DUROKOPPIN NATURE RESERVE MYGALOMORPHAE CONSERVATION PLAN

2008-2013

Durokoppin Nature Reserve

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FOREWORD

This species conservation plan has been developed by the Department of Environment and Conservation Western Australia (DEC) on behalf of the Avon Catchment Council.

Although this species is found outside the Avon River Basin (ARB), this plan relates to the management of the species within the ARB. The implementation of recommendations and associated costs contained within this plan do not reflect current funding capacity. The availability of funding will determine the capacity to implement.

Information in this Species Conservation Plan was accurate at April 2008. This plan will operate from May 2008 to May 2013 but will remain in force until withdrawn or replaced.

ACKNOWLEDGEMENTS

Meg Green (former Ecologist, DEC Wheatbelt Region) contributed significantly towards the compilation of the first draft for this conservation plan.

Professor Barbara York Main (University of Western Australia), Dr. Mark Harvey (Western Australian Museum), Mick Davis (WWF – Australia) and Monica Russel (Edith Cowan University) provided historical and current information regarding trapdoor spider biology and locations.

Paul Blechynden, David Jolliffe and Brett Beecham (DEC Wheatbelt staff) as well as Professor Barbara York-Maine provided valuable advice and comments during the preparation of this conservation plan.

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SUMMARY

Durokoppin Nature Reserve Mygalomorphs

NRM Region: Avon.

Conservation plan objective:

To maintain, and if possible enhance, the condition of *in situ* populations of mygalomorph spiders at Durokoppin Nature Reserve.

Conservation Team: Mygalomorph Conservation Team to be established as part of this plan.

Recovery Criteria:

Criteria for success:
The number of populations of Mygalomorphae has increased and / or the number of mature individuals has increased by fifteen percent or more at Durokoppin Nature Reserve over the term of the plan.

Criteria for failure:
The number of populations of Mygalomorphae has decreased and / or the number of mature individuals in the known populations has decreased by fifteen percent or more at Durokoppin Nature Reserve over the term of the plan.

Conservation Actions:

1. Establish a Mygalomorph Conservation Team
2. Determine the population characteristics of known populations & ongoing monitoring
3. Undertake a threat assessment for each population
4. Address threats to specific populations
5. Conduct surveys to identify new populations
6. Promote awareness

Conservation Team: The formation of a Mygalomorph Conservation Team is recommended as part of this and other Mygalomorph conservation plans.

Conservation plan time frame:

This plan will be [1]implemented, updated and continually evaluated over a 5 year period from 2008-2013.

[1] The degree of implementation will depend on the availability of future funding and resources

1. INTRODUCTION

Members of the suborder Mygalomorphae, commonly known as “Trapdoor” and “Funnel-web” spiders, are primarily terrestrial burrowing spiders which occasionally make tubular silk nests on tree trunks (Main, 1985). Mygalomorphs are able to persist in small isolated areas due to their low dispersion powers, long life cycle and sedentary life style (Main, 1987a).

Mygalomorph spiders take several years to reach reproductive maturity, and females can live up to and exceeding twenty years. Mature males leave their burrows during moist conditions in search of females, and die shortly after mating (Yen & Butcher, 1997). Females lay their eggs in a silk cocoon in the burrow, and after spending several months confined to the parent burrow, spiderlings emerge approximately one year after the parental mating (Main, 1982).

An area in which mygalomorph spiders have been found to exhibit high species richness is the Northwest Corner of Durokoppin Nature Reserve, (Main, 1996).

Predators of adult Mygalomorphs include other arthropods (eg. Centipedes and Scorpions) which enter burrows, Goannas and Bandicoots which dig out burrows and pompilid wasps, some of which specialize in preying upon burrowing spiders (Main, 1985). A major threat to Mygalomorphs is loss or alteration of habitat due to their specialized habitat requirements, which may restrict them to microhabitats that have only subtle differences to adjacent ones. As a result, physical disturbance to these microhabitats can cause local extinction of populations (Main, 2002).

2. DUROKOPPIN NATURE RESERVE

2.1 Background

Durokoppin Nature Reserve (A 22921) is located approximately 26 km north of the Kellerberrin townsite in the Western Australian Wheatbelt (Main, 1996). This Class A nature reserve is vested with the Conservation Commission of Western Australia (CCWA) and managed by the Department of Environment & Conservation (DEC) for the purpose of Conservation of Flora and Fauna.

The reserve has a total area of 1,030 ha; however this plan will focus on the north-west part of the reserve situated west of the Kellerberrin-Trayning Road.

During a study of Durokoppin Nature Reserve by Barbara York Main (Main, 1996), the north-west corner (hereafter referred to as "NW Corner") of the reserve was surveyed with a focus on locating mygalomorph spider species. The vegetation in this area is shrubland, with dominant taxa including *Allocasuarina acutivalvis*, *A. campestris*, *Hakea*, *Acacia* (particularly *A. stereophylla* and *A. neurophylla*), *Beaufortia*, *Grevillea paradoxa* and *Melaleuca uncinata sens lat* (Main, 1996).

The study site supported long-unburnt, ungrazed shrubland sitting relatively high in the landscape, representing a relictual fragment of the ancient plateau surface with soils preserved *in situ*. For this reason, NW Corner was considered a possible site for the location of relictual mygalomorph species in the largely cleared central Wheatbelt (Main, 1996).

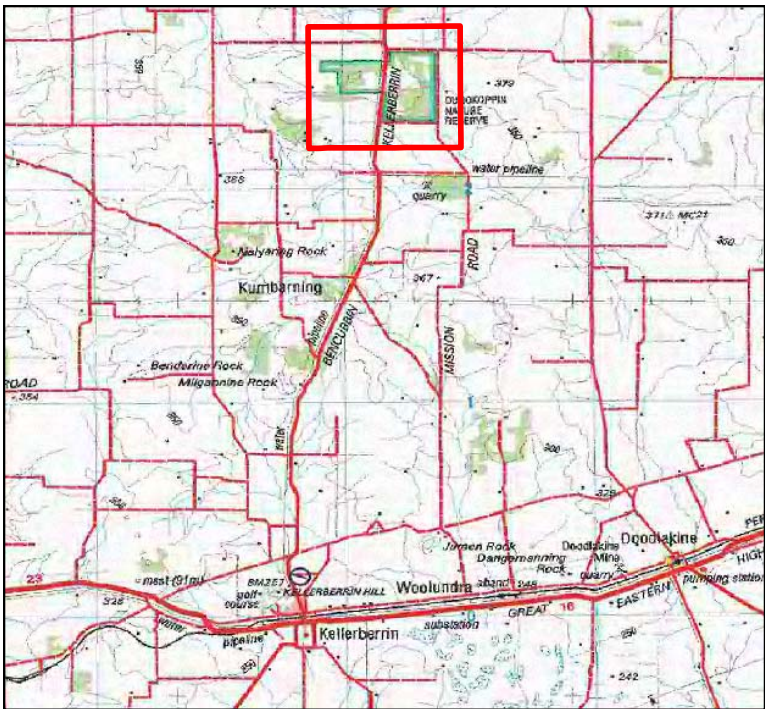

Figure 1. Map showing location of Durrokoppin Nature Reserve relative to Kellerberrin

2.2 Northwest Corner Mygalomorphs

The study by Main found that the ancient landform characteristics present at NW Corner continue to support relict taxa of mygalomorph spiders, while also maintaining populations of more 'modern' mygalomorph species. This has resulted in a high species richness of mygalomorphs in this area including both "wet" (relict) and "dry" (modern) adapted forms (Main, 1996).

NW Corner was found to support 6 families, 12 genera and 25 species of mygalomorph spiders (see Appendix 1 for a full species list). The ability of this area to support so many different taxa is partly due to the specialised adaptations of mygalomorph spiders. Different species occur in different soil types and microhabitats which can cover an area as small as a few square metres. This means that many different microhabitats can occur in a relatively small area, and different spider species can survive in adjacent areas without creating competition for one another (Main, 1996).

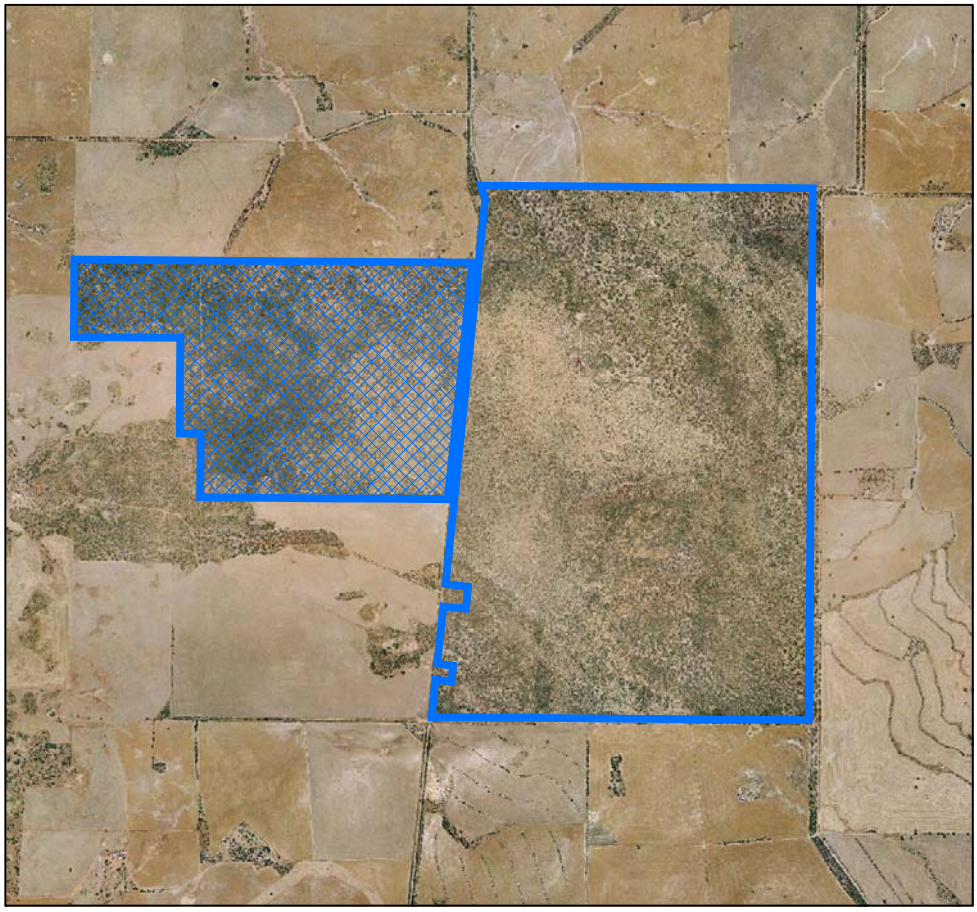

Figure 2. Aerial photograph showing Durrokoppin Nature Reserve (blue outline) and the NW corner (blue cross hatching)

3. HABITAT CRITICAL TO SURVIVAL AND IMPORTANT POPULATIONS

Habitat means the biophysical medium or media: (a) occupied (continuously, periodically or occasionally) by an organism or group of organisms; or (b) 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*).

Habitat critical to survival and important populations of mygalomorph spiders comprises:

- Areas currently occupied by the spiders;
- Areas not currently occupied by the spiders but adjacent to areas that are currently occupied by the spiders; and
- Areas of suitable vegetation within the recorded range in which undiscovered spider populations may exist.

The habitat in the north west corner consists of shrubland, with dominant taxa including *Allocasuarina acutivalvis*, *A. campestris*, *Hakea*, *Acacia* (particularly *A. stereophylla* and *A. neurophylla*), *Beaufortia*, *Grevillea paradoxa* and *Melaleuca uncinata sens lat*. The site supported long-unburnt, ungrazed shrubland sitting relatively high in the landscape, representing a relictual fragment of the ancient plateau surface with soils preserved *in situ* (Main, 1996).

4. GUIDE FOR DECISION MAKERS

The availability of accurate data for known mygalomorph populations at Durokoppin NR is essential to decision-making.

Section five provides details of current and potential threats to mygalomorph populations at Durokoppin NR. Any ground disturbance works (clearing, firebreaks, on the nature reserve will require approval under a DEC necessary operation approval process which will include an assessment of potential impact on threatened species.

A pre-disturbance survey to determine the presence / absence of mygalomorph populations at Durokoppin NR in habitat that may reasonably be expected to contain those spiders is encouraged

Working closely with neighbouring landowners will improve the capacity to identify and address any land use related threats.

The DEC provides advice on the location and protection of threatened species and communities to telecommunication, water and power providers to ensure that these areas are managed as Environmentally Sensitive Areas (ESA). DEC will ensure this advice includes information on the relatively immobile nature of these fauna species.

The DEC is responsible for assessing notifications of intent to clear under the clearing of native vegetation provisions of the Environmental Protection Act 1986. This process considers the potential impact of the proposed work on threatened fauna species.

DEC also provides advice to the Commissioner for Soil and Land Conservation in respect to notifications of intent to drain and the potential impact that these proposals may have on threatened species and other conservation values.

The sedentary nature of these species increases their vulnerability to disturbance. Therefore a Regulation 15 license to take fauna for educational or public purposes is required if disturbance will occur in or immediately adjacent to these populations. Applications for this license are made through the Department of Environment and Conservation. Failure to obtain a license may result in a breach of the Wildlife Conservation Act 1950.

5. THREATS

Mygalomorph Spiders possess certain characteristics that make them more susceptible to threats than other wheatbelt fauna. These include poor dispersal capabilities, confinement to disjunct habitats and low fecundity. These characteristics require a similar management approach to the conservation actions undertaken for Declared Rare Flora.

The limited knowledge of the ecology of these species and the nature of mygalomorph populations at Durokoppin restricts the capacity to conserve these species. The implementation of the conservation actions described in section 12 of this plan will address this knowledge gap and the threats to the survival of this species.

The main threatening processes (not necessarily in order of priority) are:

1. Lack of ecological resources to support viable populations,
2. Impacts of introduced plants and animals,
3. Inappropriate fire regimes,
4. Salinity/altered hydrology,
5. Impacts of competing land use (mining).

These threats singularly and collectively contribute towards reduced ecological viability of populations and their habitats.

5.1 Lack of ecological resources to support viable populations

Lack of ecological resources to support viable populations relates to the:

- Availability of basic resources for survival & reproduction, where availability of food, shelter and access to mates limits population size. The survival of populations can be directly threatened when restricted gene flow and insufficient habitat are below the levels necessary to maintain a viable population.
- Restricted gene flow and insufficient habitat can increase a population's susceptibility to other threats. Example a small remnant may be totally consumed by fire providing no available habitat for the species to persist in before the affected habitat returns to suitable pre-fire condition.

Land clearing associated with agriculture, mining and infrastructure has resulted in habitat loss and fragmentation of habitat which in turn results in the lack of ecological resources available to support viable populations.

Habitat fragmentation reduces the capacity of the species to increase population size, restricts gene flow through preventing the movement of individuals and makes the population more susceptible to other disturbance events. It is likely that the highly fragmented landscape of the Western Australian wheatbelt, may account for the limited occurrence of this species.

5.2 Impacts of introduced plants and animals

Introduced animal species have the capacity to cause local extinctions of mygalomorph populations. Grazing by livestock results in compaction of the soil and a reduction in leaf litter, which affects the ability of the spiders to burrow and forage. Livestock can also cause direct damage to burrows and their entrances (Main, 2001).

Grazing by rabbits causes a reduction in the ground cover that is necessary for the survival of this spider species. Rabbits may also disturb the soil profile in some spider habitats, and their diggings can directly destroy trapdoor spider burrows (Burbidge *et al.*, 1999).

Invasion by introduced plant species cause a change in the structure of vegetation communities, which in turn may affect the survival of mygalomorph populations.

5.3 Inappropriate fire regimes

Fire represents a direct threat to mygalomorph populations as intense wildfires have the capacity to result in direct mortality to individuals. Fire also represents an indirect threat through the reduction in the ground litter required for reconstructing burrows and to support the litter-dependant invertebrate food source for mygalomorph populations.

The ecological functions of fire include: removing competition, making light / nutrients available, reduces levels of parasites, triggering seed release / germination and maintains balance and diversity of the various components of flora communities.

While fire regimes provide a number of important ecological functions, inappropriate fire regimes may threaten the survival of mygalomorph populations.

Inappropriate fire regimes relate to:

- Frequency Fires that are too frequent or too infrequent
- Season Fires occurring when a species is particularly vulnerable
- Intensity Fires are too intense resulting in high mortality
- Spatial Fires are too large resulting in no unburnt refuge areas

The last fire at Durokoppin NR was a small prescribed burn that took place on the 15th of March 1989 in the south-western portion of the reserve (Appendix 2).

5.4. Impacts of competing resource use (Gravel extraction & mining)

Mining and gravel extraction represents a threat to known mygalomorph populations either directly (destruction of habitat / burrows) or indirectly (nearby mining causing a change in hydrological cycles).

Areas subjected to mining and gravel extraction are sometimes used as waste disposal sites (official and unofficial). This practice constitutes a further threat through increased fire risk, creation of harbourage for invasive species and chemical contamination via disposal of pesticide and herbicide containers that may contain residues of contracted chemicals.

Two gravel pits were battered and ripped at Durokoppin Nature Reserve in 1987. One was located off Brown Road, the other off Mission Road (See Appendix 2). In 2000, the Mission Road Gravel pit was rehabilitated.

5.5 Salinity/Altered Hydrology

Salinity and changes in hydrology (surface and ground water) are threats to mygalomorph spiders due to the effect they have upon habitats. Both salinity and altered hydrology can cause changes in vegetation structure and soil composition, which can affect the ability of mygalomorph spiders to forage, burrow and breed.

Inundation of the upper soil profile through flooding or rising ground water may result in burrows becoming waterlogged and unusable.

Events such as climate change and changes in the local hydrology of an area (resulting in a drying or excessive wetting of the habitat) must be considered as threats. The impact of surface and ground water management proposals on mygalomorph populations needs to be considered. Similarly it may be necessary to implement surface and or ground water management to conserve known populations threatened by altered hydrology.

6. INTERNATIONAL OBLIGATIONS

No mygalomorph spiders found at Durokoppin NR have been listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

7. AFFECTED PARTIES

The main parties likely to be affected by this species Conservation Plan are:

- Avon Catchment Council (ACC);
- Department of Environment and Conservation (DEC);
- Shire of Kellerberrin;
- Public utility agencies (e.g. Western Power, Westnet rail and Water Corporation) whose activities may potentially impact on spider populations at Durokoppin NR.

8. INDIGENOUS PEOPLE

According to the Department of Indigenous Affairs Aboriginal Heritage site register, no registered sites of Aboriginal significance are recorded at Durokoppin NR. Where actions recommended by the plan have the potential to impact on Noongar cultural values, further consultation will be undertaken to ensure such impact is avoided. Opportunities for Noongar individuals / groups to be involved with implementing actions including cultural interpretation and awareness of the species / community will be considered.

The advice of (one or more of the following):

- The relevant NRM indigenous reference group (s)
- South West (Yamatji – Midwest) Aboriginal Land and Sea Council, and / or
- Department of Indigenous Affairs, and / or
- Native title claimants
- Specific groups/individuals identified as having an interest

….will be sought to assist in the identification of Noongar cultural values for land occupied by threatened species, or groups with a cultural connection to land that is important for the species / communities conservation. Continued liaison with the Noongar community will identify areas in which collaboration will assist implementation of conservation plans. Consultations with indigenous groups will be made through the ACC's Aboriginal NRM Coordinator.

9. BENEFITS

The conservation actions carried out to protect the habitat mygalomorph populations at Durokoppin will contribute to the preservation of the biodiversity of this area and protection against further degradation. This will contribute to the protection of biodiversity in Western Australia.

As predators, occurrence of mygalomorph spiders indicates the presence of a sufficient number of other invertebrates. Because they are at the apex of food pyramids, these spiders are good indicators of the general balance of communities, and can be used to assess the status of other invertebrates in their community (Main, 1987a).

10. SOCIAL AND ECONOMIC IMPACTS

The implementation of this Conservation Plan is not expected to cause adverse economic impacts. Section 4 (Guide for decision makers) describes the process for identifying and assessing work that may impact on threatened fauna species.

No adverse social impacts are expected to result from the implementation of this Conservation Plan. The plan provides potential social benefits in terms of awareness raising and community capacity building programs.

11. CONSERVATION OBJECTIVES AND CRITERIA

11.1 Conservation plan objective:

To maintain, and if possible enhance, the condition of in situ populations of mygalomorph populations at Durokoppin.

11.2 Recovery Criteria:

Criteria for success:

The number of populations at Durokoppin has increased and / or the number of mature individuals has increased by fifteen percent or more over the term of the plan.

Criteria for failure:

The number of populations at Durokoppin has decreased and / or the number of mature individuals in the known population has decreased by fifteen percent or more over the term of the plan.

11.3 Evaluation

The plan will be reviewed within five years of its implementation. The implementation of these conservation actions and any changes to these actions will be documented accordingly.

12. CONSERVATION ACTIONS

The purpose of conservation actions is to provide operational guidelines for the implementation of on-ground actions. A number of conservation actions were commenced in 2006 as part of the ACC's 'Back from the Edge' program. This program has resulted in a number of significant successes including the discovery of 24 new populations of threatened spider species and an increase in the public's awareness of these species.

Determining current population and site-specific information (population size, type and severity of threats) is the first step in conserving these species.

These conservation actions will provide the following on-ground management advantages:

- Allow for site-specific operational guidelines to be compiled for Durokoppin NR. This will provide a framework to ensure that internal DEC operations and the activities of external agencies such as Westrail, and local government, are undertaken in a manner that ensures the spider populations and their habitats are not adversely affected;
- Provide a basis for prioritising the implementation of conservation actions i.e. those populations that are under imminent threat.

  Note: Permission is to be obtained from land managers before conservation actions are undertaken.

The following conservation actions are presented in order of descending priority, but this should not prevent the implementation of 'lower' priority actions where opportunities arise and funding is available. The indicative budget and timeframes included in each conservation action depends on the availability of resources.

12.1 Establish a Mygalomorph Conservation Team

A Mygalomorph Conservation Team will be established with representatives from the Avon Catchment Council community, government agencies and experts with a knowledge or interest in spider taxonomy, ecology and conservation. This team will focus on conservation efforts for threatened Mygalomorph spiders found in the Avon River basin. These species include:

- Tree-stem Trapdoor Spider (*Aganippe castellum*)
- Shield-backed Trapdoor Spider (*Idiosoma nigrum*)
- Minnivale Trapdoor Spider (*Teyl* sp.)
- Yorkrakine Trapdoor Spider (*Kwonkan eboracum*)

Action: Establish a Mygalomorph Conservation Team
Completion date: ongoing
Cost: $2,500 / year

This action has also been recommended in the other Trapdoor spider conservation plans). The budgeted amount listed in this action is a total amount for all four species.

12.2 Determine the population characteristics of known populations & ongoing monitoring

Ground work will be required in order to determine the population characteristics and confirm the continued existence of known mygalomorph populations at Durokoppin. Areas adjacent to the habitat of extant populations will also be surveyed in order to investigate whether these populations have dispersed out of their known area of occupancy.

On-ground monitoring should preferably be undertaken in the months following the first winter rains, when burrows are open and easier to locate. When it is not possible to survey at this time, consideration should be given to minimising the disturbance of burrows associated with on-ground monitoring activities.

The information obtained from the monitoring will be used to create and update threatened mygalomorph distribution maps. Data is stored at the DEC Yilgarn District office in Merredin and the DEC Species and Communities Branch in Perth.

Action:	Determine the size of known mygalomorph populations at Durokoppin NR
Completion date:	ongoing
Cost:	$3,500 / year

12.3 Undertake a threat assessment for each population

A threat / risk assessment for threatened mygalomorph populations (including habitat health assessment) will be conducted at Durokoppin NR during the population monitoring referred to in Section 12.2 of this plan.

The presence and significance of threats will be assessed, recorded and conservation actions recommended for each population. Threats considered will include the following (but not be limited to):

- introduced plants and animals;
- competing land use;
- pollution;
- inappropriate fire regimes; and
- salinity / waterlogging.

Action: Identify/confirm threats to each population
Completion date: ongoing
Cost: Incorporated into sections 12.2 and 12.3

12.4 Address threats to specific populations

Due to the limited information available on the condition of existing populations and the threats to those populations, it is likely that specific conservation actions will be identified to address these threats.

Conservation actions may include fencing to exclude stock and / or rabbits, rabbit control, weed control, revegetation (to provide habitat and connectivity between habitats/populations), fire management and management of competing resource use.

Where it is necessary to protect a population from physical disturbance, areas can be demarcated using Environmental Sensitive Area (ESA) markers similar to those markers used to demarcate Declared Rare Flora (DRF) populations.

The costs described below are nominal and relate to minor work associated with the demarcating populations and controlling grazing / weeds. Addressing threats of salinity & altered hydrological processes may require action of a larger scale with greater costs.

Action: Undertake population specific conservation actions
Completion date: On - going
Cost: $1,000 / year

12.5. Conduct surveys to identify new populations

Areas of potential habitat at Durokoppin NR will be identified through a process to map critical habitat.

The critical habitat mapping can be undertaken by a GIS desktop assessment by using the following GIS datasets:

- Geology and soil types;
- Presence of remnant vegetation;
- Beards vegetation association;
- Associated flora and /or fauna species; and
- Any other habitat specific information that may be relevant.

Those sites identified as having a high probability of supporting threatened mygalomorph populations will be subject to a field survey to determine the presence of these species. Similarly other areas to be surveyed will include: sightings reported from the public or other groups and recommendations from experts.

Action:	**Conduct surveys to identify new populations**
Completion date:	ongoing
Cost:	$2,000

13.0 SUMMARY OF CONSERVATION ACTIONS

Action	2008	2009	2010	2011	2012	Total
12.1 Establish a Mygalomorph Conservation Team	$2,500	$2,500	$2,500	$2,500	$2,500	**$12,500**
12.2 Determine the population characteristics of known populations & ongoing monitoring	$3,500	$3,500	$3,500	$3,500	$3,500	**$17,500**
12.3 Undertake a threat assessment for each population	Included in above costs	Included in above costs	Included in above costs	Included in above costs	Included in above costs	
12.4 Address threats to specific populations	$ 1,000	$ 1,000	$,1000	$ 1,000	$ 1,000	**$5,000**
12.5 Conduct surveys to identify new populations	$ 2,000	$ 2,000	$,2,000	$ 2,000	$ 2,000	**$10,000**
Cost	**$9 000**	**$9 000**	**$9 000**	**$9 000**	**$9 000**	**$45,000**

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Appendix 1: Durokoppin Nature Reserve Mygalomorphs Species List

Family	Tribe	Species
Actinopodidae		1. *Missulena hoggi* Womersley
		2. *Missulena insignis* (Cambridge) sp. group
		3. *Missulena* sp. A
Ctenizidae		4. *Conothele* sp.
Idiopidae	Aganippini	5. *Aganippe* sp. A
		6. *Aganippe* sp. B
		7. *Aganippe* sp. C
		8. *Aganippe* sp. D
		9. *Aganippe* sp. E
		10. *Anidiops villosus* (Rainbow)
		11. *Eucyrtops* sp. A
		12. *Idiosoma nigrum* Main
	Arbanitini	13. *Arbanitis* sp. A
Nemesiidae	Teylini	14. *Teyl luculentus* Main
		15. *Teyl* sp. 1
		16. *Teyl* sp. 2
		17. *Teyl* sp. 3
	Anamini	18. *Aname mainae* (Raven)
		19. *Aname* sp. A
		20. *Yilgarnia* sp. A
		21. *Yilgarnia* sp. B
Dipluridae	Euagrini	22. *Cethegus* sp. A
Barychelidae		23.? sp.

(Table modified from Main, 1996); further analysis of specimens taken from this survey has lead to the identification of a further two species (personal communication, Barbara York Main, June 2007)

Appendix 2: Map of Durokoppin NR