4,400 in first and fourth years and $1,000 in other years

7. Collect seed and cutting material

Preservation of germplasm is essential to guard against extinction if wild populations are lost. Such collections are also required to propagate plants for translocations. Some seed has been collected from both Population 1 and Population 2 but further collections are required from both populations, and any others that may be discovered. Cuttings will also be obtained to establish a living collection at the Botanic Gardens and Parks Authority (BGPA).

Action: Collect seed and cutting material
Responsibility: The Department (TFSC, Geraldton District) through the GDTFRT
Cost: $4,100 for the first two years and $1,000 in subsequent years

8. Obtain biological and ecological information

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

1. Soil seed bank dynamics and the role of various disturbances (such as fire), competition, rainfall and grazing in recruitment and seedling survival.
2. The reproductive strategies, phenology and seasonal growth of the species.
3. The mating system and pollination biology of the species.
4. The population genetic structure, levels of genetic diversity and minimum viable population size.

Action: Obtain biological and ecological information
Responsibility: The Department (Science Division, Geraldton District) through the GDTFRT
Cost: $20,900 per year for the first three years

9. Develop and implement a fire management strategy

It is believed that this species may be a resprouter, and observations also indicate that seed germination is stimulated by fire. No planned burns will occur in the habitat of Population 1 for the life of this plan, to allow the soil seed bank to reestablish. A fire management strategy will be developed to determine fire control measures and fire frequency. Observations indicate that a burn frequency of ten years or slightly longer may be suitable to maintain the species.

Action: Develop and implement a fire management strategy
Responsibility: The Department (Geraldton District) through the GDTFRT
Cost: $2,600 in first year and $1,000 in subsequent years

10. Undertake and monitor translocation, if required

Information on the translocation of threatened plants and animals in the wild is provided in the Department's Policy Statement No. 29 *Translocation of Threatened Flora and Fauna*. All translocation proposals require endorsement by the Department's Director of Nature Conservation.

If a translocation is required, disturbance trials will be undertaken to ensure that there are no natural populations of *Gyrostemon reticulatus* present as soil-stored seed in areas proposed as translocation sites.

Monitoring of translocations is essential and if a translocation is required, will be undertaken according to the timetable that will be developed for the Translocation Proposal.

Action: Undertake and monitor translocation, if required
Responsibility: The Department (Science Division, Geraldton District) through the GDTFRT
Cost: $36,000 in the third year and $2,000 in the fourth and fifth years

11. Review the need for a full Recovery Plan

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 will be assessed. If the species is still ranked as Critically Endangered at that time a full Recovery Plan may be required.

Action: Review the need for further recovery actions and/or a full Recovery Plan
Responsibility: The Department (WATSCU, Geraldton District) through the GDTFRT
Cost: $20,300 in the fifth year (if full Recovery Plan required)

4. TERM OF PLAN

This Interim Recovery Plan will operate from August 2002 to July 2007 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.

5. ACKNOWLEDGMENTS

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

Katherine Baker	PhD student, University of Western Australia
Alanna Chant	Operations Officer, the Department's Geraldton District
Anne Cochrane	Manager, the Department's Threatened Flora Seed Centre
Andrew Crawford	Seed Collector, the Department's Threatened Flora Seed Centre
Sophie Moller	Coordinator, the Department's Nature Conservation Covenant Program
Brother Van Veen	Brother, Pallotine Mission

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

6. REFERENCES

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

George, A.S. (1982) *Flora of Australia* 8: 393.

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

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

Department of Conservation and Land Management (1995) Policy Statement No. 29 *Translocation of Threatened Flora and Fauna*. Department of Conservation and Land Management, Western Australia.

Department of Conservation and Land Management (1998) Western Australian Herbarium FloraBase – Information on the Western Australian Flora. Department of Conservation and Land Management, Western Australia. http://www.calm.wa.gov.au/science/

World Conservation Union (2000) *IUCN red list categories prepared by the IUCN Species Survival Commission, as approved by the 51st meeting of the IUCN Council*. Gland, Switzerland.

7. TAXONOMIC DESCRIPTION

George, A.S. (1982) *Flora of Australia* 8: 393.

Gyrostemon reticulatus A shrub c. 1 m tall. Branchlets slender, striate when dried. Leaves linear-terete, rather crowded, 11-35 mm long, 1-1.5 mm wide, acute, sometimes uncinate; stipules swollen, oblique, c. 0.3 mm long, brown or golden. Flowers solitary, axillary. Male flowers: pedicels c. 1 mm long, spreading; calyx 1 mm long, shallowly lobed, the lobes broad, obtuse; stamens 12-14 in 1 whorl, shortly and obtusely apiculate; disc convex. Female flowers: pedicels c. 1 mm long, spreading to recurved; calyx 0.5 mm long, divided to ½ into triangular, acute lobes; carpels 5-7; stigmas narrow, flattened, united at base, 1 mm long, soon curling. Fruit spherical; carpels semi-circular, narrowed towards margin; 3 mm long, the faces reticulate. Seed obovate, c. 1 mm long, rugose, red-brown, attached at base; aril small.

Distinguished from *G. australasicus* by the reticulate carpels with narrow keels.