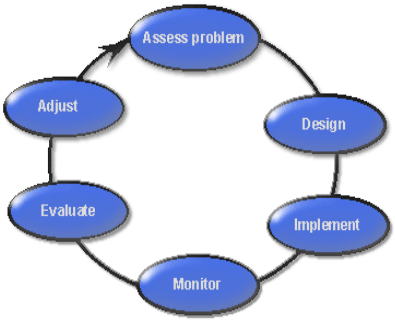
BIODIVERSITY CONSERVATION ADAPTIVE MANAGEMENT PROJECT

DEPARTMENT OF ENVIRONMENT AND CONSERVATION



PROJECT TITLE: ARID ZONE FAUNA RESTORATION: LORNA GLEN-EARAHEEDY RANGELANDS CONSERVATION PARKS

N.D. Burrows Science Division
2007

1. ASSESSMENT OF PROBLEM

[Notes: Background information and context. Project goal:[common purpose for participants; what is the project trying to achieve?].Target condition for the project – what changes do you want to happen or not happen. Develop conceptual model of your system – target condition and the factors on that condition]

1.1 *Background information and biodiversity conservation context*

In the last 200 years, 50% of the world's mammal extinctions have occurred in Australia (Short & Smith 1994). Of the 72 species of mammals (excluding bats) known to originally occupy the Australian arid zone, 11 are now extinct, five have disappeared from the mainland and are found only on off-shore islands and 15 are now severely restricted in their range, many becoming absent from the arid zone and persisting in the more mesic fringes such as south western Australia. Most extinctions and declines have occurred in the medium size group of mammals, the so called 'Critical Weight Range' (35g-5500 gm) (Burbidge & McKenzie 1989). Preventing further extinctions and reversing the rate of decline in semi-arid and arid zone Australia will require proactive and heightened intervention by conservation agencies such as the Department of Environment and Conservation (DEC). Of all the Australian conservation agencies, DEC is now well placed to a) prevent further declines and reconstruct the former mammal diversity of the rangelands (where species are extant) at strategic 'fauna restoration sites' and b) reduce the heavy reliance on several key offshore islands for the conservation of these species. One of these, Barrow Island, is under increasing resource development pressure, which could increase the risk to a suite of threatened mammals on the island – mammals that were once widespread on the mainland.

1.2 *Project location and duration*

The project will focus on the Lorna Glen-Earaheedy Conservation Park complex comprising 565,000 ha within the Gascoyne and Murchison IBRA regions on the edge of the Little Sandy Desert. Lorna Glen and Earaheedy were acquired for the conservation reserve system under the auspices of the Gascoyne-Murchison Strategy. The previous land tenure of the properties was pastoral leases under the Land Administration Act, and since purchase in 2000 they reverted to unallocated Crown land, with the intention of the properties being proclaimed under the Conservation and Land Management Act as a Conservation Park. This complex has the following characteristics that make it highly suited to this project:

- It is a large area and is typical of the arid zone rangelands ecosystems from which Australian medium size native mammals have declined.
- It contains diverse landform systems and associated diversity of habitats representative of much of the Murchison-Gascoyne rangelands.
- The vegetation is mostly in good condition with good diversity of plants, reptiles and small mammals.
- There is a good knowledge base including landform system maps, extensive biological survey, sub-fossil and other evidence of mammals that once occurred in the area, fire history and fire ecology.
- Introduced herbivores have been virtually eradicated.
- Sustained control of introduced predators (feral cats, foxes and wild dogs) by aerial baiting has been demonstrated over the last 3 years.
- A fire management plan has been prepared and is being implemented.
- A network of biodiversity monitoring sites has been established and several years of data have been gathered.
- There is good infrastructure including an airstrip, buildings and on-site care takers.
- There is good access by way of existing roads and tracks.
- Boundary fences have been upgraded.

The project builds on 10 years of research, development and operational trials, including the last 3 years at the Lorna Glen-Earaheedy complex, which has resulted in the successful development of an introduced predator baiting strategy for the arid zone, including a strategy to control feral cats. Since 2004, aerial baiting on Lorna Glen has been funded by the Western Shield program and Science Division. Mammal reintroductions/reconstruction in the arid zone – except for fenced compounds, has not been successfully achieved before in Australia and this project represents a major step forward for the conservation of Australian mammals.

The project will progress in a stepwise manner, with the next step being contingent on the success of the previous steps. If all goes according to plan, the Primary Goal (see below) will be achieved in twelve years (2019).

1.3 *Project's goal or purpose*

Primary Goal: ***Within twelve years, to establish sustainable populations of 5 medium size (Critical Weight Range – CWR) arid zone mammal species:***

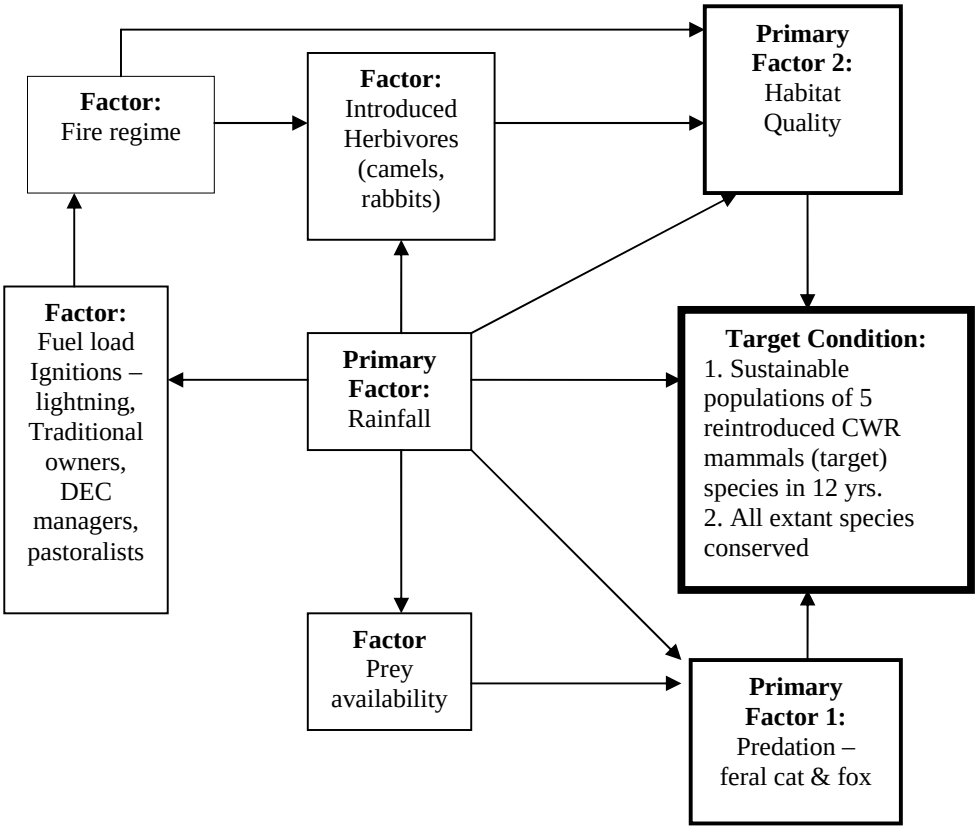
- ***Mala (Lagorchestes hirstus). Conservation status: Extinct in the wild.***
- ***Golden Bandicoot (Isoodon auratus auratus). Conservation status: Vulnerable, last specimen from the Western Desert recorded in 1952- presumed extinct in the arid zone; mainland populations persist in the north Kimberley.***
- ***Bilby (Macrotis lagotis). Conservation status: Vulnerable, locally extinct.***

- ***Boodie (Bettongia lesueur). Conservation status: Vulnerable, extinct on the mainland except for 'behind fence' populations.***
- ***Brushtail Possum (Trichosaurus vulpecula). Conservation status – not threatened but presumed extinct in the arid zone. Populations persist in the south-west.***

Collectively, the above taxa are referred throughout the text as *target species.*

Secondary objective: Conserve extant biodiversity (no permanent species losses or range reductions).

1.4 *Simplified conceptual model of system*



2. PROJECT DESIGN

[Notes for development of project management plan
[Model: ACTIVITY TEST(ASSUMPTION/HYPOTHESIS)–TO MEET OBJECTIVE – TO CHANGE FACTOR – TO CHANGE CONDITION- TO MEET GOAL]
What actions will you take to achieve the goal?
What actions are needed to affect your factors? Or,
What factors do you want to affect and what actions do you take to achieve this?
Which threats are of priority?
Develop specific objective for that factor- objectives are specific statements detailing the desired accomplishments or outcomes of a project in relation to specific factors
Develop the activities that will enable you to accomplish these objectives

Develop action plan that lists actions to change each factor that will contribute to changing the 'target condition'

Outline who/what area will be ultimately accountable for each action

Officer who has Primary Responsibility for this Project:
Dr Neil Burrows, Director Science Division

2.1 Project implementation plan

This adaptive management plan aims to proactively manage Primary Factors 1 & 2, which, together with staged fauna reintroduction and establishment of viable populations of CWR mammals (see separate Translocation Proposals), will result in the project goal being achieved if the working hypotheses described below are correct. Translocation Plans will detail specific measurable objectives, actions and success indicators. Fauna reintroductions will be staged commencing with most predator resilient species. Vulnerable species will be introduced when introduced predators are at very low levels.

An important component of this project is the advancement of knowledge about arid zone ecosystem function, and causes of extinction and decline of arid zone CWR mammals. This will inform refinement of management hypotheses and future conservation management actions.

Table 1: Elements of the project management plan

Primary Factor	Objective	Working hypothesis, risks and uncertainties	Actions & primary Responsibility
1. **IIntroduced Predator Control**	Sustained control of introduced predators (foxes and feral cats) within 3 years: Mean Track Density Index (TDI) fox ≤ 5 Mean TDI feral cat ≤10.	*Hypothesis*: Populations of target species will be lower in the presence of feral cats and foxes due to predation. Sustainable populations of target species will only be established if introduced predators are eradicated or are at very low densities (see TDIs opposite). *Risks & Uncertainties*: Aerial baiting may fail to reduce and maintain feral cats below desired density/activity level due to inappropriate weather environmental conditions prior to, during, or after baiting; high levels of live prey availability; poor bait quality; poor bait dispersal; rapid re-invasion. This presents the greatest risk to the project.	*Actions:* Annual winter aerial baiting of entire property with feral cat bait @ 50 baits km^2. Ground baiting and trapping near release sites if needed. Pre- and post- bait track counts and on-going assessment of predator density is necessary for at least the first 3 months after reintroductions. A 'predator incursion' plan, that details a management response following predation events needs to be developed prior to releases. *Responsibility:* Aerial baiting: Nature Conservation (Western Shield Coordinator). Track density monitoring: D. Algar, Science Division with assistance from Goldfields Region. Predator Incursion response – D. Algar and K. Morris.
2. Habitat quality (resources	*Objective 1:* To improve and maintain habitat	*Working Hypothesis 1:* Total grazing pressure, if excessive, causes habitat	*Actions 1*: Close artificial watering points, maintain introduced herbivore

availability - vegetation, water, soil and nutrients).	quality (vegetation cover, structural and floristic diversity) and protect top soil (no loss through wind and water erosion, no net loss of nutrients off-site - within 12 years. *Objective 2:* To change the current fire regime within 10 years to provide fine scale diversity of habitat (seral stages) and resources for target and extant species and to reduce the scale and frequency of wildfires.	degradation. Domestic stock and feral herbivores damage/degrade the vegetation and the topsoil and compete with native fauna for resources. Reducing or eradicating domestic stock and closing artificial watering points to reduce grazing pressure by native herbivores will improve vegetation/habitat condition and top soil condition. *Risks and Uncertainties 1:* Uncertainty about relationships between grazing pressure and habitat quality, uncertainties about how to measure habitat quality, uncertainties about most appropriate fire regime (hence the need for adaptive management approach). *Working Hypothesis 2:* A patch-burn strategy with strategic low fuel buffers will result in a fine-grain habitat mosaic of varying seral stages. This will improve habitat quality, increase habitat diversity and benefit biodiversity at the landscape scale. It will also reduce the impact of large wildfires on a range of values including biodiversity, cultural and property values. *Risks and Uncertainties2*: Uncertainty about most ecologically appropriate fire regime, risks associated with prescribing fire.	control and eradication, maintain boundary fencing to control straying stock. *Primary Responsibility*: Goldfields Regional Manager *Actions 2*: Implement the Fire Management Plan for Lorna Glen to: a) create strategic low fuel buffers to slow or stop wildfires, and b) create a mosaic of patches of spinifex/vegetation of different time since fire (functional habitats) by regular patch-burning (see management plan). c) liaise with neighbours and Traditional Owners. *Primary Responsibility*: Goldfields Regional Manager

2.1 Monitoring and evaluation plan

[Notes for developing a M&E plan:
How will you monitor the assumptions behind the actions?
Are your actions working?
Secondary monitoring goal - To convince others this is good and effective?

Focus on your key assumptions — the cause-and-effect chains that lead from a certain activity to a factor and ultimately to your target condition

What indicators you might need to confirm that each link along the model's chain is or is not occurring. For each indicator, the completed monitoring plan will also contain what method you will use to collect data on the indicator, and how, where, and by whom these data will be collected.

What are Key monitoring questions, framework and indicators to be measured

Purpose

The purpose of monitoring is to ensure that the management goal and the secondary objective specified at 1.3 above are being met, and if not, what corrections or adjustments need to be made. Data collected from a well designed monitoring program are also valuable for advancing understanding of ecosystem function, and hence management expertise, and for quantitative reporting on biodiversity conservation outcomes resulting from management expenditure.

The key questions that will be addressed by monitoring are:

- Have the introduced predator control actions met the program objectives specified in Table 1 above? If not, why not?
- Have the introduced herbivore control actions met the program objectives specified in Table 1 above? If not, why not?
- Have CWR mammals been successfully established according to the success criteria stipulated in the Translocation Plan? If not, why not?
- Has fire management met the objectives specified in Table 1 above? If not, why not?
- Has the combination of introduced predator and herbivore control, fauna reintroductions and fire management maintained or improved ecosystem condition, where ecosystem condition in this context refers to/means:
    - native species richness and composition,
    - diversity of seral stages and vegetation structures (links with fire management above),
    - soil physical and nutrient status relevant to an accepted baseline.

Method

Monitoring must measure both a) the target resource condition and b) biophysical (casual) factors most likely to significantly affect resource condition, including management activities. Monitoring design will always be a trade-off between sampling effort and available resources. However, there is a threshold level of effort below which monitoring is meaningless. The threshold is difficult to determine where spatial and temporal variability of the target resource and causal factors are not well understood, and it may require some period of monitoring and adjustment to determine this. The use of indicators can simplify monitoring, but this implies a high level understanding of ecosystem processes so the right indicators can be selected and interpreted. Such an understanding is does not yet exist for most ecosystems, including arid zone ecosystems, so a more inclusive and broader approach will be taken.

Consistent with the management goals and objectives defined above, there are 5 key components to monitoring that will require discrete methodologies. These are:

- monitoring the re-introduced mammals

- monitoring introduced predators and introduced herbivores
- monitoring the broader native biota (biodiversity monitoring)
- monitoring abiotic factors (soils and rainfall).

Monitoring re-introduced animals:
At least 50% of each species of reintroduced animals will be intensively monitored via radio tracking (and as specified by the Translocation Plan). This will include an initial intensive eight week period immediately after release, followed by two week monitoring periods of radio-tagged animals every 6-8 weeks for at least the next 2-3 years after each release (or as specified by the TP). Additional monitoring of non-radio-tagged animals through trapping would occur at least every 6 months after this time and be restricted to cooler months between March/April and September/October each year (ongoing).
Data storage and analysis: Known to be alive (KTBA), cause of death, breeding status, age class structure, sex ration, body condition index, home range, habitat utilization, morphometrics.
Responsibility: K. Morris

Monitoring introduced predators (foxes, wild dogs, feral cats):
D. Algar's established transect methodology combined with plot-based counts using attractants along track transects. Revisit appropriate frequency of monitoring after 3 years and aim to handover monitoring to Goldfields Region within 3-5 years. Monitoring to be weekly in the first 2-3 months, then 4-5 times per year - winter, spring, summer, autumn with additional post-bait monitoring. Monitoring alternates between Goldfields Region and Science Division (ongoing - frequency to be revised after 2-3 years).
Data analysis: Relative densities of each species through time and space, approximate size class distribution, impact of baiting operations on density index.

Monitoring introduced herbivores
To be done annually in conjunction with aerial baiting for cost savings. Also include aerial kangaroo counts. Rabbits monitored as part of the introduced predators protocol (above).
Data storage and analysis: Relative densities by species through time and space, impacts of control actions on relative densities.
Responsibility: Goldfields Regional Manager.

Biodiversity monitoring:
Biodiversity monitoring will capitalize on the network of existing sampling grids established by M. Cowan some 5 years ago. In addition, this network will be reviewed to ensure that major and important ecological systems, as mapped by landform systems, are represented and b) that other taxa, primarily vascular plants (primary producers), are included.

Mark Cowan's standard Rangelands Survey methodology (sets of 2 centre fenced pit trap lines, 50m apart, with 6 x 20L buckets, located 10m apart on each line) for terrestrial vertebrates. Vascular plants will be monitored in four 30m x 30m quadrats collocated with fauna monitoring sites. Using Tom Bragg's method, in representative vegetation types recording floristics & structure (height, cover - biomass), as well as line transect across the diagonal to measure % cover and height by life form. This will enable

biomass to be calculated. Broadscale trends in the vegetation cover index will be determined from remote sensing.
Data storage and analysis: Capture rates by species, guilds, spatial temporal. Species richness, cover and composition across all grids. Also biomass for vegetation.
Photopoints: installation of three permanent pins for each photopoint (1 where camera sits, 2 pins to form frame of shot. Shoot in southerly direction, pref. mid-day) at each monitoring grid.
Responsibility: M. Cowan for vertebrate fauna, B. Ward for vegetation.
Monitoring soils & rainfall
Baseline soil samples taken from A horizon at each monitoring site; soil chemistry analysis performed on each as per Mark Cowan's established methodology. Network of 20 soil erosion pins established at each site (see Burrows *et al*). One digital rainfall recorder to be installed at each of the biodiversity monitoring sites. To be checked twice per year as part of extant fauna monitoring and vegetation monitoring excercises (Ongoing).
Responsibility: B. Ward.

3. IMPLEMENTATION

3.1 Project partners

The Rangelands Fauna Restoration adaptive management project team includes staff from DEC's Goldfields Region (Kalgoorlie), Science Division and Nature Conservation Division. The Wiluna traditional owners are involved through a joint management MoU with DEC. In addition, the project has attracted the involvement of students and academics from local and international universities (University of Western Australia, University of Nebraska, Goethe University Frankfurt).

3.2 Data management

Discrete databases are/will be established for each of the key activities (responsible officer nominated):
Fauna reintroductions: Keith Morris
Introduced Predators: Dave Algar
Fire management and introduced herbivores: Goldfields Region
Extant vertebrate fauna monitoring: M. Cowan
Vegetation and Soils Monitoring: B. Ward.

All databases will be integrated and copies kept at Kalgoorlie (Goldfields Region) and Woodvale Science Division.

4. MONITOR

See above

5. ANALYSE DATA AND COMMUNICATE RESULTS

Outline analysis to be used
Document and communicate results
Outline communication plan – techniques to be used to communicate to (a) project participants (b) investors and (c) interested parties ; and who will undertake these

See above.

Document and communicate results. Progress/review reports on this project, including actions and monitoring results, will be prepared at least annually. The Project Leader, Dr Neil Burrows, Will be responsible for preparing the report with input from others. Communication plan: Annual progress report (see above) will be circulated to project participants and other interested parties. Media opportunities will be sought at key points in the project, such as the fauna reintroductions. Goldfields Region are responsible for handling media and neighbour communications. Scientific/technical papers will be prepared as data become available.

6. REVIEW & ADJUSTMENT

Outline process to achieve/undertake review
How often will this take place
How will project be adjusted

Project progress and milestones will be reviewed within 3 months of any fauna reintroductions, then at least annually by a) compiling and assessing the results of the various monitoring protocols outlined above, especially with regard to the reintroduced fauna, and b) assessing the resourcing availability to determine the extent/nature of future activity – which will be resource dependent. The first annual review will occur in June 2008. If the project is still active, a major 5-year review and write-up will be undertaken as a basis for guiding future fauna conservation actions in the rangelands. Decisions on the future actions and directions of the project will be made on the basis of the results from monitoring and availability of resources. If necessary, baiting strategies and fire management will be adjusted.

APPENDIX I Administration of project

Reporting and accountability
Work schedules and milestones
Budget and human resources

Reporting and accountability:
Director Science Division has primary responsibility for this project. Other levels of responsibility and reporting are detailed above, in summary:

Fauna reintroductions: Keith Morris
Introduced Predators: Dave Algar
Fire management and introduced herbivores: Goldfields Region
Extant vertebrate fauna monitoring: M. Cowan
Vegetation and Soils Monitoring: B. Ward.

Summary of key milestones July 2007 - November 2007:

Milestone	By When	Officer/Position Responsible
Pre-bait introduced predator survey	June 2007	D. Algar
Pre-bait assessment of vertebrate monitoring sites	June 2007	M. Cowan
Aerial baiting Lorna Glen	June 2007	J. Asher
Post-bait aerial survey	July 2007	D. Algar
Prepare/finalise Translocation Proposals	July 2007	K. Morris

Prepare/finalise staff roster monitoring - reintroduced fauna	July 2007	K. Morris
Communications (neighbours, traditional owners, other stakeholders, media releases/opportunities)	July 2007	Goldfields Regional Manager
Fauna reintroductions (2 species)	August 2007	K. Morris
Introduced predator monitoring	Ongoing	D. Algar
Reintroduced fauna monitoring	Continuous August – November 2007, then review.	K. Morris
Project review and establishment of tasks and milestones for the next 6-12 months	October 2007	N. Burrows

Budget Estimate Summary – Fauna reintroductions & associated monitoring:

Item	2006/07	2007/08	Existing/New?
Salary & o/heads	$19,000	$80,000	Existing
Wages	$10,000	$30,000	New
Materials/Consumables (radio collars, etc.)	$30,000	$30,000	New
Vehicle running & Travel and Allowances	$25,000	$60,000	New
Aircraft – radio tracking	nil	$30,000	New
Aircraft Contracts/baiting	$50,000	$50,000	Existing
Totals	**$134,000 ($69k existing, $65k new)**	**$280,000 ($130,000 existing, $150,000 new)**	