INTERIM RECOVERY PLAN NO. 190

LONG-FLOWERED NANCY

(*WURMBEA TUBULOSA*)

INTERIM RECOVERY PLAN

2004-2009

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DEPARTMENT OF Conservation AND LAND MANAGEMENT
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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This Interim Recovery Plan will operate from January 2005 to December 2009 but will remain in force until withdrawn or replaced. It is intended that, if the taxon is still ranked Vulnerable, this IRP will be reviewed after five years and the need to update the plan and for further recovery assessed.

This IRP was given Regional approval on 18 January 2005 and approved by the Director of Nature Conservation on 2 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 as at January 2005.

ACKNOWLEDGMENTS

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

Andrew Crawford	Technical Officer, CALM's Threatened Flora Seed Centre
Anthony Desmond	Program Leader Nature Conservation, CALM’s Midwest Region
Terry Macfarlane	Senior Research Scientist, CALM Manjimup
Amanda Shade	Horticulturalist, Botanic Garden and Parks Authority
Sue Patrick	Senior Research Scientist, CALM Herbarium

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:	*Wurmbea tubulosa*	**Common Name:**	Long-flowered Nancy
Family:	Colchicaceae	**Flowering Period:**	June-August
CALM Region:	Midwest	**CALM District:**	Geraldton
Shire (populations):	Three Springs (2); Mingenew (3,4,5,7, 8,10,11,12 13,14,15); Irwin (6); Greenough (1,9)	**Recovery Team:**	Geraldton District Threatened Flora Recovery Team

Illustrations and/or further information: Brown, A., Thomson-Dans, C. and Marchant, N. (Eds) (1998) Western Australia's Threatened Flora, Department of Conservation and Land Management, Western Australia; Macfarlane, T.D. (1987) *Wurmbea*. Flora of Australia 45: 387-404.

Current status: *Wurmbea tubulosa* was declared as Rare Flora in March 1982 under the *Wildlife Conservation Act 1950*. It currently meets World Conservation Union (IUCN) red list category Vulnerable (VU) under criterion B1ab(iii) (IUCN, 2000) as its geographic range is restricted to about 100km, populations are severely fragmented, and there is continuing decline in the quality of habitat. *Wurmbea tubulosa* is listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The main threats are competition from weeds, clearing, degraded habitat, edge effects, grazing, inappropriate fire regimes, apparent low recruitment, recreational activities, and road, rail and firebreak maintenance.

Description: *Wurmbea tubulosa* is a small dioecious plant 1-3 cm tall, with an ellipsoid corm to 2.5 cm long. It has three leaves, and the lower two are basal and similar in length and width, with no distinct section of stem between their bases. The leaves are very broad, 3-22 mm wide, lanceolate in shape, and held flat to the ground. The upper leaf is smaller and erect, emerging from the two lower leaves or attached to the stem just above them. The male and female flowers are borne on separate plants, with up to16 flowers in the inflorescence. The male flowers are in an open inflorescence which is taller than the uppermost leaf, whereas the female flowers are in a dense inflorescence which is almost concealed between the two basal leaves at ground level. The perianth is 6-7 mm long in male flowers, 9-12 mm in female flowers, white to pale pink in colour and joined at the base into a long tubular section for about half the perianth length. The upper section of the perianth is divided into six equal lobes, each having a single nectary, which is a narrow, curved, mauve-pink band situated a third to a half the distance from the base of the lobe and slightly raised. There are six stamens in the male flowers and a superior ovary with three styles in the female flowers. The fruit is a capsule with spherical, smooth brown seeds.

Habitat requirements: *Wurmbea tubulosa* is currently known over a geographic range of about 100km, with the majority of the populations found around Mingenew. It grows in clay and sandy clay, clay loam or brown loam under shrubs on riverbanks, along drainage lines and in seasonally wet places in woodland of *Eucalyptus loxophleba* with an open shrub layer including *Acacia* and *Hakea* species beneath.

Critical habitat: The critical habitat for *Wurmbea tubulosa* comprises the area of occupancy of important populations; similar habitat within 200 metres of important populations; corridors of remnant vegetation that link important populations and additional occurrences of similar habitat on conservation lands near important populations that do not currently contain the species but may have done so in the past and may be suitable for translocations.

Habitat critical to the survival of the species, and important populations: The following are all important populations of *Wurmbea tubulosa*: Population 1 represents the typical form of *Wurmbea tubulosa* and is close to the original type location; Population 4 is the only population within conservation estate; Populations 5 and 8 are large populations; and populations that occur within the Depot Hill Reserve (Populations 3, 10, 11, 13, 14 and 15) contain a large number of plants. 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 nearby lands 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: Population 1 occurs in the Greenough River Flats Threatened Ecological Community (TEC) which is currently listed as critically endangered in Western Australia. Recovery actions such as the control of weeds at Population 1 will also help to protect the ecological community.

Grevillea phanerophlebia (Declared Rare Flora - DRF) occurs at Mingenew Nature Reserve but does not grow with *Wurmbea tubulosa*. Although it grows some distance from the *Wurmbea* population, any action taken to eradicate the declared weed *Gorteria personata* that is present throughout the reserve, may benefit this population.

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. However, as *Wurmbea tubulosa* is not specifically listed under any international agreement, the implementation of other international environmental responsibilities is not affected by this plan.

Role and interests of indigenous people: An Aboriginal Sites Register is kept by the Department of Indigenous Affairs, and lists two artefacts/scatters sites and a water source site within the vicinity of *Wurmbea tubulosa*. Implementation of recovery actions under this plan includes consideration of the role and interests of indigenous communities in the region.

Social and economic impact: The implementation of this recovery plan has the potential to have some limited social and economic impact, where populations of *Wurmbea tubulosa* occur on private property or on other lands not specifically managed for conservation including rail and road reserves, local government reserves, and reserves managed by other government authorities. Negotiations will continue with regard to future management of habitat where populations occur on these lands and recovery actions refer to continued liaison between stakeholders with regard to these areas.

Affected interests: Populations of *Wurmbea tubulosa* occur on lands managed by three local government authorities (the Shires of Irwin, Mingenew, and Three Springs), on land managed by WestNet Rail, Main Roads WA, Department of Environment and property managed by seven private landowners.

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.

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. DRF Markers are in place at Populations 3, 5b and 6.
3. Part of Population 1a was fenced in 1997.
4. *Lycium ferocissimum* (African boxthorn) was removed by hand and herbicide treatment at Population 1 in 2000.
5. Weed control trials were conducted at Population 1c in 2001, in conjunction with a prescribed burn.
6. Bollards missing at the carpark adjacent to Population 3 were replaced in 2002.
7. *Gorteria personata*, a declared weed, was sprayed and hand weeded in the Nature Reserve habitat of Population 4 in 2003.
8. The Botanic Garden and Parks Authority attempted to tissue culture the species in 1991 but this was not successful.
9. Seed was collected from Population 3 in 2004. Viability and germination tests have not yet been done.
10. Further survey of Depot Hill Reserve resulted in new populations being located in 2004.
11. The Geraldton District Threatened Flora Recovery Team is overseeing the implementation of this IRP.

IRP objective: The objective of this Interim Recovery Plan 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 individuals within populations and/or the number of populations have increased by ten percent or more over the period of 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 period of the five year period of the plan.

Recovery actions

1. Coordinate recovery actions	7. Develop and implement a fire management strategy
2. Map critical habitat	8. Monitor populations
3. Implement weed control	9. Conduct further surveys
4. Liaise with relevant land managers	10. Promote awareness
5. Collect seed	11. Obtain biological and ecological information
6. Seek long-term protection of habitat	12. Review the need for further recovery

1. BACKGROUND

History

This taxon was first described in 1878 by George Bentham from material collected from Champion Bay, now a part of Geraldton. It was thought extinct until 1975 when Dr. Terry Macfarlane and Dr. Steve Hopper, rediscovered the taxon at Depot Hill, a shire reserve north west of Mingenew. Surveys since then have located an additional 14 populations, ranging from Geraldton to south of Mingenew, within a 100 km range.

Description

Wurmbea tubulosa is a small dioecious plant 1-3 cm tall, with an ellipsoid corm to 2.5 cm long. It has three leaves, and the lower two are basal and similar in length and width without a distinct section of stem between the bases. The leaves are very broad, 3-22 mm wide, lanceolate in shape, and held flat to the ground. The upper leaf is smaller and erect, emerging from the two lower leaves or attached to the stem just above them. The male and female flowers are borne on separate plants, with up to 16 flowers in the inflorescence. The male flowers are in an open inflorescence that is taller than the uppermost leaf, whereas the female flowers are in a dense inflorescence which is almost concealed between the two basal leaves at ground level. The perianth is 6-7 mm long in male flowers, 9-12 mm in female flowers, white to pale pink in colour and joined at the base into a long tubular section for about half the perianth length. The upper section of the perianth is divided into six equal lobes, each having a single nectary, which is a narrow, curved, mauve-pink band situated a third to a half the distance from the base of the lobe and slightly raised. There are six stamens in the male flowers and a superior ovary with three styles in the female flowers. The fruit is a capsule that is smooth brown and spherical (description adapted from Patrick 2001).

This species differs from all other Western Australian species of *Wurmbea* in that the perianth is tubular for up to half of its length. *Wurmbea drummondii* is a related species but differs in that the perianth is united into a tube for up to a quarter of its length. It also differs in the smaller flowers, which are fewer in each flower head.

Distribution and habitat

Wurmbea tubulosa is known from 14 populations in CALM's Geraldton District and 1 population in CALM's Moora District. It grows in clay and sandy clay, clay loam or brown loam under shrubs on riverbanks, along drainage lines and in seasonally wet places in woodland of *Eucalyptus loxophleba* with an open shrub layer including *Acacia* and *Hakea* species.

Biology and ecology

Wurmbea tubulosa is a tuberous species, and as a consequence it is reliant on its underground perennial corm for survival. Above ground parts emerge annually after initial winter rainfall. The number of plants that emerge at a site varies from year to year and is probably dependant upon the amount of rainfall. In 2004, higher rainfall than in previous years resulted in an increase in population size for several sites. The plants also appeared larger and healthier than in previous years. The species flowers from June to July, with plants readily setting seeds before the cover of introduced grasses reaches a peak and competes with it (S. Patrick[1] personal communication). In that way it is likely to survive for reasonable period under heavy grass cover (T. MacFarlane[2]

[1] Sue Patrick, Senior Research Scientist, CALM Herbarium
[2] Terry MacFarlane, Senior Research Scientist, CALM Manjimup

personal communication). Subsequent to flowering, the above ground parts die and the plant remains dormant over summer.

Currently, there is no information on the germination requirements of the species as the Threatened Flora Seed Centre had not collected seed until recently. However, plants of other species within the genus take more than a year to reach flowering size after seed germination (T. MacFarlane personal communication).

In terms of disturbance, plants recover well after shallow surface disturbance, but deep ploughing may damage the corms. It appears the reason the plants survived at the Greenough Flats location (Population 1) was that the site had not been ploughed despite being cleared. It has also been observed growing on firebreaks that are regularly graded (T. MacFarlane personal communication).

The general response to fire is unknown, however, flowering has been enhanced by fire in other species of *Wurmbea* and this may also apply to this taxon. After fire, the species is more easily located, as any grassy cover will have been removed. Being a small plant, it can be hidden by heavy grass cover and be difficult to locate. Populations 1b and 1c were first discovered after a fire in 1983 when all the plants were clearly visible (T. MacFarlane personal communication).

Threats

Wurmbea tubulosa was declared as Rare Flora in March 1982 under the *Wildlife Conservation Act 1950*. It currently meets World Conservation Union (IUCN) red list category Vulnerable (VU) under criterion B1ab(iii) (IUCN 2000) as it occurs over a restricted geographic range of about 100km, populations are severely fragmented and there is continuing decline in the quality of habitat at many sites. *Wurmbea tubulosa* is listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The main threats are:

- **Weed invasion** is a threat to most populations, with only a few remaining populations largely weed-free at present. Weeds suppress plant growth and recruitment by competing for soil moisture, nutrients and light. They also exacerbate grazing pressure and increase the fire hazard due to the easy ignition of high fuel loads that are produced annually by many grass weed species.

  Population 1 is densely infested with weeds, mostly introduced grasses, *Oxalis pes-caprae* (sour-sob), and *Lycium ferocissimum* (African boxthorn). At times, the cover of introduced grasses has been so high that Population 1 was thought to be extinct as the plants were not visible.

  Gorteria personata, an introduced and declared plant (a noxious weed), is present at populations 4, 7 and 8. Declared noxious weeds are those specified by the Department of Agriculture as having the potential for significant impact on agricultural production or ecological integrity. Gorteria has the capacity to do both. The Department of Agriculture can require landowners to eradicate declared weeds on their property at the landowner's expense. At Population 8, *Gorteria* is present outside the habitat of the population but is encroaching. Population 4 is most at threat from *Gorteria* as it is present throughout most of Mingenew Nature Reserve.

- **Clearing** of bushland for development is possible at several sites where *Wurmbea tubulosa* occurs. Negotiations will occur with relevant stakeholders at each site as any development proposals arise. As the species is Declared Rare Flora, however, no *W. tubulosa* plants may be taken or damaged without Ministerial approval.

- **Degraded habitat** is a current threat to Population 1 (on Greenough Flat). The lack of associated native vegetation means that it is more likely that pollinators will be infrequent or absent. In addition, the lack of habitat available for recruitment is of concern.

- **Edge effects** severely affect narrow linear populations such as those on road or rail reserves by exposure to influences from adjacent cleared land. In addition to the proximity of a weed seed source, effects include increased wind speed, fertiliser and herbicide spray drift and runoff, modified hydrology and altered disturbance regimes, including fire.

- **Grazing** by rabbits is a threat to Population 10e, grazing by stock is a threat to Population 9 in a pasture paddock, and there has been historical grazing by kangaroos at Population 5. In addition to grazing, rabbits also impact on populations by increasing invasion of weeds through soil disturbance, addition of nutrients to soil, and introduction of weed seeds.

- **Inappropriate fire regimes** may affect the viability of populations. The response of this taxon to fire is unknown; however, as above ground parts emerge during winter, burning at this time of year would impact the species. Alternatively, burning during summer would help avoid damage as the species is dormant during this period. An additional consideration is the role of fire in facilitating weed invasion. In many populations weeds are currently restricted to the edges of the habitat, but are likely to invade post-fire without prompt and effective weed control.

- **Poor recruitment** may be an issue at most populations as no seedling plants have been observed recently. However, the seedlings may be even more cryptic than adult plants and consequently may be difficult to locate. The seed viability, and cues for germination are not known for this species.

- **Recreational activities** are a threat to Population 3 which is situated adjacent to a car park. In previous years, bollards have been removed, and old campfires were found close to plants.

- **Road, rail and firebreak maintenance** threatens all road and rail reserve populations, and several populations on private property and Shire Reserves. Threats include grading, chemical spraying, construction of drainage channels and the mowing of roadside vegetation. Several of these actions also encourage weed invasion. Vegetation slashing was undertaken near Population 6a in 2003 with no obvious negative effects on the population.

Summary of population information and threats

Pop. No. & Location	Land Status	Year/No. plants	Condition	Threats
1a. Greenough Flats	Private property	1996 1,520 2001 1,150+ * 2002 1,000+ * 2004 1,000+ *	Healthy (2004)	Intense weed competition (*Oxalis* sp, grasses), firebreak construction, edge effects, private land development
1b Greenough Flats	Private property	2001 * 2002 * 2004 *	Healthy (2004)	Intense weed competition
1c. Greenough Flats	Private property	1996 480 1998 200+ 2001 * 2002 * 2004 *	Healthy (2004)	Intense weed competition (*Oxalis* sp, grasses), firebreak construction
2. Morawa/Three Springs Rd.	Shire (tip?) reserve	1993 1000 1996 30+	Healthy (1996)	Road maintenance, weed competition
3. Depot Hill	Shire reserve	1996 30+ 1999 200+ 2000 1 000+ 2002 400+ 2003 1 000+ 2004 1 000+	Healthy (2003)	Recreational impacts
4. Mingenew Nature Reserve	Nature Reserve	1996 300 2001 1 000 2004 1 000+	Moderate to Healthy (2004)	Weeds (*Gorteria*)
5a. Mingenew/ Morawa Rd	Water and Rivers Commission (now Department of Environment) Reserve	1996 10 000+ 2004 10 000+*	Healthy (2004)	Weed competition (wild oats)
5b. Mingenew/ Morawa Rd	Shire road reserve	1996 * 2004 *	Healthy (1996)	Weeds, road maintenance
6a. East of Dongara	Rail reserve	1996 500+* 2002 500+ 2004 500*	Healthy (2004)	Rail maintenance, intense weed competition (grasses), soil disturbance (firebreaks)
6b. East of Dongara	MRWA road reserve	1996 * 2002 0 2004 *	Moderate (2002)	Road maintenance, intense weed competition (grasses), soil disturbance (firebreaks)
7. Yandanooka townsite	Townsite reserve	1991 1000+ 2004 0	Poor (2004)	Infested with *Gorteria personata*
8. Nanekine South Rd.	Private property	1996 300+ 2004 150 000	Healthy (2004)	*Gorteria personata*
9.Sandsprings Road	Private property	1996 800+ 1998 900+ 2000 200+	Healthy (2000)	Grazing by stock, weed competition
10a. Depot Hill	Private property	1998 50+ 2000 50+	Healthy (2000)	Firebreak maintenance, weed competition
10b. Depot Hill	Private property	1998 20 2000 30+	Healthy (2000)	Firebreak maintenance, weed competition, grazing
10c. Depot Hill	Shire reserve	1998 50 1999 60+ 2000 100+	Healthy (2000)	Unknown
10d. Depot Hill	Shire reserve	1998 40+ 2000 100+	Healthy (2000)	Weed competition
10e. Depot Hill	Private property	2000 50+	Moderate (2000)	Rabbits
11. Depot Hill	Shire reserve	1998 1 000+ 1999 1 250+ 2000 2 000+ 2004 2 000+	Healthy (2004)	Weed competition
12. Yandanooka-Melarra Rd	Private property	1996	Unknown	None listed (no Rare Flora Report Form submitted)

Pop. No. & Location	Land Status	Year/No. plants	Condition	Threats
13. Depot Hill	Shire Reserve	2004 2 000+	Healthy (2004)	Weeds
14. Depot Hill	Private Property	2004 15 000	Healthy (2004)	Weeds
15. Depot Hill	Shire Reserve	2004 2 000+	Healthy (2004)	Weeds

* = total for subpopulations combined.

Guide for decision-makers

Section 1 provides details of current and possible future threats. Any on-ground works (clearing, firebreaks, roadworks) in the immediate vicinity of *Wurmbea tubulosa* 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).

There are several important populations of *Wurmbea tubulosa*. Population 1 represents the typical form of *Wurmbea tubulosa* and is close to the original type location (S. Patrick, personal communication). Population 4 is the only population within a conservation estate, Populations 5 and 8 are large populations, and all populations that occur within the Depot Hill Reserve (Populations 3, 10, 11, 13, 14 and 15), represent a large proportion of the total number of *Wurmbea tubulosa*. All of these are therefore considered to be important populations and their habitat is considered to be critical habitat. Critical habitat therefore includes:

- the area of occupancy of important populations;
- areas of similar habitat within 200 metres of important populations, i.e. clay , sandy clay, clay loam or brown loam under shrubs on riverbanks, along drainage lines and seasonally wet places;
- corridors of remnant vegetation that link important populations (these are necessary to allow pollinators to move between populations and are usually road and rail reserves); and
- additional occurrences of similar habitat in conservation estate near important populations 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

Population 1 is part of the Greenough River Flats Threatened Ecological Community (TEC) that is listed as critically endangered in Western Australia. Recovery actions such as the control of weeds at Population 1 will also help to protect the ecological community.

Grevillea phanerophlebia (DRF) occurs at Mingenew Nature Reserve but grows some distance from the *Wurmbea* population. However, any action taken to eradicate *Gorteria personata* that is present throughout the reserve, may benefit this population.

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. However, as *Wurmbea tubulosa* is not specifically listed under any international agreement, the implementation of other international environmental responsibilities is not affected by this plan.

Role and interests of indigenous people

An Aboriginal Sites Register is kept by the Department of Indigenous Affairs, and lists two Artefacts/Scatter sites and a water source site in the vicinity of *Wurmbea tubulosa* populations. Implementation of recovery actions under this plan includes consideration of the role and interests of indigenous communities in the region.

Social and economic impacts

The implementation of this recovery plan has the potential to have some limited social and economic impact, where populations of *Wurmbea tubulosa* occur on private property or on other lands not specifically managed for conservation including rail and road reserves, local government reserves, and reserves managed by other government authorities. Negotiations will continue with regard to future management of habitat where populations occur on these lands and recovery actions refer to continued liaison between stakeholders with regard to these areas.

Affected interests

Populations of *Wurmbea tubulosa* occur on lands managed by three local government authorities (Irwin, Mingenew, and Three Springs Shires), on land managed by WestNet Rail, Main Roads WA, Department of Environment, and seven private landowners.

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 abate identified threats and maintain or enhance in-situ populations to ensure the long-term preservation of the species in the wild.

Criteria for success: The number of 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 period of the five year period of the plan.

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 *Wurmbea tubulosa* and the associated legal obligations.

Declared Rare Flora markers have been installed at Populations 3, 5b and 6. These serve to alert people working in the vicinity to the presence of DRF, and the need to avoid work that may damage plants or their habitat.

A major proportion of subpopulation 1a was fenced in 1997 in collaboration with the landholder and CALM. The subpopulation contains approximately 1000 plants.

Control of *Lycium ferocissimum* (African boxthorn) was conducted at Population 1 in 2000. Removal of the boxthorn was mainly by hand, with shoots sprouting from root material sprayed with Roundup in 2001. The population of *W. tubulosa* was not damaged as they were well away from the boxthorn reshoots.

Weed treatment trials were conducted in 2001 at the St. James Church site (Population 1c) in an area remote from the *Wurmbea* population. The aim of the trial was to test effective methods of control for the different types of weeds that occur at the site, such as burning, and the use of different herbicides. No significant results were obtained.

A prescribed burn was conducted in late October 2001 to reduce fire hazard at Subpopulations 1a and 1c. The burn temporarily cleared weeds on the southern end of the block and did not encroach on the *Wurmbea tubulosa* population.

Population 3 is located adjacent to a carpark in Depot Hill Reserve. In 2002, the site was found being used as a campsite, and several bollards had been removed. After discussion with the Shire of Mingenew the missing bollards were replaced to prevent vehicle access.

Annual weed control of *Gorteria personata* (*Gorteria*) near Population 4 was initiated in 2003. Access tracks within the Nature Reserve were graded to remove seed and avoid further spread of the weed by vehicle traffic. Access tracks were then sprayed with Simizine herbicide to kill any further *Gorteria* germinants. *Wurmbea tubulosa* has not been recorded on the access tracks so this did not damage the population. *Gorteria* plants in the area surrounding the population were sprayed with Roundup herbicide. *Gorteria* growing nearby and amongst the *W. tubulosa* plants were not sprayed to avoid damage to the rare flora and these weeds have since been removed by hand. Later inspection revealed that the spraying had been effective in killing the *Gorteria*, and had not affected *W. tubulosa*. The hand weeded area was relatively weed free when assessed in 2004 due to removal of *Gorteria* seeds. Weed control is ongoing, and a management plan aimed at dealing effectively with this weed throughout the Nature Reserve is being prepared.

Seed was collected from Population 3 in October 2004 (A. Crawford, personal communication[3]). Numbers and germination tests will be undertaken to determine viability and germination levels. Seed from the collection will be stored at CALM's Threatened Flora Seed Centre (TFSC) at –18°C.

[3] Andrew Crawford, Technical Officer, CALM's Threatened Flora Seed Centre

Immature seeds of *Wurmbea tubulosa* were collected by Botanic Garden Parks Authority (BGPA) from Population 5a late in 1991. Attempts were made to tissue culture the species, but were not successful. There have been no attempts to propagate the species at BGPA nursery (A. Shade personal communication[4]).

Survey work was undertaken in 2004 to update population numbers for this plan. This work resulted in the discovery of three new populations within Depot Hill Reserve and adjacent property. These additional populations increased the known numbers of *Wurmbea tubulosa* by approximately 19 000 plants.

The Geraldton District Threatened Flora Recovery Team 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 generally in order of descending priority, influenced by their timing over the life of the Plan. However this should not constrain addressing any of the priorities if funding is available for 'lower' priorities and other opportunities arise.

1. Coordinate recovery actions

The Geraldton District Threatened Flora Recovery Team will coordinate recovery actions for *Wurmbea tubulosa* and other Declared Rare Flora in their District. 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: $1,500 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 Recovery Teams
Cost: $3,500 in the first year

3. Implement weed control

Gorteria personata is present in the habitat of, and in some cases encroaches upon, several populations of *Wurmbea tubulosa* (Populations 4, 7, and 8). Control of *Gorteria* at Populations 4 has already begun and the methods have proved successful and will be continued. Control of the weed in the habitat of the other populations will be undertaken in liaison with the land manager at Population 8, and in the habitat of Population 7 if it is relocated.

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

The current level of threat from weeds is low at the remaining populations. If weed numbers increase (such as after fire) they could impact on *Wurmbea tubulosa*. If monitoring indicates that the threat from weeds has increased, weed control will be undertaken 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 *W. tubulosa* and associated native plant species.

Action: Implement weed control
Responsibility: CALM (Geraldton District) through GDTFRT; relevant land managers
Cost: $2,400 per year

4. Liaise with relevant land managers

Staff from CALM's Geraldton District will continue to liaise with relevant land managers and landowners to ensure that populations are not accidentally damaged or destroyed. Three significant sites that occur in the vicinity of *Wurmbea tubulosa* are listed on the Aboriginal Sites Register maintained by the Department of Indigenous Affairs. Input and involvement will be sought from any indigenous groups that have an active interest in areas that are habitat for *Wurmbea tubulosa*.

Action: Liaise with land managers
Responsibility: CALM (Geraldton District) through the GDTFRT
Cost: $1,000 per year

5. Collect seed

It is necessary to store germplasm as a genetic resource, ready for use in translocations and as an ex-situ genetic 'blueprint' for the species. The germplasm stored will be in the form of seed only. Some seed has been collected from Population 3 but additional collections are required from both that and other populations to maintain adequate representation of the remaining genetic diversity of this taxon. At the time of writing this plan, germination and viability tests had not been conducted on the collected seed.

Action: Collect seed and cutting material
Responsibility: CALM (TFSC, Geraldton and Moora Districts) through the Recovery Teams
Cost: $2,900 in the second and fourth years

6. Seek long-term protection of habitat

Ways and means of improving the security of populations and their habitat will be investigated. Currently, discussions are being held with the Shire of Mingenew with regard to the acquisition of Depot Hill Reserve. This acquisition will continue to be promoted as it contains several populations of *Wurmbea tubulosa* amounting to at least 6000 plants.

On private land, long term protection may include conservation covenants with a range of agencies or registration through the Land for Wildlife scheme. The possibility of acquiring the Department of Environment (previously Waters and Rivers Commission) Reserve that contains Population 5 will be investigated.

Action: Seek long-term protection of habitat
Responsibility: CALM (Geraldton District) through the GDTFRT
Cost: $1,800 per year

7. Develop and implement a fire management strategy

The only known fire-response for the genus is an increase in flowering following burning. However, it is hypothesised that fire during the growing season would kill or damage the adult plants, preventing accumulation/storage in the corms and decreasing the health and viability of populations. Fire also promotes the introduction and proliferation of weed species. Fire should therefore be prevented from occurring in the habitat of populations, except where it is being used experimentally as a recovery tool. Fire access tracks within the Nature Reserve (Population 4) are maintained regularly. A fire management strategy will be developed in consultation with land managers to determine recommended fire control measures, fire frequency, timing, and intensity.

Action: Develop and implement a fire management strategy
Responsibility: CALM (Geraldton and Moora Districts) through the Recovery Teams
Cost: $3,000 in first year, and $2,000 in subsequent years

8. Monitor populations

Bi-annual monitoring of factors such as habitat degradation (including weed invasion, salinity and plant diseases), 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. All populations were last surveyed between 2000 and 2004.

Action: Monitor populations
Responsibility: CALM (Geraldton District) through the GDTFRT
Cost: $1,400 per year in the first, third and fifth years

9. Conduct further surveys

Further surveys will be conducted by CALM staff during the flowering period of the species (June-July). Volunteers will be encouraged to be involved in these surveys. Records of areas surveyed will be sent to Wildlife Branch and retained at the Districts, even if *Wurmbea tubulosa* is not found.

Action: Conduct further surveys
Responsibility: CALM (Geraldton and Moora Districts) through the Recovery Teams
Cost: $2,500 per year 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 will be produced, and will include a description of the plant, its habitat, threats, recovery actions and photos. This will be distributed to the public through CALM's Moora and Geraldton District offices and at the offices and libraries of the Shires of Greenough, Irwin, Mingenew and Three Springs. Such information distribution may lead to the discovery of new populations.

Action: Promote awareness
Responsibility: CALM (Moora and Geraldton Districts) through the Recovery Teams
Cost: $1,700 in first year, and $1,100 per year thereafter

11. Obtain biological and ecological information

Improved knowledge of the biology and ecology of *Wurmbea tubulosa* will provide a scientific basis for its management in the wild. An understanding of the following is necessary for effective management:

1. The role of various disturbances (including fire), competition, rainfall and grazing in germination and recruitment.
2. The reproductive strategies, phenology and seasonal growth of the species.
3. Effect of introduced grasses on the species.

Action: Obtain biological and ecological information
Responsibility: CALM (Science Division, Moora and Geraldton Districts) through the Recovery Teams
Cost: $12,000 per year in the second, third and fourth years

12. 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 will be assessed. If long-term protection can be provided to significant populations in the term of this plan, the conservation status of *Wurmbea tubulosa* will be reviewed and the need for further recovery actions 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 January 2005 to December 2009 but will remain in force until withdrawn or replaced. If the taxon is still ranked Vulnerable after five years, the need for further recovery actions 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 (1994) Policy Statement No. 50 Setting Priorities for the Conservation of Western Australia's Threatened Flora and Fauna. Perth, Western Australia.

CALM (1992) Policy Statement No. 44 Wildlife Management Programs. Perth, Western Australia.

IUCN (2000) *IUCN Red List Categories prepared by the IUCN Species Survival Commission, as approved by the 51st Meeting of the IUCN Council*. Gland, Switzerland.

Macfarlane, T.D. (1987) *Wurmbea*. Flora of Australia 45: 387-404. Australian Biological Resources Study, Canberra.

Patrick, S. (2001) Declared Rare and Poorly Known Flora in the Geraldton District. Department of Conservation and Land Management, Western Australia.

6. TAXONOMIC DESCRIPTION

Excerpt from: Macfarlane, T.D. (1987) Wurmbea. Flora of Australia 45: 387-404. Australian Biological Resources Study, Canberra.

Wurmbea tubulosa
Plant 1-3 cm tall, dioecious, sometimes andromonoecious. Leaves 3; lower 2 leaves basal, similar, lanceolate, 3-22 mm wide; upper protruding from between lower two, much smaller, dilated with short or long pointed apex or narrowly lanceolate. Male and andromonoecious inflorescences open or dense; female inflorescence contracted, dense, largely enclosed by leaf bases; flowers 1-16. Perianth 6-7 mm long in male, 9-12 mm long in female and andromonoecious plants; tepals 6, connate for c. ½ of length, white, ageing faintly pink; nectary 1 per segment 1/3 – ½ from base, a transverse band curving distally at middle, slightly raised, white or pink. Stamens c. 2/3 as long as perianth; anthers c. 1 mm long, purplish red. Styles free.

Occurs near Greenough and near Mingenew, W.A. Grows in clay and sandy clay under shrubs on river banks and seasonally wet places.

A rare species closely related to *W. drummondii* but maintained as distinct because of the considerably larger flowers with long tubes, the larger number of flowers and the more frequent occurrence of andromonoecious plants. A vegetative specimen resembling both *W. tubulosa* and *W. drummondii* has been collected from 150 km north of Greenough, and will prove a large range extension for either species when positively identified.

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	1000	500		1000	500		1000	500		1000	500		1000	500	
Map critical habitat	2500		1000												
Weed Control	1300		1100	1300		1100	1300		1100	1300		1100	1300		1100
Liaise with land managers	600		400	600		400	600		400	600		400	600		400
Collect seed				1300		1600				1300		1600			
Seek long-term protection of habitat	1500		300	1500		300	1500		300	1500		300	1500		300
Develop and implement a fire management strategy	1500	1100	400	1000	500	500	1000	500	500	1000	500	500	1000	500	500
Monitoring	1000		600				1000		600				1000		600
Further survey	800		600				800		600				800		600
Promote awareness	1100		600	1100			1100			1100			1100		
Obtain biological and ecological information				5000		7000	5000		7000	5000		7000			
Review need for further recovery													400		600
Total	11,300	1,600	5,000	12,800	1,000	10,900	13,300	1,000	10,500	12,800	1,000	10,900	8,700	1,000	4,100
Yearly Total		**17,900**			**24,700**			**24,800**			**24,700**			**13,800**	

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

Total CALM: $58,900
Total Other: $5,600
Total External Funding: $41,400
Total Costs: $105,900