



# ARID RECOVERY

RESTORING AUSTRALIA'S ARID LANDS



# 2005 ANNUAL REPORT

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Department  
for Environment  
and Heritage



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This document is the 8th in a series of annual reports and outlines the activities of Arid Recovery for the period from January to December 2005.

Arid Recovery is a partnership which commenced in 1997 between BHP Billiton (formerly WMC Resources), the University of Adelaide, SA Department for Environment and Heritage and the Friends of Arid Recovery.

Copies of this report or further information may be obtained by contacting us or visiting our website.

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## BACKGROUND

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Arid Recovery is based at Roxby Downs in the South Australian outback and is dedicated to the restoration of Australia's arid lands.

Established in 1997, the program is centred around a 60km<sup>2</sup> fenced reserve from which all feral cats, rabbits and foxes have been eradicated. An additional 26km<sup>2</sup> has also been recently fenced so that viable populations of native animals can be accommodated.

### A UNIQUE PARTNERSHIP

Arid Recovery is the result of a partnership between industry, community, government and education. The four founding and supporting partners are:

- BHP Billiton, operators of the nearby Olympic Dam mine;
- Friends of Arid Recovery, a community group with over 250 members worldwide;
- The South Australian government through the Department for Environment and Heritage;
- The University of Adelaide.

Over the years, Arid Recovery has developed into Australia's premier arid zone conservation partnership and is a unique demonstration of how mining, tourism, pastoralism and conservation can work together to provide mutually beneficial conservation outcomes.

The development of a world class conservation program adjacent to the huge copper, uranium, gold and silver Olympic Dam mine and processing plant shows that contemporary mining operations can benefit, rather than threaten, regional environmental values.

### ECOLOGICAL RESTORATION

The 86km<sup>2</sup> reserve has provided an area of complete protection allowing the regeneration of native vegetation and the re-introduction of five locally extinct mammals.

The Greater Stick-nest Rat *Leporillus conditor*, Burrowing Bettong *Bettongia lesueur*, Greater Bilby *Macrotis lagotis*, and Western Barred Bandicoot *Perameles bougainville* have all been successfully reintroduced into Arid Recovery. A trial release of the Numbat *Myrmecobius fasciatus* was undertaken in November 2005.

Latest research shows there are now ten times as many non-reintroduced small native mammals inside the reserve compared to outside.

Arid Recovery is unique in many ways. The Reserve is the largest non-coastal area in Australia from which feral cats, rabbits and foxes have been removed, and it is surrounded by a fence which has never been breached by either cats or foxes.

The program is also unique in that it is specifically dedicated to arid zone conservation; few conservation projects target arid areas due to their low population base and inaccessibility even though Australia's arid zone has suffered the country's worst extinction rate.

Arid Recovery depends heavily on volunteer support and is assisted by the local community, conservation organisations, students and indigenous groups.

### MANAGEMENT

Arid Recovery is overseen by a Steering Committee made up of representatives from each founding organisation.

A new Memorandum of Understanding, outlining the contributions from each partner for the next ten years, is currently being developed and will be signed in 2006.

Arid Recovery was planned in stages to allow monitoring of its progress. A review was conducted in 2003 as many of the original actions were completed.

Five year actions developed in 2003 are still in progress and actions for the next five years are currently being developed.

# OUR MISSION

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## MISSION STATEMENT

To facilitate restoration of arid zone ecosystems through on ground works, applied research, and industry, community and government partnerships.

## VISION

Recognition as a world class conservation and research program, with research outcomes and management techniques recognised and adopted on regional, national and international scales.

## OBJECTIVES

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### Conservation and restoration

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To facilitate ecological restoration of arid ecosystems through the;

- Establishment of a cat, fox and rabbit free reserve
- Establishment of a regional buffer zone outside of the reserve where these exotic pest species are controlled
- Re-establishment of endemic species, particularly threatened or locally extinct species, within and beyond the Arid Recovery Reserve

### Research and monitoring

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To research and monitor the processes of ecological restoration and provide transferable information and techniques for broadscale environmental management of Australia's arid lands including;

- Re-introduction and rehabilitation protocols
- Developing and improving large-scale feral animal control techniques
- Increasing Arid Recovery's capacity to undertake and supervise arid zone ecological research

### Demonstration

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To demonstrate how mining, pastoralism, tourism and conservation organisations can work together to achieve mutually beneficial sustainable ecological outcomes, by;

- Increasing the profile of Arid Recovery as a demonstration of the value of these partnerships
- Developing and promoting Arid Recovery as a world class arid zone research centre
- Developing and maintaining formal and informal networks between stakeholders

### Education and training

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Facilitating the understanding and adoption of sustainable land management techniques developed or promoted by Arid Recovery through;

- Increasing awareness of conservation and sustainable management issues and the value of industry-backed partnerships to address these issues
  - Encouraging and developing arid zone restoration ecologists and land managers
  - Identifying and developing tourism and education opportunities
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# THE ARID RECOVERY TEAM

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The Arid Recovery team is made up of steering committee members and staff members. Arid Recovery supports two full time positions consisting of one Manager and an Ecologist.

Part-time positions include a Research Coordinator, Maintenance Officer, Education Coordinator and a Publicity Coordinator/Administrator.

The Education Coordinator is a new position developed in 2005 to coordinate educational projects and facilitate educational tours of the reserve.

## STAFF

### Arid Recovery Manager

- Dr Adam Bester
- Brydie Hill

### Arid Recovery Ecologist

- Jenny Stott

### Research Coordinator

- Katherine Moseby

### Publicity Coordinator/Administrator

- Yvette Mooney

### Education Coordinator

- Rebecca Gotch

### Casual Maintenance Officer

- Marty Kittel

### Casual Field Contractor

- Paul Gillen

### Casual Rabbit Control Contractors

- Adam O'Neil
- Ross Beeby

## 2005 STEERING COMMITTEE

### BHP Billiton

- Dr John Read (Land Management)
- Chris Schultz (Environment)

### Friends of Arid Recovery

- Katherine Moseby
- Bree Galbraith

### University of Adelaide

- Dr David Paton

### Dept for Environment & Heritage

- Peter Copley
- Geoff Axford

## STUDENTS

Students from universities around Australia were involved in research projects and other Arid Recovery activities in 2005.

Five students conducted research related to their current studies, three students took part in Arid Recovery's scholarship programme, and one student took part in BHP Billiton's annual Vacation Student programme.

### University of Adelaide

- Josh Griffiths (PhD)
- Janet Newell (PhD)
- Karleah Trengrove (Honours)
- Emmy Gerlach (Honours)

### University of Sydney

- Karl Newport (Masters)

### Deakin University

- Amber Cameron (Scholarship)

### University of Melbourne

- Mimi d'Auvergne (Scholarship)

### Charles Sturt University

- Karen Rusten (Scholarship)
- Hugh McGregor (Vacation Student)

# THE ARID RECOVERY RESERVE

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The Arid Recovery Reserve currently comprises 86km<sup>2</sup> of arid land. Many habitats are present within the reserve including chenopod (saltbush/bluebush), inter-dunal swales, sandhill wattle and hop bush dunes, native pine and mulga sandplains, canegrass swamps, canegrass dunes and claypans.

The reserve is bordered to the north by Stuart Creek Station, the west by Roxby Downs and Billa Kalina Stations, the east by the Borefield Road and to the south by the Olympic Dam Special Mine Lease. The dog fence which runs through the middle of the reserve, was re-aligned with assistance from the Dog Fence Board in 2000.

Approximately 7km<sup>2</sup> of the 86km<sup>2</sup> project area lies on the Olympic Dam Special Mine Lease. Approximately 1km<sup>2</sup> is situated on Mulgaria Pastoral Station and 5km<sup>2</sup> on Billa Kalina Pastoral station. The remaining 73km<sup>2</sup> is part of the Roxby Downs (49km<sup>2</sup>) and Stuart Creek (24km<sup>2</sup>) Pastoral Stations leased by BHP Billiton.

The reserve lies within the boundaries of three Natural Resource Management districts namely Kingoonya, Marla-Oodnadatta and Marree.

## DEVELOPMENT OF THE RESERVE

In order to facilitate manageable and effective rabbit control, the reserve was incrementally fenced in sections until the whole 86km<sup>2</sup> was finally enclosed in 2005. The area is divided into a 14km<sup>2</sup> electrified Main Enclosure where endangered species are first re-introduced, two 8km<sup>2</sup> expansion areas adjoining the Main Enclosure, a 30km<sup>2</sup> Northern Expansion area and the 26km<sup>2</sup> Red Lake Expansion.

The gate between the First and Northern Expansions was opened in 2004 giving animals in these enclosures access to 38 km<sup>2</sup>.

The 8km<sup>2</sup> Second Expansion has been retained as a control site, from which rabbits, cats, foxes and re-introduced species have been excluded.

With the exception of a few short-term incursions by individual rabbits, the Main Enclosure, First, Second and Northern Expansions have been free of rabbits, cats and foxes since December 2002.

## THE RED LAKE EXPANSION

The Red Lake Expansion in the north of the reserve was initiated in 2003. The Red Lake Expansion has been fenced with a rabbit, cat and fox proof fence and all rabbits, cats and foxes are currently being removed.

The expansion was fenced using a cheaper fence design that still excludes rabbits, cats and foxes. Fence pen trials indicated that a 1.15m high fence with floppy top, similar to the current fence but shorter, was largely effective against cats and foxes.

The expansion is being developed to provide an additional area of land rehabilitated from the effects of cattle, rabbits, cats and foxes as a precautionary measure against potential future impacts of mining activities on the southern boundary of the reserve.

The Red Lake expansion will also reduce population pressure within the reserve and provide unique opportunities for further research into rabbit control methods, predator-prey interactions and dispersal mechanisms from the other 60km<sup>2</sup> section of the reserve, such as via a one-way gate system.

## THE ARID RECOVERY RESERVE

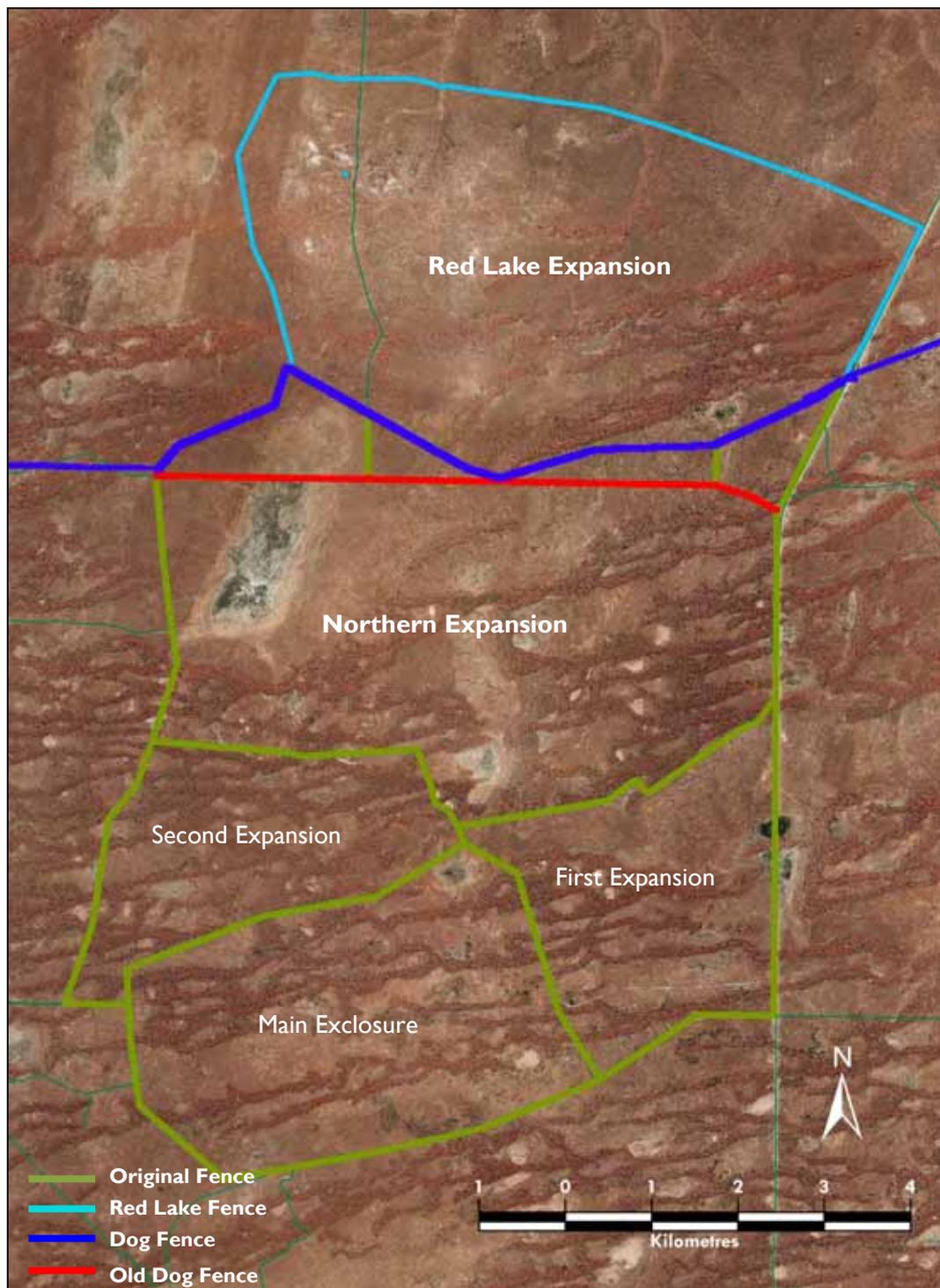


Figure 1. The 86km<sup>2</sup> Arid Recovery Reserve showing the original exclosure and all expansion stages. All land between the old Dog Fence and the mine lease fence is situated on Roxby Downs Station leased by BHP Billiton. The old Dog Fence (red line) has been realigned along the northern boundary of the northern expansion. The light blue line represents the boundary of the 26km<sup>2</sup> Red Lake expansion completed in 2005.

## MAJOR ACHIEVEMENTS IN 2005

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### **NUMBAT REINTRODUCTION.**

The first trial release of numbats was conducted in November 2005.

Three males and two females were captured from Scotia Sanctuary in NSW and released into the Main Enclosure. Animals will be monitored for six months to gather information on their behaviour and to determine the suitability of Arid Recovery as a site for a viable population of numbats.

If the trial is successful a further 20 animals will be released into Arid Recovery in November 2006.

### **WESTERN BARRED BANDICOOT BREEDING AND TRANSFERS**

Six western barred bandicoots were captured and put into an eight hectare pen in the Main Enclosure. These animals were provided with water and food to stimulate breeding.

Breeding was very successful and most females produced three litters in the one season. Following this success, seven bandicoots were transferred to the release pen in the Northern Expansion in late 2005.

Surveys in the Main Enclosure also indicated that the population and distribution of bandicoots has increased since their reintroduction in 2001.



### **SA PREMIER VISIT AND NEW INTERPRETIVE DISPLAYS.**

South Australian Premier Mike Rann, a number of BHP Billiton executives and a contingent of media personnel visited the reserve in November 2005.

The visit also coincided with the unveiling of the new display panels for the viewing platform. The visit included drinks on the viewing platform, an interpretive walk and a dinner under the stars.

### **HOSTING INTERNATIONAL STUDENT VOLUNTEERS**

Two groups of international student volunteers from the United States visited the Arid Recovery Reserve to complete the conservation component of their college course work.

Students were involved in completing the installation of foot-mesh on the inside of the fence, building a boardwalk, a shelter for the electric fence batteries and a fire-pit, spotlighting, radio-tracking reptiles and conducting searches for stick-nest rat nests.

Their involvement in these activities gave the students an understanding of the impact of introduced species on native wildlife in Australia and the importance of controlling these threatening processes.

**PHOTOS: LEFT:** ONE OF ARID RECOVERY'S REINTRODUCED NUMBATS – PHOTOGRAPHER: KAREN RUSTEN  
**RIGHT:** SA PREMIER MIKE RANN WITH ADAM BESTER AT THE RESERVE – PHOTOGRAPHER: YVETTE MOONEY

## MAJOR ACHIEVEMENTS IN 2005

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### PREDATOR AWARENESS TRAINING OF BILBIES

We examined whether wild bilbies within a predator proof reserve could be trained to respond to predators by associating their capture with visual stimuli (cat carcass) and an olfactory cue (feline scent).

Trained bilbies were significantly more likely to move burrows after their burrow was sprayed with feline scent, whereas untrained bilbies predominantly remained at the test burrow. Trained bilbies also used significantly more burrows and changed burrows more often compared to untrained animals.

This highlights that bilbies can be trained to recognize the smell of cats and associate it with a prior unpleasant experience. Thus, given these results, the next stage in the project will be to test if trained bilbies have a greater chance of survival outside the reserve.

### RESEARCH PUBLICATIONS

Students and staff conducting research at Arid Recovery had a very successful year.

The most notable publications this year included 'The efficacy of feral cat, fox and rabbit exclusion fence designs for threatened species protection' in the international journal - Biological Conservation and 'Improving control methods of European rabbits (*Oryctolagus cuniculus*) in arid South Australia' in the international journal Wildlife Research.

Karleah Trengrove from Adelaide University completed her research on the spinifex hopping mouse and received First Class honours.



### ARID RECOVERY OPEN DAY

On the 10th September 2005, the Friends of Arid Recovery hosted its third open day. This was the most successful open day to date with over 200 people attending.

Activities included nature walks, children's scavenger hunt, radio-tracking, damper cooking and a colouring-in competition for the children.

# FERAL ANIMAL CONTROL & MONITORING

## RABBITS

Rabbits were completely eradicated from the southern-most 60 km<sup>2</sup> of the reserve in late 2001.

During 2005 two rabbits gained entry to the Northern Expansion, one in February 2005 and one in June 2005. One rabbit also gained entry to the First Expansion in April 2005. They presumably entered through holes dug under the fence from the inside by bilbies.

Two rabbits were captured within two days of discovery. Despite ongoing trapping efforts, one rabbit was not captured until five months after its discovery.

In 2005, foot netting was attached to the inside of all the external reserve fenceline in the First and Northern Expansions. The foot mesh has been successful at stopping digging under the fence and no rabbits have breached since the completion of this foot mesh.

Spotlight transects indicate that rabbit densities outside the reserve increase periodically and in 2005 they approached lower densities recorded pre-Rabbit Calicivirus Disease (RCD) (BHP Billiton - Base Metals Olympic Dam data 2005; Figure 2 and Figure 3). However, during the winter months rabbit densities declined due to extended dry conditions and an outbreak of RCD.

Rabbit densities began to increase again in the second half of 2005 in response to good late winter and spring rain. Over the last couple of years the trend indicates that rabbit numbers are indeed increasing, possibly as RCD is becoming less effective.

In October 2005 rabbit numbers had increased to 92 per km<sup>2</sup>. Spotlight counts underestimate true rabbit density and should be used as an indication of temporal trends only.

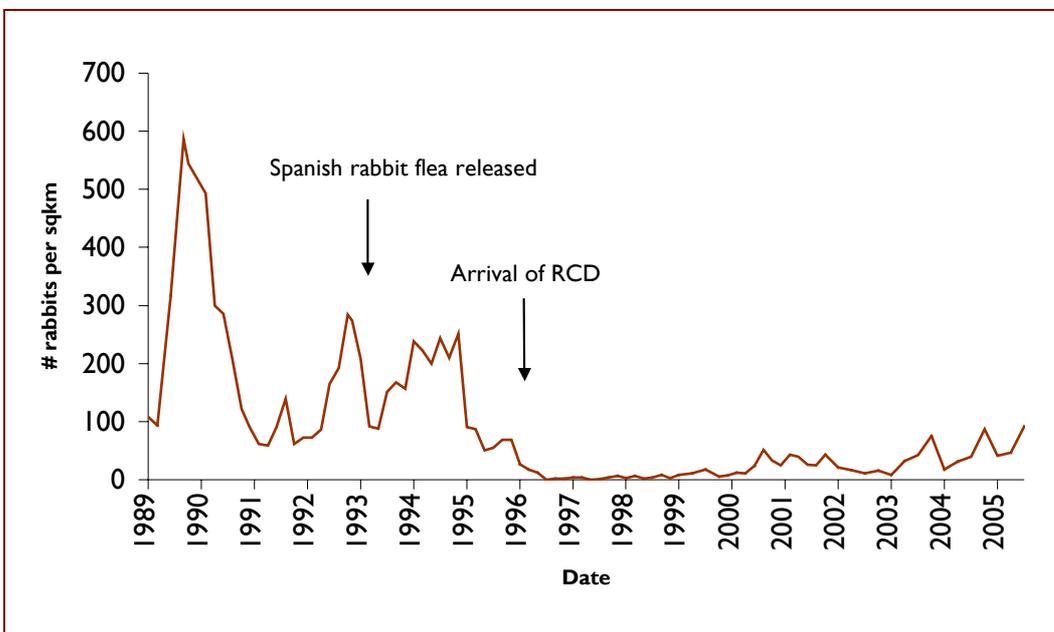


Figure 2. Rabbit density (no. per km<sup>2</sup>) at Roxby Downs showing decline after the arrival of RCD in 1996. Data courtesy of BHP Billiton - Base Metals Olympic Dam, long term monitoring data from quarterly counts.

## FERAL ANIMAL CONTROL & MONITORING

Rabbit control in the Red Lake Expansion began in 2003 and was conducted intensively from December 2003 through to the end of 2005.

In 2005, 783 rabbits were removed within the Red Lake Expansion. This brings the total number of rabbits removed from Red Lake to 1793, not including many hundreds poisoned or fumigated but not retrieved.

RCD is thought to have reduced rabbit numbers in the Red Lake Expansion during winter 2004 just before breeding was recorded. However, rabbits then bred continuously from July 2004 until February 2005, in response to good environmental conditions and this hampered eradication efforts.

Delays in the erection of rabbit proof fencing also affected the eradication of rabbits from the expansion. Rabbit control work is continuing and it is hoped that the area will be rabbit-free by mid 2006.



Data collected during rabbit control work in the Red Lake Expansion is being compiled for two scientific publications, one on the effect of RCD on rabbit populations and demography, the other on the most efficient methods of removing rabbits and their effects on non-target species.

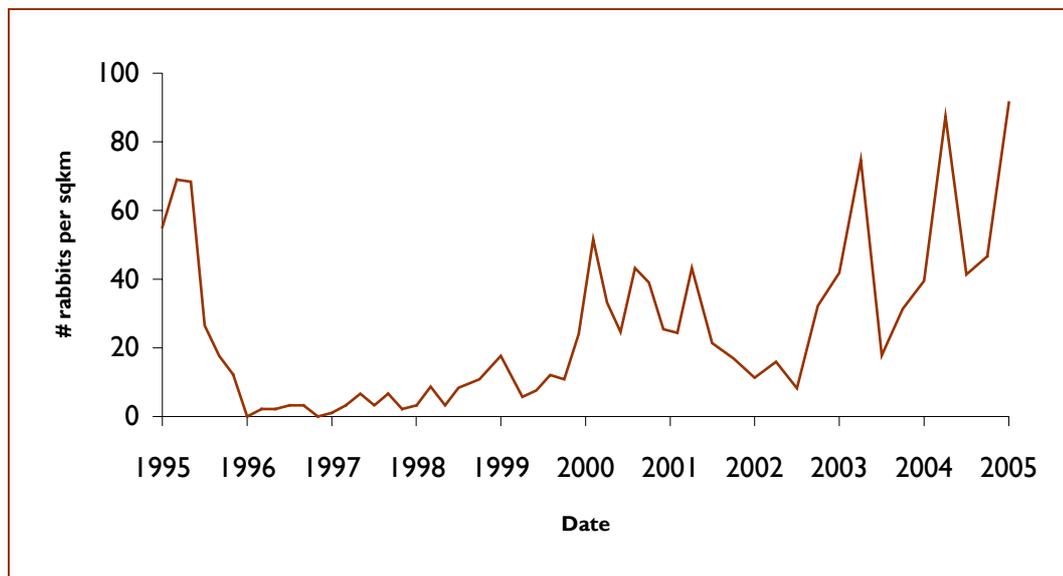


Figure 3. Rabbit density (no. per km<sup>2</sup>) spotlight counts conducted by BHP Billiton staff since the arrival of RCD in 1996. Shown at a lower scale than Figure 2 to illustrate post RCD changes in rabbit density. Data courtesy of BHP Billiton - Base Metals Olympic Dam, long term monitoring data from quarterly counts.

# FERAL ANIMAL CONTROL AND MONITORING

## CATS AND FOXES

Cats (*Felis catis*) and foxes (*Vulpes vulpes*) were completely eradicated from the Main Enclosure in 1998 and the First, Second and Northern Expansions in early 2001. No cats or foxes have since gained access to the reserve.

Twelve permanent traps, with audio lures and soft leg-hold traps are set immediately outside the fence perimeter. These traps are checked daily using remote telemetry tracking.

During 2005, 49 foxes and 79 cats were captured using this method compared to 56 foxes and 23 cats in 2004 (Table 1; trap nights 3982, overall trap success 3.2%).

A further 20 cats and one fox were shot in the vicinity of the reserve in 2005 increasing the total number of cats and foxes trapped or shot from around the reserve to 149 in 2005 compared to 98 in 2004.

The number of cats trapped increased in March and April in 2004 then declined significantly through the winter and spring months (Figure 4).

The cat capture rate in March 2005 represents the highest capture rates around Arid Recovery since January 2001 (see Figure 5).

Table 1. Number of cats and foxes caught in traps set around the Arid Recovery Reserve in each year and trap success rate for each species.

	2001 (3012 trap nights)		2002 (3012 trap nights)		2003 (4629 trap nights)		2004 (4208 trap nights)		2005 (3982 trap nights)	
	#	% trap success								
Cat	19	0.6	16	0.5	32	0.7	23	0.5	79	2.0
Fox	25	0.8	22	1.3	10	0.2	56	1.3	49	1.2

# FERAL ANIMAL CONTROL AND MONITORING

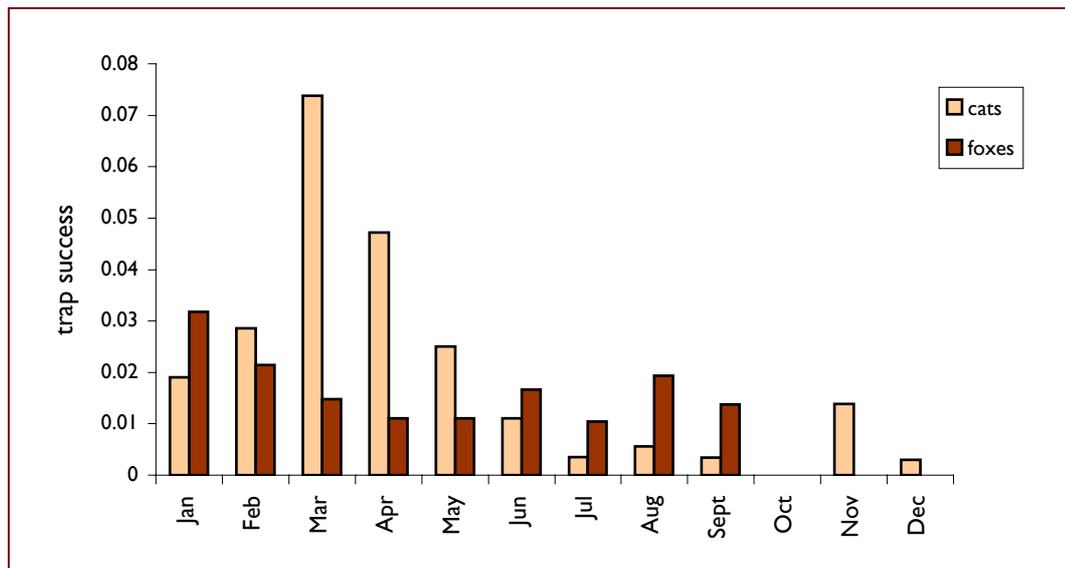


Figure 4. Trap success for each month of 2004 in cat and fox traps around the Arid Recovery Reserve. There were 12 traps set permanently around the reserve.

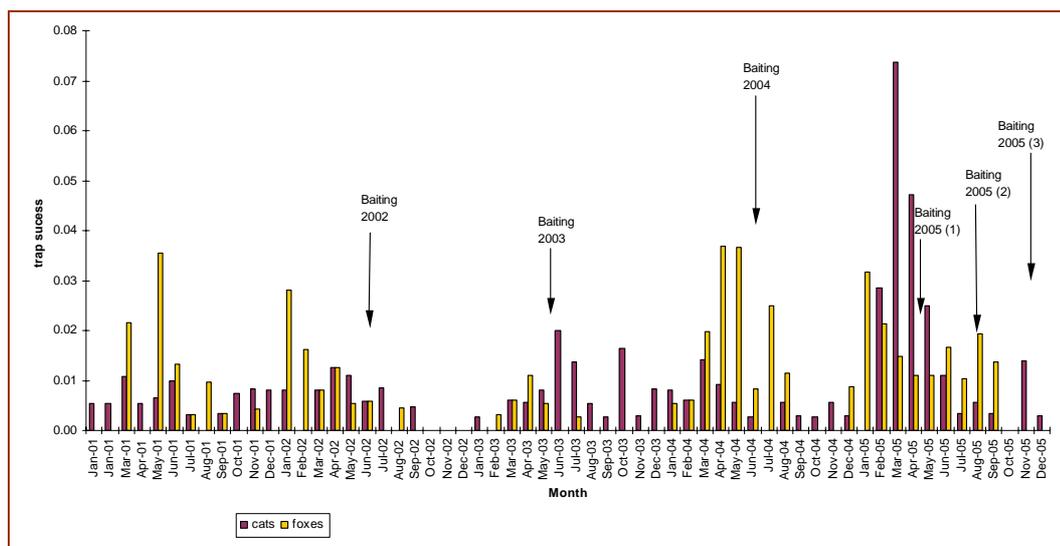


Figure 5. Trap success for each month between 2001 - 2005 in cat and fox traps around the Arid Recovery Reserve. There were 12 traps set permanently around the outside perimeter of the reserve.

# FERAL ANIMAL CONTROL AND MONITORING

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## AERIAL BAITING TRIALS

Aerial baiting for foxes and cats was conducted in 2005 in conjunction with the SA Department for Environment and Heritage (DEH). This has formed part of a series of 1080 baiting trials working towards the development of a cost-effective large-scale system for control of cats and foxes.

The 2002, 2003, 2004 and 2005 trials were conducted under an experimental license (#PER5356) held by the Western Australia Department of Conservation and Land Management (CALM), using specially designed cat baits. Permits for the use of 1080 have also been approved by the Animal and Plant Control Commission (Permit numbers: PER6445 & PER8369).

The 2002 study used special CALM sausage cat baits aerially spread over an area of 600km<sup>2</sup>, within a 10km radius around the reserve.

Changes in fox and cat activity before and after baiting were monitored within the baited zone and in control areas through track counts, conducted monthly for six months before and after baiting.

The baiting was successful for foxes and cats with minimal activity detected within the baited zone for three months after the baiting. However, cat and fox activity gradually increased and was comparable to control levels after three months. Increase in activity was potentially due to the reinvasion of cats and foxes from non-baited areas into the baited zone.

In order to slow down the rate of reinvasion, the radius of the baited area was doubled in 2003, increasing the area to 1800km<sup>2</sup> but at the same baiting rate of 25 baits/km<sup>2</sup>. Unfortunately, track transects indicated no change in cat activity inside the baited zone despite most monitored radio-collared cats dying from 1080 poison. However, fox activity declined after baiting.



In May 2004 dried kangaroo meat baits were aerially distributed over 1800km<sup>2</sup> (within a 20km radius of the reserve, the same area as 2003) at a reduced density of 5 baits per km<sup>2</sup>. Predator sign on track transects showed a similar response to that of 2003 with no significant change in cat activity in the baited areas after baiting and a decline in fox activity after baiting.

In 2005, Arid Recovery trialled a quarterly aerial baiting program using cat sausage baits to primarily control cats but hopefully reduce fox numbers at the same time. The rationale was that more frequent baiting might mean at least some baiting events would coincide with periods of low food availability and result in a large reduction in cat numbers.

Cat baits were aerially distributed over 1800km<sup>2</sup> (within a 20km radius of the reserve) in May, August and November, at a density of 10 baits per km<sup>2</sup>. On all three occasions fox activity again declined in the baited area relative to control areas but cat activity declined on both control and baited transects. Further research is required to investigate these findings.

**PHOTO:** ARID RECOVERY MANAGER ADAM BESTER PREPARING BAITS FOR AERIAL BAITING. PHOTOGRAPHER: JENNY STOTT

# FERAL ANIMAL CONTROL AND MONITORING

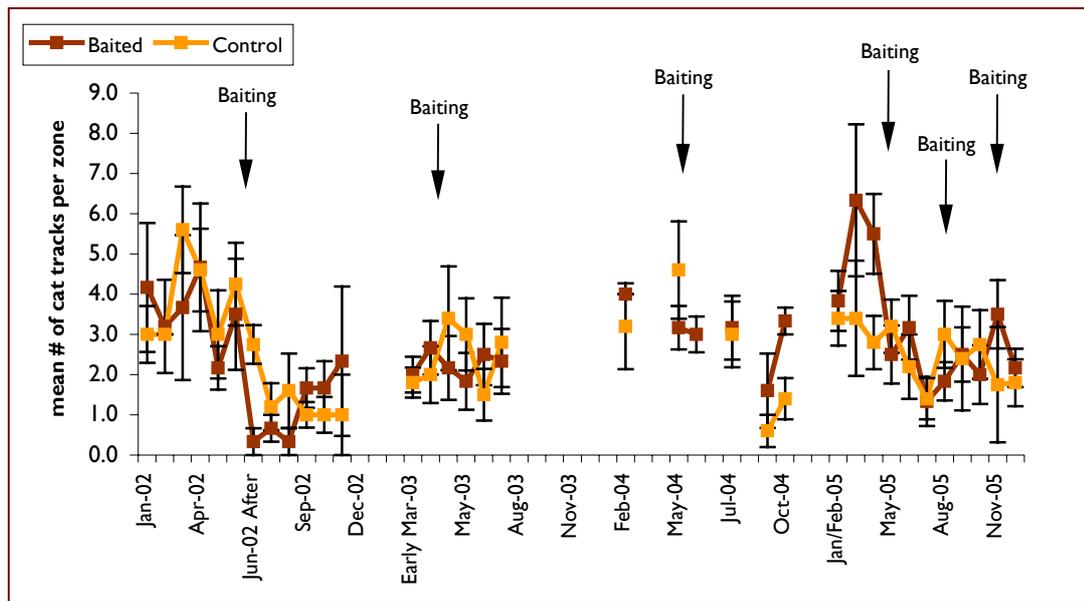


Figure 6. The average number of cat tracks for 5 control and 5 baited transects. Bars denote one standard error.

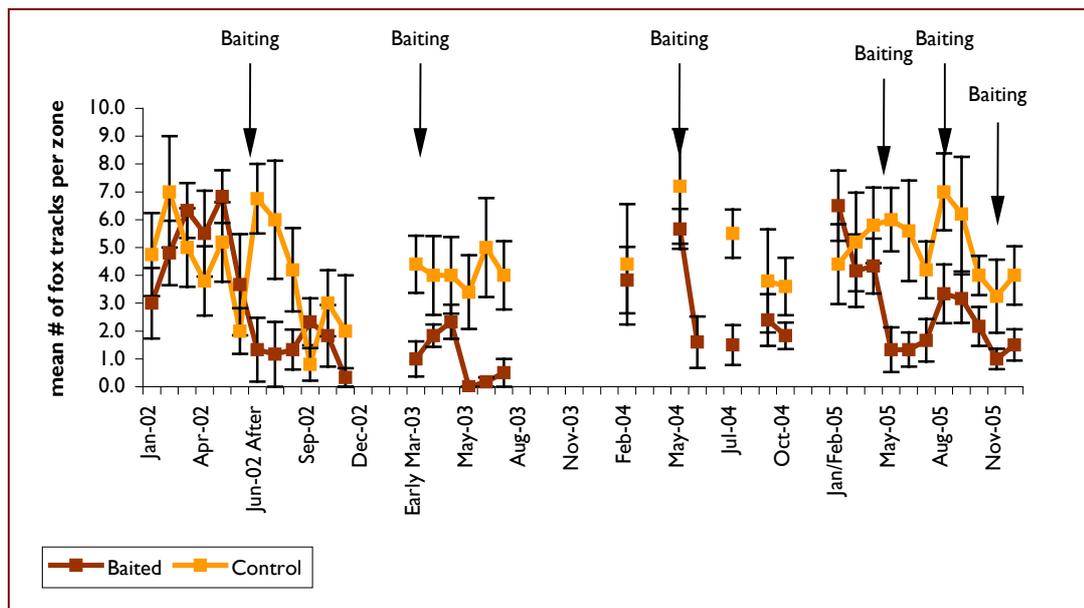


Figure 7. The average number of fox tracks for 5 control and 5 baited transects. Bars denote one standard error.

# NATIVE FAUNA RE-ESTABLISHMENT AND MONITORING

## SUMMARY

At least 27 species of native mammal once inhabited the Roxby Downs region but over 60% have become locally or completely extinct since European settlement. Some bird species have also declined and many plant species are now rare in the vicinity of the reserve.

Arid Recovery aims to restore as much of the original fauna and flora as possible to the reserve, through natural re-establishment and planned re-introductions.

Re-introductions are research-based to obtain information on how the animals survive in the arid zone, the best methods for re-introduction and whether long term re-establishment is possible.

Some species such as the Spinifex Hopping-mouse *Notomys alexis* and Plains Rat *Pseudomys australis* have re-established naturally in the reserve.

A sub-fossil deposit found 30km from Roxby Downs and historic observations were used to determine which animal species formerly occurred in the region (see list).

Globally extinct species are in italics, species that have already been re-introduced are in bold and species that could potentially be re-introduced are underlined.



*Pig-footed Bandicoot*

*Lesser Stick-nest Rat*

*Short-tailed Hopping Mouse*

*Long-tailed Hopping Mouse*

*Gould's Mouse*

**Greater Stick-nest Rat**

**Burrowing Bettong**

**Greater Bilby**

**Western Barred Bandicoot**

**Numbat**

Golden Bandicoot

Kultarr

Ampurta

Common Brush-tailed Possum

Long-haired Rat

Bush thick-knee

Plains Wanderer

Woma Python

# NATIVE FAUNA RE-ESTABLISHMENT AND MONITORING

## REINTRODUCTIONS

Five threatened mammal species have been re-introduced into the reserve to date. Re-introductions began in 1998 with the Greater Stick-nest Rat followed by the Burrowing Bettong in 1999, Greater Bilby in 2000 and the Western Barred Bandicoot in 2001.

The first trial release of Numbats was undertaken in November 2005. Five numbats were transferred from Scotia Sanctuary – a property in New South Wales owned by the Australian Wildlife Conservancy – and were released into the Main Enclosure of Arid Recovery.

All re-introductions were initially into the Main Enclosure, with further releases being conducted into the Northern and First Expansions. A summary of releases,

movements and population estimates is presented in Table 2.

Plans are in place to conduct a trial release of Woma Pythons (*Aspidites ramsayi*) in 2006.

A Kultarr (*Antechinomys laniger*) was also discovered near the Arid Recovery reserve (data collected by BHP Billiton) in December 2005 and thus may still occur in low densities in the region.

Monitoring methods for re-introduced species included track and spotlighting transects, cage trapping, radio-tracking of animals transferred between enclosures, remote scanning plates for reading transponder PIT tag implants, net/hand capture and opportunistic trapping.

Table 2. Population estimates as of December 2005 (based on track counts and section size) and transfers to date within the reserve.

Species	Main Enclosure (14km <sup>2</sup> )	Second Expansion (8 km <sup>2</sup> )	First & Northern Expansions (38 km <sup>2</sup> )
Burrowing Bettong	150-200 (30 released)		165-220 (8 trans. 2001, 27 trans. 2002 2 trans 2003)
Greater Bilby	75-100 (9 released)	10-20 (escaped 2003-2005)	440-580 (5 released & 16 trans. 2002; 8 released 6 trans. 2003; 15 released 2004; 10 released 2005)
Greater Stick-nest Rat	150 (100 released)		90 (15 trans. 2001; 12 released 7 trans. 2003)
Western Barred Bandicoot	30-40 (10 released)		7 (7 trans. 2005)
Numbat	5 (5 released 2005)		

# NATIVE FAUNA RE-ESTABLISHMENT AND MONITORING

## TRACK TRANSECTS

In 2005, track transects were conducted quarterly, or when conditions permitted (for walking transects a windy night followed by a still night is required).

Figure 8, Figure 9 and Figure 10 show the results for track transects since 2000 for the Main Enclosure, 2002 for the First Expansion and 2003 for the Northern Expansion.

Results are discussed separately for each reintroduced species under the Reintroduced Species Description section.

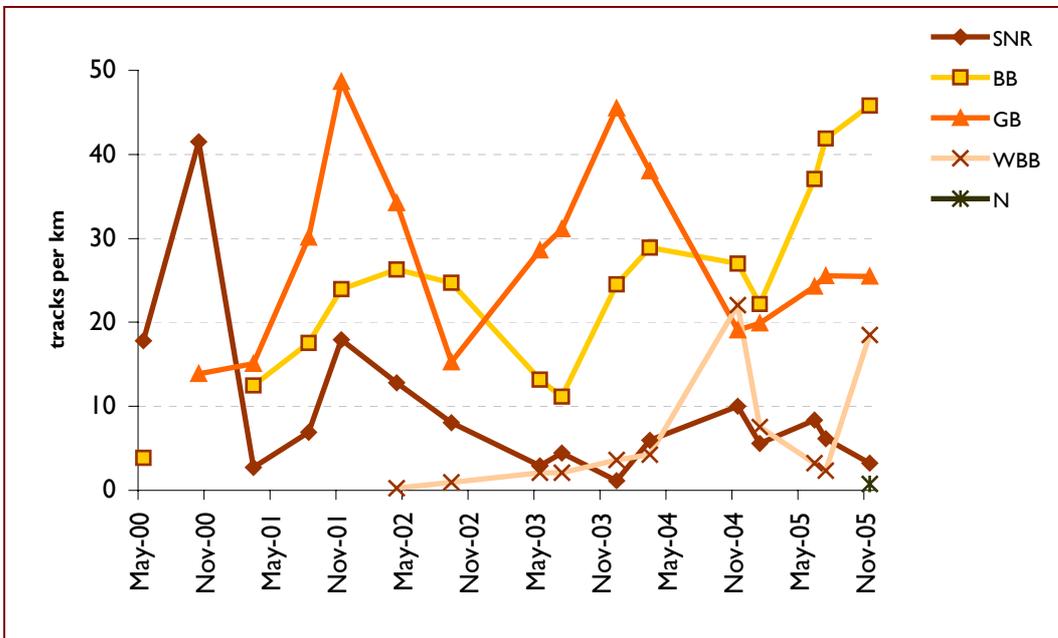


Figure 8. Number of tracks per kilometre of the four re-introduced species (SNR is Greater Stick-nest Rat, BB is Burrowing Bettong and GB is Greater Bilby, WBB is Western Barred Bandicoot and N is Numbat) within the 14km<sup>2</sup> Main Enclosure of the reserve. Total distance of walking transect is approximately 10km.

## NATIVE FAUNA RE-ESTABLISHMENT AND MONITORING

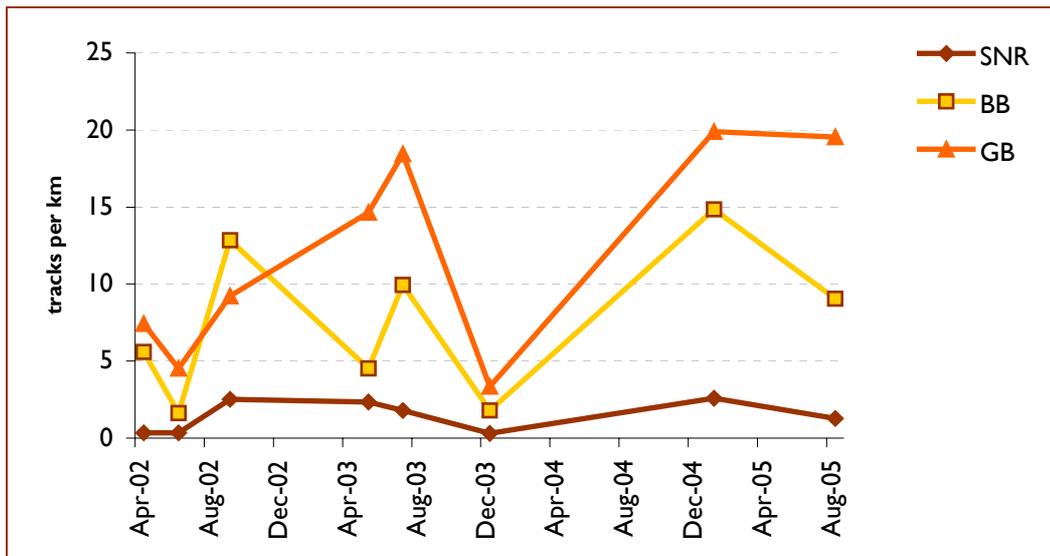


Figure 9. Number of tracks per kilometre of re-introduced species (SNR is Greater Stick-nest Rat, BB is Burrowing Bettong and GB is Greater Bilby) within the 8km<sup>2</sup> First Expansion. Total distance of walking transect is approximately 5.5km. The gate between the First and Northern Expansion was opened in July 2003 to allow animals to naturally disperse into the Northern Expansion.

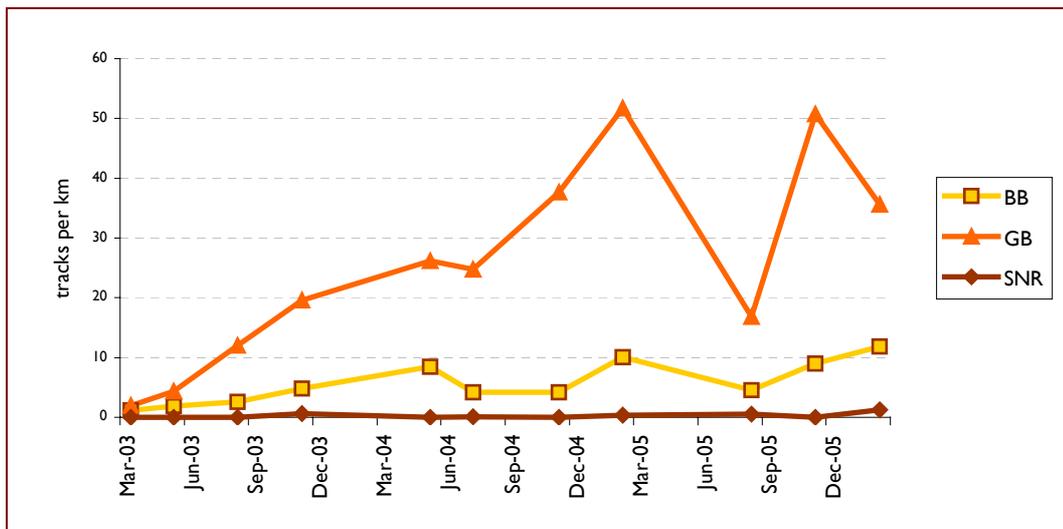


Figure 10. Number of tracks per kilometre of the four re-introduced species (SNR is Greater Stick-nest Rat, BB is Burrowing Bettong and GB is Greater Bilby) within the 30km<sup>2</sup> Northern Expansion. Total distance of transects driven by quad bike is approximately 16km.

# NATIVE FAUNA RE-ESTABLISHMENT AND MONITORING

## ANNUAL CAGE TRAPPING

Permanent trap sites have been established adjacent to roads in the Main Enclosure and are trapped every September for one night each (total number of trap nights is 84: Table 3). Trap success refers to individuals only, re-captures and escapees within a session are excluded.

In 2003, 29 trapping sites were established in the First Expansion (Table 4).

Unfortunately traps needed to be closed in the First Expansion this year due to rain and thus no data were recorded.



Results are discussed separately for each re-introduced species in the Re-introduced Species section.

Table 3. Trap success of reintroduced species in the Main Enclosure during annual cage trapping (n=84).

Species	2001 trap success	2002 trap success	2003 trap success	2004 trap success	2005 trap success
Burrowing Bettong	26.0%	24.0%	42.8%	40.5%	53.6%
Greater Bilby	0%	2.4%	0%	1.2%	3.6%
Greater Stick-nest Rat	2.4%	2.4%	4.8%	0%	1.2%
Western Barred Bandicoot	0%	1.2%	0%	0%	0%
<b>Total trap success</b>	<b>28.6%</b>	<b>30.1%</b>	<b>47.6%</b>	<b>41.7%</b>	<b>58.3%</b>

Table 4. Trap success of re-introduced species in the first expansion during annual cage trapping (n=29).

Species	2003 trap success	2004 trap success
Burrowing Bettong	20.7%	34.5%
Greater Bilby	3.5%	0%
Greater Stick-nest Rat	0%	0%
<b>Total trap success</b>	<b>24.2%</b>	<b>34.5%</b>

# NATIVE FAUNA RE-ESTABLISHMENT AND MONITORING

## SPOTLIGHTING

Spotlighting transects were conducted quarterly throughout 2005 in the Main Exclosure and Northern Expansion.

Results are shown in Figure 11 and Figure 12 and are discussed separately for each species in the Re-introduced Species section.

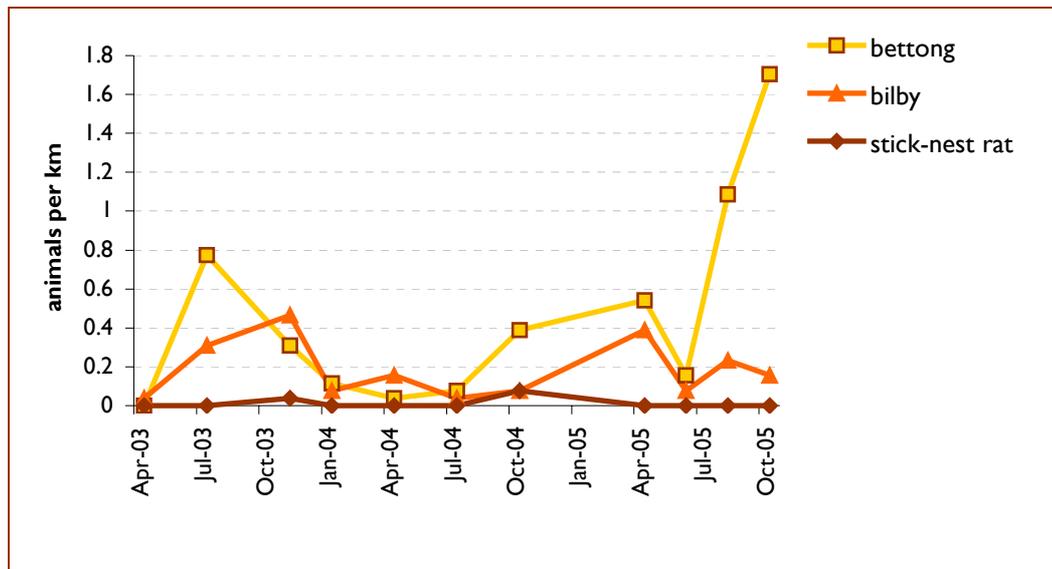


Figure 11. Number of reintroduced species seen per km spotlighting within the 14km<sup>2</sup> Main Exclosure. Total distance of the driven transect is 26km.

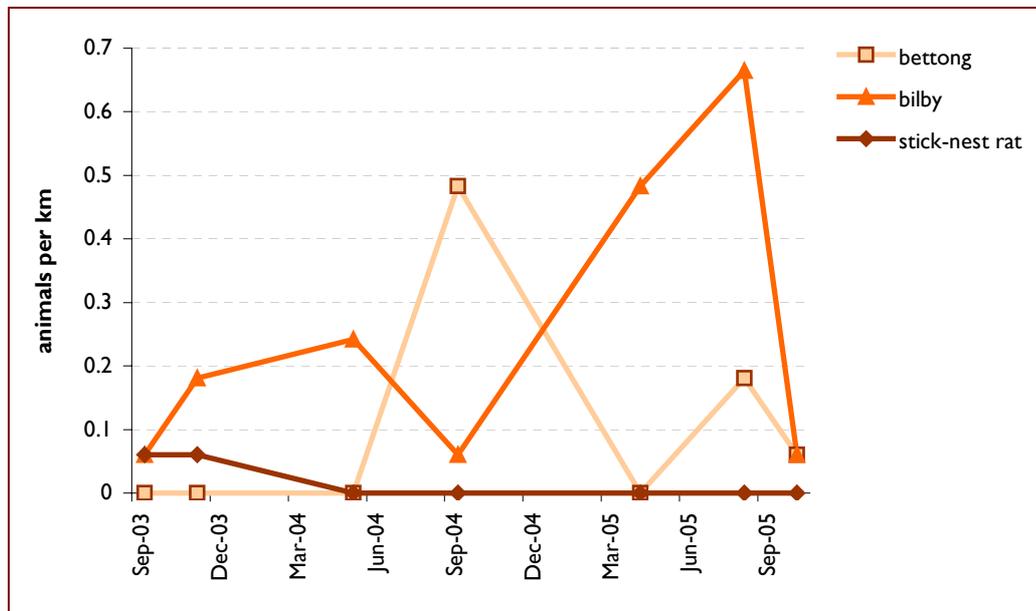


Figure 12. Number of reintroduced species seen per km spotlighting within the 30km<sup>2</sup> Northern Expansion. Total distance of the driven transect is 21km.

## RE-INTRODUCED SPECIES

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### GREATER STICK-NEST RAT

The Greater Stick-nest Rat is a native rodent that was once widespread in arid and semi-arid areas. After European settlement stick-nest rats became extinct on the mainland and survived naturally on only two off-shore islands in SA.

DEH conducted a re-introduction program for stick-nest rats which successfully re-introduced stick-nest rats to three additional off-shore islands. The Arid Recovery Reserve is currently the most successful mainland re-introduction site.

One hundred stick-nest rats were released into the Main Enclosure in April and June 1999 (Table 5). Stick-nest rats are monitored through trapping at nest sites, nest activity, opportunistic trapping and track transects.

Since they were released 119 Roxby-born stick-nest rats have been recorded in the reserve. Only three individual stick-nest rats were captured in April 2005 and one in April 2004 during trapping at 20 permanent nest trapping sites in the Main Enclosure. This number is not believed to be a true indication of the number of stick-nest rats within the Main Enclosure due to trap interference by bettongs.

During the last three years of trapping there has been increasing interference with the traps by bettongs and very few stick-nest rats trapped, despite evidence (tracks, noise and faeces) to support stick-nest rat activity in the majority of the 20 nests monitored (Figure 13).

Since trapping for stick-nest rats in April 2005, trapping has now been excluded from the monitoring program and replaced with scoring for activity at permanently marked nest sites. Nest searches were conducted over the 8 km<sup>2</sup> First Expansion, however only three nests in total were found and scored for activity.



Further searches will be carried out in the Northern Expansion in 2006 to find seven nests for establishing an additional ten permanent monitoring sites.

Track counts indicated a decline in the track activity of stick-nest rats in the Main Enclosure during 2003 followed by a steady increase throughout 2004 (Figure 8). However, track numbers then decreased slightly in 2005.

Track transects in the Northern Expansion area showed very low stick-nest rat activity during 2004 and 2005. This is likely due to the lower number of stick-nest rats that were initially released into this section of the reserve compared with the Main Enclosure.

Stick-nest rats were seen in the Northern Expansion area during spotlighting counts in swale and mulga habitats and a few active nests have also been found on the western side of the expansion area.

## RE-INTRODUCED SPECIES

Table 5. Greater Stick-nest Rat releases and translocations within the Arid Recovery Reserve.

Year	Section	Total	M	F	Origin
1998	Main	10	5	5	Reevesby Is
1999	Main	84	38	46	Reevesby Is
		6	4	2	Monarto
2001	First	19	8	11	Roxby
2003	North	16	10	6	Monarto
		7	2	5	Roxby

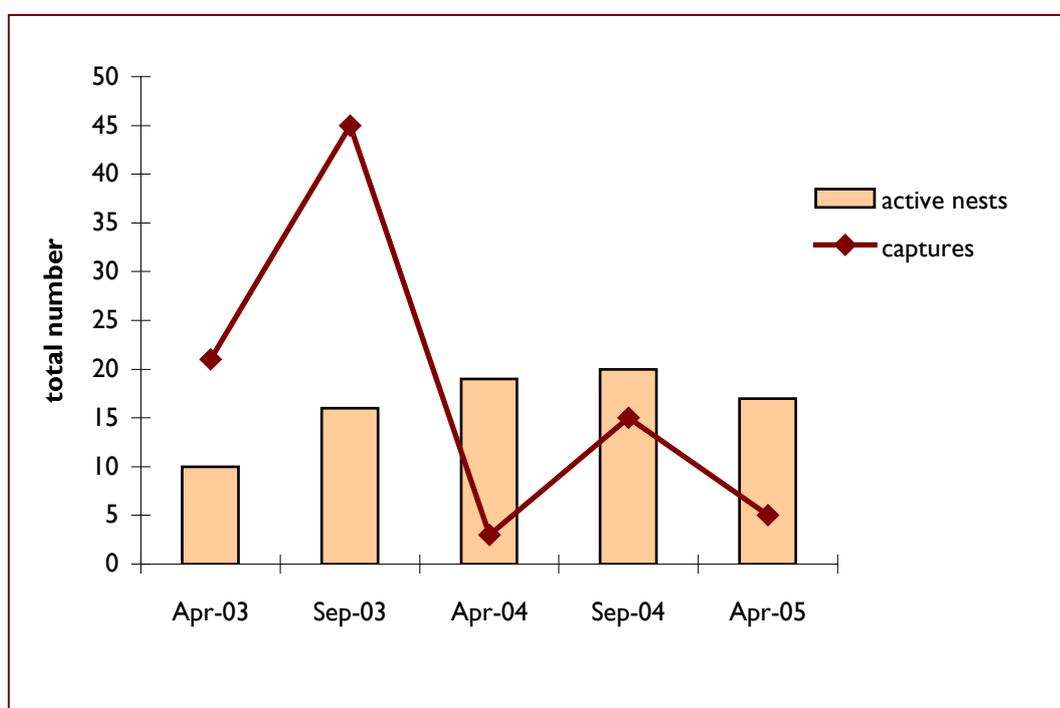


Figure 13. Total number of Greater Stick-nest Rat captures and number of nests showing activity (total number of nests is 20) in 2003, 2004 and 2005 monitoring.

## RE-INTRODUCED SPECIES

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### GREATER BILBY

Nine (5F, 4M) Greater Bilbies from the Monarto Zoo captive breeding facility were released into the Main Enclosure of the Arid Recovery Reserve in April 2000. In 2003, a further eight (4M, 4F) bilbies from Monarto were released into the Northern Expansion.

In 2004, 15 (4F 11M) bilbies from Thistle Island (SA) were released into the Northern Expansion in 2005 and a further 10 were released from Monarto into the Northern Expansion. The total number of animals released to date is 42 (18F, 24M; Table 2).

Since the initial release, 273 new Roxby-born individuals have been captured (April 2000 - December 2005). With several research projects focussing on bilbies this year an increased trapping effort was undertaken and 126 new individuals were caught in 2005.

Continual reproduction was recorded between release in April 2000 and February 2002 and bilby numbers increased considerably during that time. During this period bilbies were transferred between the Main Enclosure and adjacent expansion areas of the reserve (Table 2).

In 2004, 15 bilbies from Thistle Island were released into the Northern Expansion area where Roxby-born individuals were already present. Four males died within two weeks of the release and two of these had suffered considerable weight loss, but cause of death is unknown. The surviving bilbies were in good condition when checked in December 2004.

Ten bilbies from Monarto Zoo were released into the Northern Expansion in April 2005. Unfortunately all of these animals were found dead within two months of release.



The cause of death is unknown but it is possible that the reserve was beyond carrying capacity and could not support the additional individuals.

Further investigations are being made to determine maximum carrying capacity, and plans are being made to reintroduce natural predators and trial a one-way gate system (one-way from the inside of the reserve to the outside only).

Twelve bilbies were removed from the Main Enclosure for the first release of bilbies outside the reserve in 2004 (see research section for further details about the external release and subsequent monitoring).

Since this external release a total of 33 bilbies/tracks have been captured/observed outside the reserve. One of these bilbies has been found as far as 15km from the western Arid Recovery fence and one was observed near Olympic Dam Village.

The population outside of Arid Recovery is not solely from the initial release, but has been supplemented by bilbies that have dug out of the reserve prior to the complete installation of the internal foot-mesh in July 2005. Research will be undertaken in 2006 to determine if annual/quarterly baiting has helped bilbies become established in the 20km buffer zone around Arid Recovery.

## RE-INTRODUCED SPECIES

A slight increase in bilby track activity was recorded in the Main Enclosure in 2005 (Figure 8). This followed a decline in track counts over the 2004 season.

Track counts in the First Expansion remained stable and high (around 19-20 tracks per km) over 2005. However as both spotlight and track results suggest (Figure 10 and Figure 12), there appeared to be a decline in the Northern Expansion in the first half of 2005 before numbers increased again in the latter part of the year. One carcass was found in early June in the Northern Expansion.

It is possible that the crash was due to this section of the reserve being at carrying capacity. Bilbies have been known to decrease breeding output when food or space is limited. No bilby breeding activity was recorded in the reserve between February and July 2005. Only 12% of female bilbies caught in 2005 had pouch young (n=52) compared to 24% in 2004 (n=50). This is considerably lower than the 60% recorded in 2003.

In October 2002 bettong tracks were first discovered inside the Second Expansion. Bilby tracks were first noted in April 2003. It is important to remove these animals as this is a control area for various monitoring projects.

Various holes have been discovered under the fence between the Northern Expansion and the Second Expansion, the gate was left open one night in 2004, and bettongs have been observed climbing these low internal fences.

In 2005 a floppy top was placed on this low fence to stop animals climbing over and all the foot netting was completed to prevent bilbies from digging under the fence. Since trapping began in Oct 2002 a total of 8 bettongs and 43 bilbies have been removed from the Second Expansion. Most bilbies were removed between April 2005 to December 2005 (n = 30).

Current estimates of bilbies still in the Second Expansion are at around 10-20 individuals. We aim to have all of these removed by June 2006.

Table 6. Greater Bilby releases and translocations within the Arid Recovery Reserve.

Year	Section	Total	M	F	Origin
2000	main	9	4	5	Monarto
2001	first	2	1	1	Roxby
2002	north	3	1	2	Roxby
2003	north	8	4	4	Monarto
		4	2	2	Roxby
2004	north	15	11	4	Thistle Is
2004	outside	12	6	6	Roxby
2005	north	10	5	5	Monarto

## RE-INTRODUCED SPECIES

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### WESTERN BARRED BANDICOOT

Ten Western Barred Bandicoots were re-released into the Main Enclosure of the reserve in May 2001 after quarantine at Adelaide Zoo (Table 7). Three bandicoots subsequently died from collar-related deaths or natural causes. Radio-tracking data collected before the collars were removed indicated that dune habitat was favoured and that the bandicoots utilised the leaf litter of a variety of overstorey species for making their nest sites with favoured species including narrow-leaved hop-bush.

Three additional captive-bred animals from the Monarto Zoo captive breeding facility were released into a smaller release pen in April 2002. These Monarto captive-bred animals have not been recorded since their release.

One trap death was recorded in mid 2002, and including new animals captured during this time there was a maximum of 17 bandicoots present in the reserve at the end of 2002. A ten week monitoring study conducted in winter 2003 using trapping, tracking and a microchip scanning plate found that bandicoots were predominantly using the dune habitat in the north western area of the reserve (Figure 14).

Track transects show a large increase in bandicoot activity in 2005 (Figure 8) from less than 5 per kilometre to around 19 by November. Whilst much of the increase in activity was in the north western and north central dune area, tracks were also seen on southern transects in 2005. Figure 14 shows the increase in distribution and density since surveys were first undertaken in 2002.

Additional bandicoots were to be sourced from the Dryandra population in WA in 2004. Unfortunately the symptoms of a potentially lethal wart virus were present in Dryandra bandicoots trapped for relocation, and consequently no new animals have been added to the Arid Recovery population.



An intensive monitoring session was undertaken in 2005 to determine the numbers of new individuals in the population and to health check all animals.

The Arid Recovery bandicoot population has shown no signs of the wart virus, making it one of only three potentially wart-free populations (the other two are Dorre Island and Heirisson Prong in WA).

Cage trapping was conducted for bandicoots between May and June 2005. A total of 17 bandicoots were captured during this period, all of which were Roxby-born. All but one male were previously recorded.

Intensive track counts were also undertaken in April and again in October/November 2005. Based on trapping surveys and track counts in early 2005, the total population estimate was around 30-40 individuals. This estimate is low for such an important population of Western-Barred Bandicoots, especially as there were only seven founders (and consequently comprises a limited genetic diversity within the population).

## RE-INTRODUCED SPECIES

In order to increase population size and ensure the overall long-term survival of Western Barred Bandicoots in the reserve, a supplementary feeding experiment was therefore conducted in 2005 in an attempt to breed up animals and enable a transfer of some animals into the Northern Expansion.

Six individuals (two adult males, four adult females) were captured from the Main Enclosure population and transferred to the 8 ha Main Enclosure release pen for supplementary feeding and watering over a period of seven months (from 31 May 2005 to the end of December 2005).

Two males were discovered to have invaded the release pen, and there were two recorded escapes (one male, one female), with an eventual total breeding population attaining three males and three females.

During the seven-month holding period, all female bandicoots were recorded to have undergone at least two, some having had three recorded breeding cycles.

A total of seven individuals (four females and three males) were captured over a 5-week period and translocated to the Northern Expansion release pen in October. This population comprised of two juvenile females, two adult females, two juvenile males and one adult male.

All animals were kept in the Northern Expansion release pen for a minimum of two weeks and then allowed to come and go through fitted polypipe placed in the walls of the release pen.

Plans for 2006 include sourcing additional bandicoots from other wart-free populations to increase genetic diversity amongst the Arid Recovery populations.

Table 7. Western Barred Bandicoot releases and translocations within the Arid Recovery Reserve.

Year	Section	Total	M	F	Origin
2001	Main	8	1	7	Bernier Is
		2	1	1	Roxby
2002	Main	3	1	2	Monarto
2005	Northern	7	3	4	Roxby

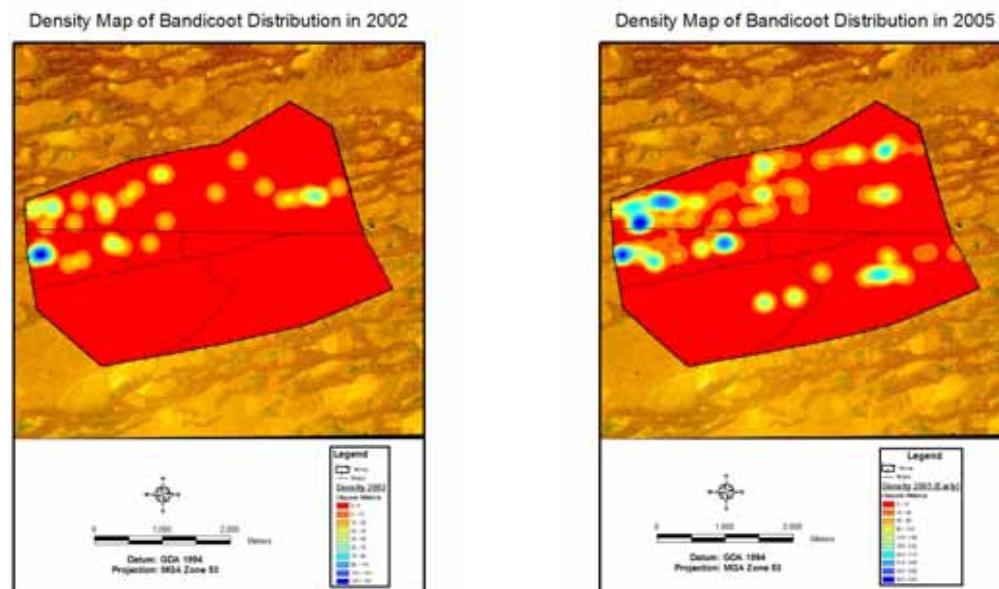


Figure 14. Density and distribution of Western Barred Bandicoots in the Main Enclosure of the Arid Recovery Reserve in 2002 and 2005.

## RE-INTRODUCED SPECIES

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### NUMBAT

Six numbats (3 female; 3 male) were captured from Scotia Sanctuary during the period of 7-11th November.

Numbats are extremely difficult to catch in traps, so animals were captured by sighting individuals, pursuing them on foot and removing them from hollow logs.

The numbats were then processed, had genetic samples taken and had a radio-collar attached. They were subsequently placed back into a log at the point of capture. All this was undertaken two weeks prior to the translocation to allow enough time for the animals to settle back into their normal feeding patterns and so that they could be recaptured quickly on the transfer date.

However, two weeks later only two of the females of the original six numbats were available for transfer.

One female was found dead from unknown causes (although she appeared to be an old breeding female), one male dropped its collar and two other males could not be found. These two males were searched for over a further two days using a 10 metre high portable radio-tracking tower fixed to the back of a vehicle. They were also searched for by aircraft, both within the enclosure and within a 10km zone around the sanctuary.

The numbats could not be detected and were assumed to have either jumped over the fence and travelled beyond the 10km zone around the fence, or both their transmitters had failed.



An additional two numbats (two males) were captured on the morning of the transfer (23rd November). They were processed and had a collar attached.

All four numbats were placed in calico bags inside pet-packs during transit and transferred by Arid Recovery staff in a light aircraft during the afternoon. They were wormed with an Ivomec™ injection, administered by a local vet and then released at Arid Recovery in the evening.

An additional male numbat was captured on the 24th November and then transferred by air-conditioned vehicle to Arid Recovery. He was wormed in the early morning and then released into a burrow on the 25th November.

## RE-INTRODUCED SPECIES

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All five numbats were released directly into tree hollows/burrows that had been pre-selected. These areas were previously surveyed and contained the highest densities of hollows, burrows and cover from aerial predators.

Given our lack of knowledge on preferred habitat of numbats in the arid zone, they were released in an ecotone on the edge of mulga woodlands, dune edges and swale to take advantage of all possible preferred habitats.

Numbats were hard-released as soft-release enclosures are unlikely to contain sufficient food to support numbats.

All five numbats were monitored every day until the end of 2005. They were monitored using radio-tracking to pinpoint their location.

They appeared to use all of the Main Exclosure, even extensive swales, although this appeared to be only during the first month when they were establishing territories (see research section for further details). Tracks were also detected at low densities during the quarterly track counts. These occurred in the north-west dune system.



All numbats were captured during week four and five after release to assess condition and check the radio-collars. All numbats had lost weight, with the largest weight loss being recorded by two males (both 7.6% loss). However, this was deemed to be acceptable given that weight loss usually occurs after transfer.

One of the male numbats was found dead 47 days after release. He was presumably preyed upon by a raptor.

**PHOTOS:**

**ABOVE:** THE HABITAT IN THE ARID RECOVERY RESERVE CHOSEN FOR THE NUMBAT RELEASE – PHOTOGRAPHER: KAREN RUSTEN

**BELOW:** NUMBAT IN A HOLLOW LOG – PHOTOGRAPHER: KAREN RUSTEN

## RE-INTRODUCED SPECIES

### BURROWING BETTONG

Twenty-nine Burrowing Bettongs (19 from Bernier Island in WA and 10 from Heirisson Prong in WA) were released into the Main Enclosure of the reserve between October 1999 and September 2000 (Table 8).

Bettongs bred continuously after release until October 2002. The very dry conditions recorded in 2002 resulted in a slowing of reproductive activity during the year. Breeding activity resumed in 2003 and continued throughout 2004 despite dry conditions at the beginning of the year.

Eighty female and 140 male bettongs were caught in the reserve in 2004. Forty-four per cent of adult females captured had pouch young. Eight bettongs were translocated into the First Expansion in late 2001 and a further 27 animals from the Main Enclosure were translocated into the Northern Expansion in October and November 2002 (Table 8). A total of 143 new bettongs were caught in 2005, bringing the total tally of Roxby-born bettongs since first release to 415. The current population estimate stands at between 315 and 420 individuals (Table 2). Bettong track activity in the Main Enclosure decreased at the start of 2005 but then increased to the highest level to date with 45 tracks per kilometre by the end of 2005 (Figure 8). Bettong activity on spotlight surveys was also the highest on record in both August and October 2005 (1.7 per km; Figure 11). Trap success during annual trapping inside the Main Enclosure was also higher than that of 2004 (42% in 2004 and 58% in 2005; Table 3).



This increase, in conjunction with the increase in track activity, and bettongs observed during spotlighting and the first signs of browsing on the leaves and bark of native plums, suggest that the bettong population in the Main Enclosure has increased significantly in 2005. A slight decline in bettong track activity was recorded in the Northern Expansion area of the reserve and also the First Expansion (Figure 9 & Figure 10). Trap success was not calculated for the First Expansion in 2005 due to adverse weather effects. Bettong numbers during spotlighting were also down in the Northern Expansion compared to 2004 (Figure 12).

Bettongs made up the majority of captures during annual trapping in 2005 (Table 3 & Table 4). Bettongs are extremely easy to trap. They also frequently travel along the tracks where traps are set which may increase their likelihood of capture. Plans for 2006 are to establish a more rigorous monitoring technique to allow for an accurate determination of bettong densities and population size.

Table 8. Burrowing Bettong releases and translocations within the Arid Recovery Reserve

Year	Section	Total	M	F	Origin
1999	Main	10	3	7	Heirisson Prong
2000	Main	19	8	11	Bernier Island
2001	First	8	4	4	Roxby
2002	North	27	14	13	Roxby
2003	North	2	2	-	Roxby

PHOTO: BURROWING BETTONG. PHOTOGRAPHER: CARLY BISHOP

## BIOLOGICAL MONITORING

The design of the reserve provides a unique opportunity to investigate the effect of different grazing and predation treatments on the local ecosystem (see Figure 15). Treatments include: reintroduced species only (the Main Enclosure, First and Northern Expansion areas of the reserve);

introduced rabbits, cats and foxes (outside the reserve on the mine lease); introduced species and domestic stock (outside the reserve on pastoral stations); and a control with no reintroduced species, rabbits, cats, foxes or cattle (Second Expansion).

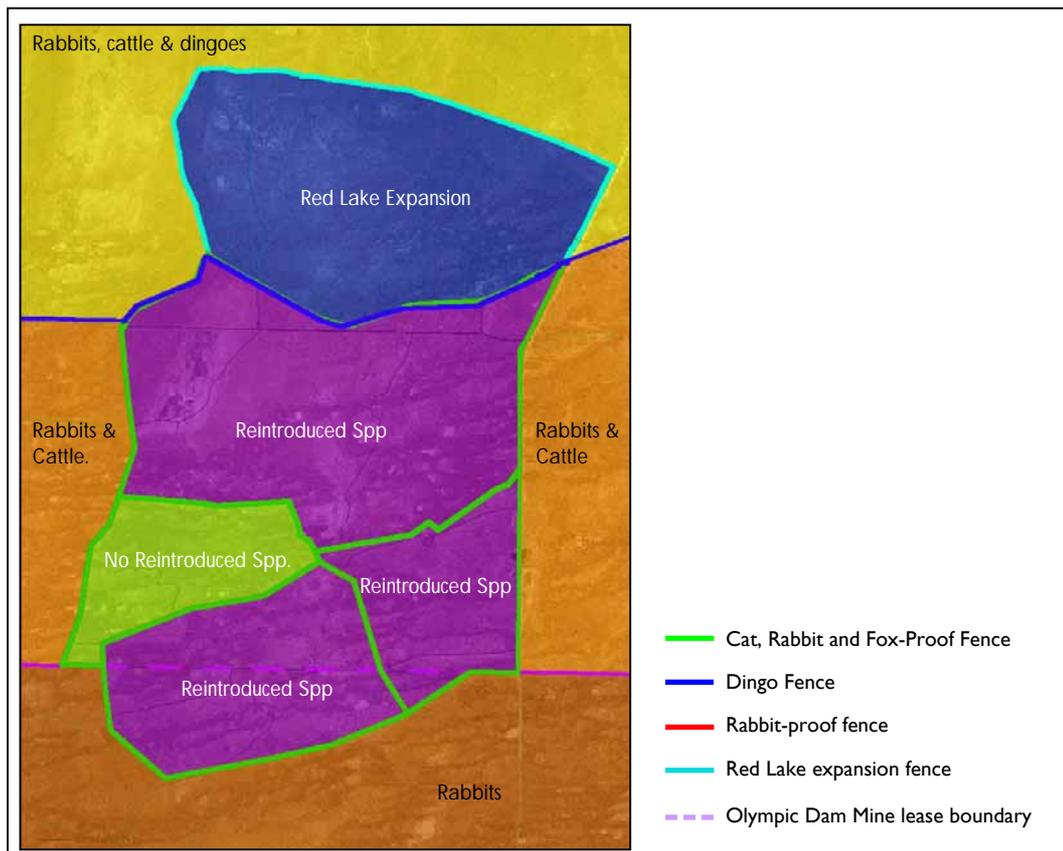


Figure 15. The Arid Recovery Reserve and surrounding land use, showing the treatments available for comparative research.

Table 9 shows the distances or number of sites/animals that are usually monitored within Arid Recovery. No plant or soil monitoring was conducted in 2005.

More sites were trapped for bandicoots in 2005 for establishing a breeding population in the Main Enclosure Release Pen and again for the transfer to the Northern Expansion. Permanent burrow and warren sites were set up in 2003 and monitored again in 2005.

A significant amount of time was spent monitoring and trapping bilbies released outside of the reserve using radio-telemetry, and removing bilbies from the Second Expansion (Table 9 & Table 10).

A number of bilbies were also caught by hand for the predator avoidance training.

## BIOLOGICAL MONITORING

Table 9. Monitoring conducted at the Arid Recovery Reserve. Those in italics indicate monitoring activities undertaken in 2005.

Method	Freq.	Number	Reason
<b>Plant</b>			
Jessop Transects, Step Point, Species List, Photopoint and Abundance	Annual	30	Investigate regeneration of native plants after removal of rabbits and domestic stock.
Small Enclosures	Every 3 years	4	Investigate effect of stick-nest rats on the survival and recruitment of <i>Gunnipopsis quadrifida</i> .
Small Enclosures	Every 3 years	3	Investigate effect of stick-nest rats on vegetation in preferred habitat areas.
Seedling Counts	Opport.	280	Investigate impact of stock, rabbits and re-introduced species on recruitment of perennial plant species.
Seedling Measurements	Opport.	40	Investigate impact of stock, rabbits and re-introduced species on growth of perennial plant species.
<b>Small Vertebrates</b>			
<i>Pitfall Sites</i>	<i>Annual</i>	<i>30</i>	<i>Investigate response of small mammals and reptiles to removal of introduced herbivores and predators.</i>
<b>Ecosystem Health</b>			
Landscape Function Analysis	Every 5 years	30	Investigate impact of stock, rabbits and re-introduced species on ecosystem health, measured as stability, nutrients and infiltration.
<b>Birds</b>			
<i>Bird Transects</i>	<i>Annual</i>	<i>12km</i>	<i>Investigate response of birds to removal of feral cats and rabbits including increases in structure and vegetation cover and lower predation levels.</i>
<i>Mist Netting</i>	<i>Annual</i>	<i>4</i>	<i>Investigate site fidelity, longevity and habitat preference of native bird species.</i>
<b>Feral Cats, Foxes, Rabbits</b>			
<i>Spotlight Transect</i>	<i>Quarter</i>	<i>4</i>	<i>Investigate the temporal changes in feral animals around the reserve fenceline.</i>
<i>Track Transects</i>	<i>Month</i>	<i>11</i>	<i>Determine the efficacy of aerial baiting trials around the outside of the reserve.</i>
<b>Re-introduced Species</b>			
<i>Track Transects</i>	<i>Quarter</i>	<i>18</i>	<i>Investigate temporal changes in abundance of stick nest rats, bettongs, bilbies and bandicoots in the main, first and northern expansions.</i>
<i>Trapping</i>	<i>Annual</i>	<i>113</i>	<i>Annual trapping to determine population fluctuations of reintroduced species.</i>

## BIOLOGICAL MONITORING

Table 9 continued: Monitoring conducted at the Arid Recovery Reserve

Method	Freq.	Number	Reason
<b>Re-introduced Species (continued)</b>			
<i>Spotlighting</i>	<i>Quarter</i>	9	<i>Investigate temporal changes in abundance of stick-nest rats, bettongs, bilbies and western barred bandicoots in main and first expansion and northern expansion</i>
<i>Burrow and Nest measurements</i>	<i>Annual</i>	67	<i>To observe changes to warrens, burrows and nests over time.</i>
Trapping and monitoring bilbies	Opport.		Remove bilbies from the Second Expansion and conducting track counts to determine density and distribution
<b>Numbats</b>			
<i>Trapping</i>	<i>Opport.</i>	5	<i>Trapping to monitor condition of numbats post-transfer</i>
<b>Greater Stick-Nest Rats</b>			
<i>Nest Sites</i>	<i>Annual</i>	20	<i>Trapping to determine nest fidelity and relatedness at nest sites.</i>
<i>Nest activity</i>	<i>Biannually</i>	24	<i>Nest activity scores and measurements (20 in Main Enclosure, 4 in First Expansion)</i>
<b>Western Barred Bandicoots</b>			
<i>Trapping</i>	<i>Opport.</i>	17	<i>Investigate survival and breeding status in the Main Enclosure and Northern Expansion.</i>

Table 10. Radio-tracking conducted at Arid Recovery during 2005

Species	Project	Freq.	Duration	# animals	Reason
Sleepy Lizards	Sleepy Lizard Home range	Daily	4 months	5	Record home range and foraging activities of Sleepy Lizards
Greater Bilbies	External Bilby Release	Daily	7 months	5	Investigate survival after re-introduction outside the reserve
	Predator awareness training	Daily	3 months	14	Determine the location and behaviour of bilbies in response to predator avoidance training
Numbats	Numbat trial release	Daily	34 days	5	Monitor the survival and ecology of numbats in the Main Enclosure
Echidnas	Echidna Ecology in the Arid Zone	Weekly	4 months	3	Record features of echidna ecology in the arid zone

# BIOLOGICAL MONITORING

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## ANNUAL BIRD MONITORING



Birds numbers are monitored each year in April by the University of Adelaide.

Preliminary analysis in 2003 suggested that during dry times, the reserve provides more resources for birds compared to outside, and results for 2004 and 2005 may support this as conditions were very dry during the 2004 and 2005 monitoring.

Good winter rainfall in 2005 resulted in many nomadic species moving into the Roxby Downs region. Crimson Chats *Epthianura tricolor*, Masked Woodswallows *Artamus personatus*, Wedge-tailed Eagles *Aquila audax* and White Winged Trillers *Lalage sueurii* were observed breeding in the reserve.

Tracks and sightings of the Australian Bustard *Ardeotis australis* were also observed several times inside the Main Enclosure and Second Expansion. The first sightings in the reserve of the Western Ringneck *Barnardius zonarius* and Splendid Fairy-wren *Malurus splendens* occurred in 2005.



The numbers of honeyeaters were low in 2005 but densities continued to be higher inside the enclosure than outside. Red-capped Robins *Petroica goodenovii* which were largely absent in April 2004 were present at more typical densities both inside and outside the reserve in April 2005.

Four granivorous species, Crested Pigeons *Ocyphaps lophotes*, Bourke's Parrots *Neopsephotus bourkii*, Blue Bonnets *Northiella haematogaster* and Zebra Finches *Taeniopygia guttata* were more abundant outside the enclosure than inside, particularly in April 2004 and April 2005 (Figure 17). This suggests that increases in mammal populations (Bilbies, Hopping Mice) inside the enclosure may be reducing seed availability for granivorous birds or water availability is greater outside.

### PHOTOS:

LEFT: WEDGE-TAILED EAGLE – PHOTOGRAPHER: JENNY STOTT  
RIGHT: AUSTRALIAN BUSTARD – PHOTOGRAPHER: MARK ZIEMBICKI

## BIOLOGICAL MONITORING

Most of the predominantly insectivorous species (fairy-wrens, babbler, bellbird, thornbills) had similar densities inside and outside the enclosure. However, both Cinnamon Quail-thrushes *Cinclosoma cinnamomeum* and Chirruping Wedgebills *Psophodes cristatus* continued to be more abundant inside compared to outside the reserve (Figure 16 and Figure 18).

Black-faced Woodswallows *Artamus cinereus* were also at much lower densities outside the reserve in April 2005 than inside the reserve compared with previous years, suggesting areas inside the reserve were better for this species in April 2005. Both Southern Boobooks *Ninox novaeseelandiae* and Barn Owls *Tyto alba* were still common within the reserve in April 2005.

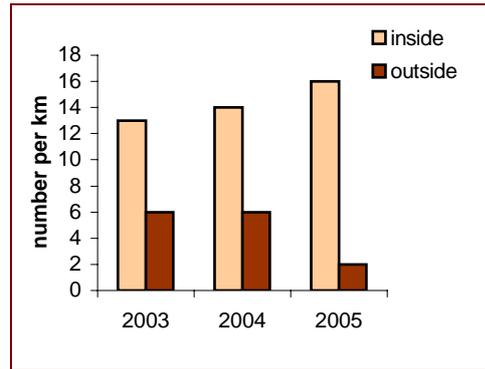


Figure 16. Changes in numbers of Cinnamon Quail-thrushes in areas inside and outside the Arid Recovery Reserve in April over the last 3 years. Data are expressed as numbers of birds seen per kilometre of searching. 56km of searching took place within the reserve and 32km outside the reserve.

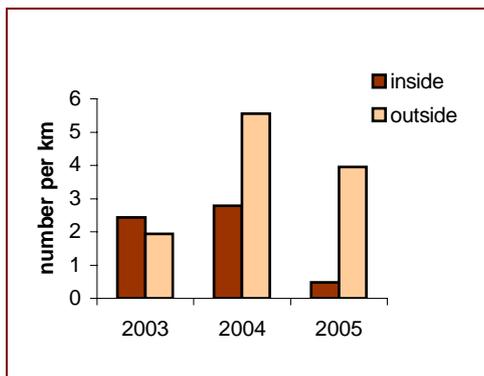


Figure 17. Changes in numbers of granivorous birds in areas inside and outside the Arid Recovery Reserve in April over the last 3 years. Data are expressed as numbers of birds seen per kilometre of searching with the counts for Bourke Parrots, Crested Pigeons and Zebra Finches combined. 56km of searching took place within the reserve and 32km outside the reserve.

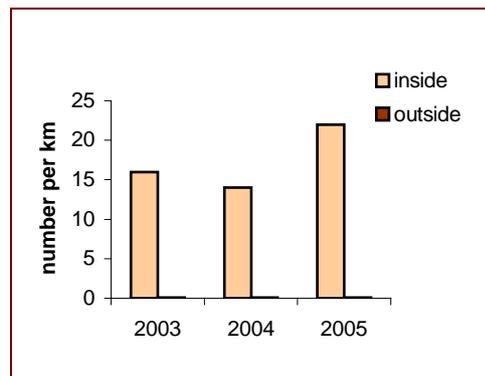


Figure 18. Changes in numbers of Chirruping Wedgebills in areas inside and outside the Arid Recovery Reserve in April over the last 3 years. Data are expressed as numbers of birds seen per kilometre of searching. 56km of searching took place within the reserve and 32km outside the reserve.

# BIOLOGICAL MONITORING

## SMALL VERTEBRATE MONITORING

Small vertebrate pitfall and Elliott trapping sites are located at vegetation monitoring sites and are trapped annually to determine changes in the abundance and diversity of small reptiles and mammals.

There are 12 sites situated inside the Main Enclosure of the reserve, seven sites within the Second Expansion control site and 11 outside. Sites are comprised of six pitfall traps and 15 Elliott traps set for four nights.

Results from the first four years of trapping (1998 - 2001) revealed little difference in native mammal captures between sites inside and outside the reserve (Figure 19). However, from 2002 to 2005 there was significantly higher numbers of native mammals recorded at sites within the reserve than outside (wald=200.82 df 2,  $P < 0.001$ ).

The control (Second Expansion) sites were trapped as a group for the first time in 2003, and in 2004 showed similar numbers of small mammal captures to the inside sites in the Main Enclosure where reintroduced

animals are present. However, interestingly, the number of captures was higher in the Main Enclosure compared with the control area in 2005.

The number of mammal captures inside both the Main Enclosure and the control areas of the reserve were higher than outside.

During 2005, a total of 988 small mammals and reptiles were captured during the four night survey from 30 sites. This equates to a total trap success of 57.4%; much higher than the trap success recorded for 2004 (37.4%).

In 2005, the number of small mammal captures inside the reserve was almost ten times higher than outside, with an average of 75.2% trap success inside compared to 7.6% outside (Figure 19).

As Figure 19 shows, trap success has remained stable outside the reserve since 1998, whilst trapping success in the reserve has increased.

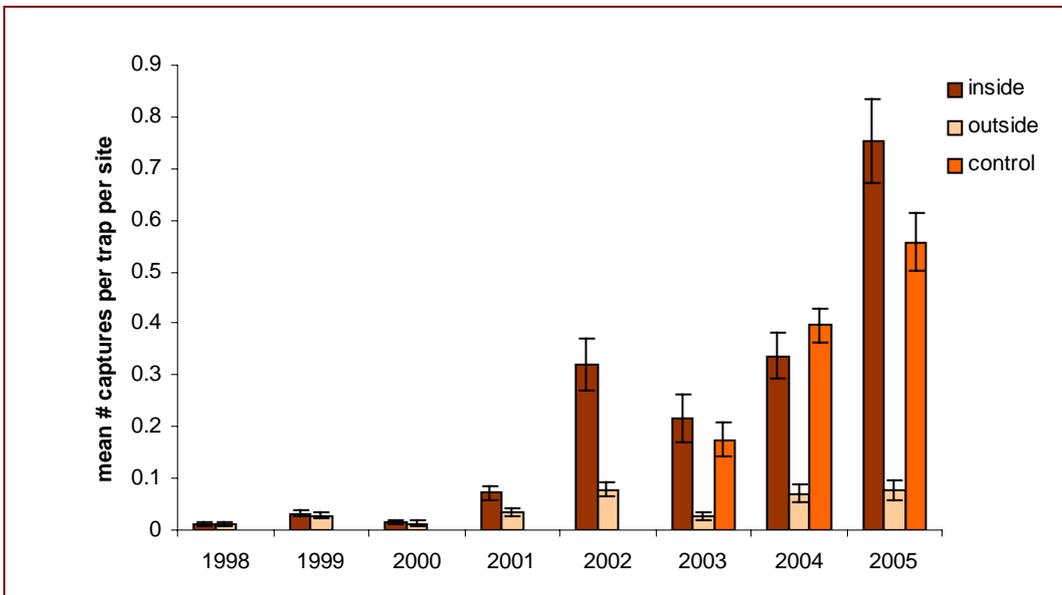


Figure 19. Average number of native mammal captures per site inside ( $n=12$ ), outside ( $n=11$ ) and in the control area ( $n=7$ ) of the Arid Recovery Reserve. Bars indicate one standard error.

## BIOLOGICAL MONITORING

The majority of small mammal captures in 2005 were Spinifex Hopping-mice and Bolam's Mice *Pseudomys bolami*. Overall numbers were much higher than those in 2003 and 2004, and were probably due to an increase in rainfall in 2004 (193.3 ml) compared to the previous two years (43.5 ml & 152.4 ml respectively) Trapping is conducted in February and results are therefore influenced by rainfall from the preceding year.

The number of small mammal captures at the outside sites in 2005 were comparable to that of 2002, which followed a wet year in 2001. Thus, the high numbers recorded in 2005 cannot be attributed to the wet condition in the previous year alone.

High numbers inside the reserve may reflect increased vegetation cover since the removal of rabbits and may also reflect lower predation rates within the reserve. Hopping-mice are regularly found within the stomachs of feral cats trapped outside the reserve.

Notable mammal captures during 2005 included one Giles' Planigale *Planigale gilesi* caught at a control site and substantially more Stripe-faced Dunnarts *Sminthopsis macroura* caught in 2005 (n = 21) compared with 2004 (n = 3).

Reptile captures showed little difference in captures between inside and outside sites during the first few years of trapping. However, recent capture results show less reptile captures within the reserve than outside (Figure 20), an opposite trend to that observed in native mammals (Figure 19).

Control sites had less reptile captures than the inside sites in 2003, but there was no obvious difference between these sites in 2004 and 2005. Some reptile species may be favoured by sparse vegetation cover and many reptiles also respond to change in vegetation structure rather than vegetation cover.

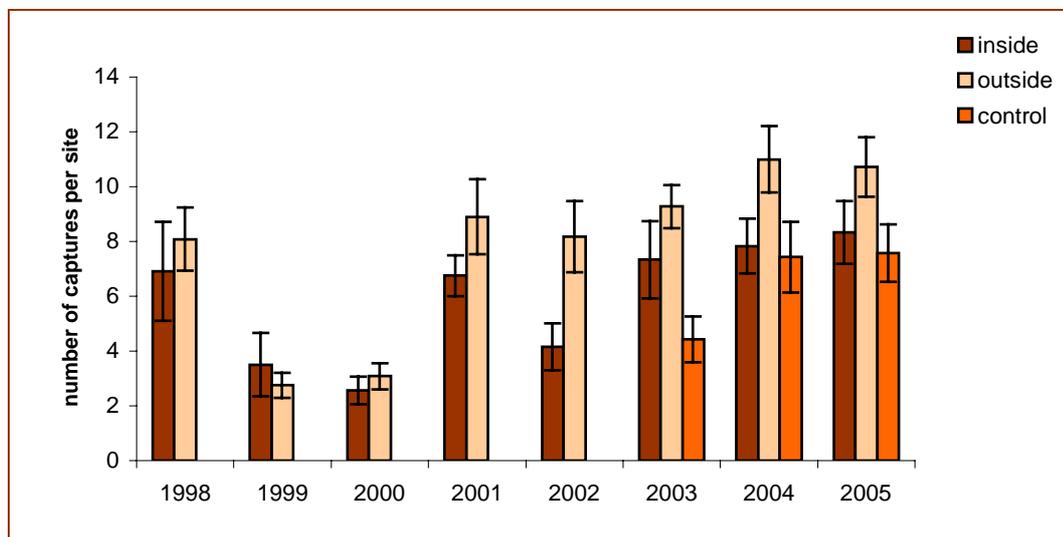


Figure 20. Average number of reptile captures per site inside (n=12), outside (n=11) and in the control area (n=7) of the Arid Recovery Reserve. Bars indicate one standard error.

# RESEARCH

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## CURRENT RESEARCH

Three research students undertook 12 week scholarship programs at Arid Recovery in 2005.

Amber Cameron undertook a research project investigating the success of predator avoidance training with Greater Bilbies. Mimi d'Auvergne undertook work monitoring bandicoot numbers in the Main Expansion pre transfer and in the Northern Expansion following the release. Mimi also commenced work on the one-way gate trial. Karen Rusten conducted research on numbat habitat preferences and home range in the Main Expansion.

In addition, four new/ongoing Arid Recovery research projects were also undertaken in 2005. They included studies of meat ant distribution (conducted by Adelaide University students), Echidna *Tachyglossus aculeatus* home range in Red Lake Expansion, Sleepy Lizard home range, vegetation mapping of the Main Enclosure, First and Second Expansions.



One honours student completed a project at the reserve and one honours student commenced their project.

Two PhD students continued their research and one Masters student commenced work on the Western Barred Bandicoot.

Two research papers were published in international scientific journals in 2005.

## PAPERS

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### Arid Recovery papers published in 2005:

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Moseby, K.E., De Jong, S., Munro, N. and Pieck, A. (2005) Home range, activity and habitat use of European rabbits (*Oryctolagus cuniculus*) in arid Australia: implications for control. *Wildlife Research* 32(305-311).

Moseby, K.E., Read, J. (2005) The efficacy of feral cat, fox and rabbit exclusion fence designs for threatened species protection. *Biological Conservation* 127(429-437).

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### Papers being prepared for publication during 2006:

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Reintroduction Protocols; A comparison of reintroduction methods for the Greater Bilby, Burrowing Bettong and Greater Stick-nest Rat. Katherine Moseby, Tyrone Lavery and Ruth Coates (Funding obtained from Nature Foundation SA and Earthwatch).

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**PHOTO:** AMBER CAMERON RELEASES A BILBY DURING THE PREDATOR AWARENESS TRAINING TRIAL.

## RESEARCH

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### Papers being prepared for publication during 2006 (continued):

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Diet of the re-introduced Greater Bilby (*Macrotis lagotis*: Peramelidae) and Burrowing Bettong (*Bettongia lesueur*; Potoroidae) in the Arid Recovery Reserve, northern South Australia. Katherine Moseby and Jackie Bice.

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Seedling germination and growth rates of selected perennial species under rabbit, cattle and native mammal grazing regimes. Nicki Munro, Katherine Moseby and John Read (Funding obtained from the Native Vegetation Fund).

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Counting Ferals: estimating activity of rabbits, cats, foxes and dingoes in central Australia. John Read and Steve Eldridge.

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Rabbit, bilby and bettong warrens as refuges for fauna in arid Australia. John Read, Jude Carter, Aaron Greenville and Katherine Moseby.

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The efficacy and off-target impacts of trapping, baiting and warren ripping for rabbit control. Jason Briffa, John Read and Reece Pedler.

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Aerial baiting trials for feral cats and foxes at Arid Recovery, northern South Australia.

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A comparison of monitoring methods for reintroduced threatened mammal species in northern South Australia.

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Numbat home range establishment and habitat preferences in the arid zone.

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### Previously published research:

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Bolton, J. and Moseby, K.E. (2004). The activity of Sand Goannas *Varanus gouldii* and their interaction with reintroduced Greater Stick-nest Rats *Leporillus conditor*. *Pacific Conservation Biology* 10(3) 193-201.

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Finlayson, G.R. and Moseby, K.E. (2004) Managing confined populations: The influence of density on the home range and habitat use of re-introduced Burrowing Bettongs (*Bettongia lesueur*). *Wildlife Research* 31:457-463.

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Moseby K.E. and Bice J. (2004). A trial reintroduction of the Greater Stick-nest Rat (*Leporillus conditor*) in arid South Australia. *Ecological Management and Restoration* 5(2):118-124.

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Moseby, K.E and O'Donnell, E. (2003). Reintroduction of the greater bilby, *Macrotis lagotis* (Reid) (Marsupialia : Thylacomyidae), to northern South Australia: survival, ecology and notes on reintroduction protocol. *Wildlife Research* 30:15-27.

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Moseby, K.E., Selfe, R. and Freeman, A. (2004). Attraction of auditory and olfactory lures to Feral Cats, Red Foxes, European Rabbits and Burrowing Bettongs. *Ecological Management and Restoration* 5(3) 228-231.

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Read, J.L. (2004). Catastrophic Australia following intensive cattle browsing. *J. Arid Environ* 58: 535-544.

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Ryan, S.A, Moseby, K.E. and Paton, D.C. (2003). Comparative Foraging Preferences of the Greater Stick-nest Rat (*Leporillus conditor*) and the European Rabbit (*Oryctolagus cuniculus*): Implications for Regeneration of Arid Lands. *Australian Mammalogy* 25: 135-146.

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# RESEARCH

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## CONFERENCE PRESENTATIONS

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### Conference Presentations During 2005:

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Newell, J. Paton, D. Moseby, K. Carthew, S., and Facelli, J. (2005) 'The Reintroduction of Bilbies and Burrowing Bettongs: What about the Soil Seed Banks?', Ecological Society of Australia Conference, 29 Nov - 2 Dec, Brisbane.

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### Previous conference presentations

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Hill, B. M., Moseby, K. M. and Cunningham, L. (2004). A trial release of the Greater Bilby *Macrotis lagotis* to an area outside the Arid Recovery Reserve in South Australia. Conference presentation, Ecological Society of Australia Conference, Adelaide.

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Hill, B., Moseby, K. (2004) Arid Recovery - Beyond Mining Restoration. Conference presentation. Minerals Council of Australia Conference on Global Sustainable Development, Melbourne

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Galbraith, B., Hill, B. (2004) Arid Recovery - Pathway to sustainable arid zone conservation. Poster presentation. Minerals Council of Australia Conference on Global Sustainable Development, Melbourne.

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James, A. I., Eldridge, D. J. and Hill B. M. (2004). Bilbies, bettongs, rabbits and goannas ecosystem engineers of arid dunefields. Poster presentation, Australian Rangelands Society Conference, Alice Springs.

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James, A. I., Eldridge, D. J. and Hill B. M. (2004). Creation of fertile patches by four ecosystem engineers in arid South Australia. Conference presentation, Ecological Society of Australia Conference, Adelaide.

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Moseby, K. M., Hill, B. M. and Read, J. L. (2004) Setting yourself up for success: The importance of research and monitoring in ecological restoration projects Conference presentation, Ecological Society of Australia Conference, Adelaide.

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Moseby K. E. Lavery, T and Coates, R. (2004) A comparison of soft and hard release protocols for reintroduced threatened species: greater bilbies, burrowing bettongs and stick-nest rats. Conference presentation, Australian Mammal Society, Tanunda.

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Newell, J. (2004). Investigating the effects of ecosystem engineering by reintroduced Greater Bilbies (*Macrotis lagotis*) and Burrowing Bettongs (*Bettongia lesueur*). Poster presentation, Australasian Wildlife Management Society Conference, Kangaroo Island.

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Read J. L., Carter J., Greenville, A. and Moseby K. E. (2004). Rabbit Control Affects More Than Just Rabbits. Conference presentation, Ecological Society of Australia Conference, Adelaide.

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Hill, B.M, Moseby, K. E. and Read, J.L. (2003) Arid Recovery - Recovery of Arid Land. Conference presentation. Ecological Society of Australia Conference, Armidale

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Galbraith, B. Moseby, K. (2003) The Arid Recovery Project - Roxby Downs. Kangaroo Island Community Feral Cat Conference, Kangaroo Island

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## RESEARCH

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### Previous conference presentations (continued)

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Nicki Munro, N., Moseby, K. (2003) The Arid Recovery Project: The effects of grazing by native, introduced and re-introduced herbivores on seedling growth and survivorship. Native Veg Conference, Melbourne.

Green, S. Read, J. (2003) The Arid Recovery Project - Partnership Case Study. Conference Presentation. Minerals Council of Australia Conference, Brisbane.

Moseby, K. (2002) Arid Recovery Project. Conference presentation. Australian Veterinary Association Conference, Adelaide.

Moseby, K. (2002) Arid Recovery Project - Bilbies as Ecosystem Engineers. Poster presentation

Freeman, A. (2001) Vertebrate Pest Control/Eradication at the Arid Recovery Project, Roxby Downs, SA. Poster presentation. Australasian Vertebrate Pest Control Conference, Melbourne.

Read, J (2001) The Arid Recovery Project. Conference presentation. Birds Australia Centenary Conference, Adelaide.

Moseby, K. (2001) Research Initiatives at the Arid Recovery Reserve in Northern S.A. Conference presentation. Australian Wildlife Management Society Conference, Dubbo, N.S.W.

Munro, K. (2000) The Arid Recovery Project. Conference presentation. Resource 2000 conference, Adelaide.

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# RESEARCH

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## RESEARCH PROJECT SUMMARIES

### The survival and establishment of the Greater Bilby outside the Arid Recovery Reserve

The Greater Bilby has been extinct in the wild in the Roxby Downs region since the 1930s. In 2000, bilbies were re-introduced into the Arid Recovery Reserve. Numbers inside the reserve have increased since that time and there have been many records of bilbies digging out under the fence.

A long-term goal of Arid Recovery is to re-establish populations of threatened species outside the reserve. Fenced reserves provide an unnatural barrier for the dispersal of animals across the landscape. In the absence of predators, animals within the reserve may eventually become limited by resources.

Burrows, digs and tracks indicated that at least one of the 'escapee' bilbies survived for six months outside of the reserve. Although cats and foxes were present outside the reserve the number of foxes in the area during this time was low due to 1080 baiting.

The survival of these bilbies and the extant wild populations in NT and WA where cats are present suggested that bilbies may be able to survive in the presence of cats but with fox control.

A trial release was conducted in 2004 to determine the survival of bilbies of different age and sex classes in the presence of reduced fox numbers, outside the Arid Recovery Reserve. Twelve bilbies (six males: two adult and four juvenile and six females: three adult and three juvenile) were released outside the Arid Recovery Reserve in June 2004. After release bilbies were monitored daily using radio-telemetry.



Seven bilbies were preyed upon by feral cats within 25 days. One bilby was assumed to have had a transmitter failure and four (two males and two females) survived for at least 100 days post-release.

Of those bilbies that survived the initial release, one female and one male were still known to be alive at the end of the trial period (231 days post-release).

In February 2005, the remains of one female bilby were found (taken by a cat). However, it is believed that she successfully produced young before her mortality in February. The other surviving female also produced young, one of which was captured and radio-tracked for two months before having his transmitter removed at the end of the trial.

## RESEARCH

The transmitter on one male failed in early January. The other male lost his transmitter in January but was re-captured, re-collared and radio-tracked again in April. Thus, at the end of the trial in June 2005 there was one female and one male still known to be alive from the original release and another male thought to be alive but not radio-tracked.

At least three juvenile bilbies had been produced. There was no difference in survival between adult and juvenile bilbies. Male bilbies were killed first, which may have been due to them travelling further, increasing the chance of them encountering a predator.

The movements and spatial distribution of the surviving bilbies showed no pattern that would make them less likely to come across a predator than the bilbies that were predated. Monitoring indicated that predator abundance did not change significantly after the first seven bilbies were killed.

Since August 2004, several other bilbies are known to have escaped Arid Recovery by digging under the fence. Figure 21 shows the location of 28 bilby sightings or bilby tracks in the Roxby Downs region at the end of 2005. A more thorough survey will be conducted within the 20 km buffer zone around the reserve in early 2006.

There are several possible explanations (or combinations of these) for the survival of these bilbies; either aerial baiting has decreased fox and cat numbers sufficiently to give the bilbies a greater chance of survival, alternative prey sources (particularly rabbits) increased and predators were more likely to come across a rabbit than a bilby, or these bilbies are "smarter" and have the ability to avoid predation. The last explanation is supported by the fact that predator tracks were also found around the burrow

entrances of these bilbies. Further studies will be conducted during 2006 to determine if predator-awareness training can enhance bilby survival outside the reserve.

In summary though, the two main lessons to date have been that:

1. feral cats can be a significant predator of bilbies and
2. some bilbies can survive and recruit young into the population outside of the reserve.

Whether this latter outcome is the result of innate differences between bilbies, or of an increased probability of survival on the outside of the reserve with increased time and exposure to predators (i.e. through acquired behaviours), or just due to chance, is yet to be determined.

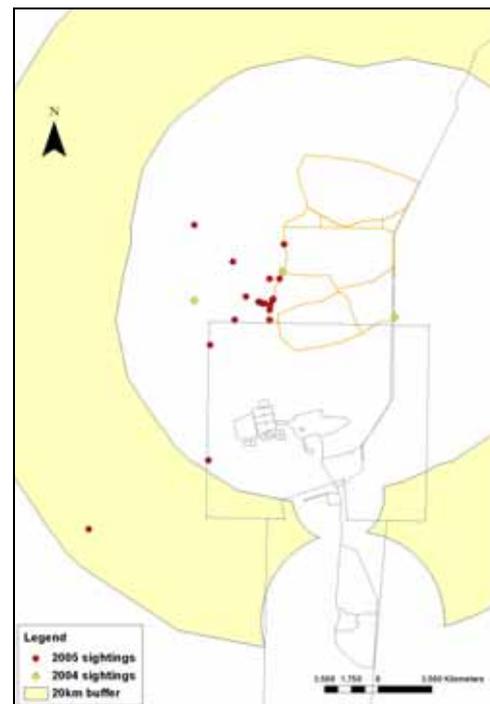


Figure 21. The location of bilby sightings or tracks observed outside of the Arid Recovery Reserve between August 2004 and December 2005.

## RESEARCH

### A comparison of predator trained and untrained bilbies (*Macrotis lagotis*)

Predator awareness training has been demonstrated in a range of taxa under the confines of a laboratory, but few experimental studies have investigated this phenomenon in free-ranging animals.

Here we examined whether wild bilbies within a predator proof reserve could be trained to respond to predator scent by associating their capture with visual stimuli (cat carcass) and an olfactory cue (feline scent). Secondly, the study aimed to determine what types of behavioural responses are triggered by predator-awareness training in the Greater Bilby.

Assessment of behaviour changes in the treatment bilbies was identified by comparing their response to a control group of bilbies that were captured and handled without the visual or olfactory cues.

Trained bilbies were significantly more likely to move burrows after their burrow was sprayed with feline scent, whereas control bilbies predominantly remained at the test burrow. Trained bilbies also used significantly more burrows and changed burrows more often compared to the control animals (Figure 22). The average total cumulative distance moved by trained bilbies ( $1387 \pm 513$  m) over the monitoring period was also substantially greater than that moved by control bilbies ( $158 \pm 40$  m).

Control bilbies in this study did not respond to the placement of feline scent at their burrows, suggesting they did not recognize the scent of a potential predator. Pairing the capture of trained bilbies with the cat carcass and feline scent however, led to the simultaneous movement of treatment bilbies whenever feline scent was sprayed at a burrow entrance.

This highlights that bilbies can be trained to recognize the smell of cats and associate it with a prior unpleasant experience.

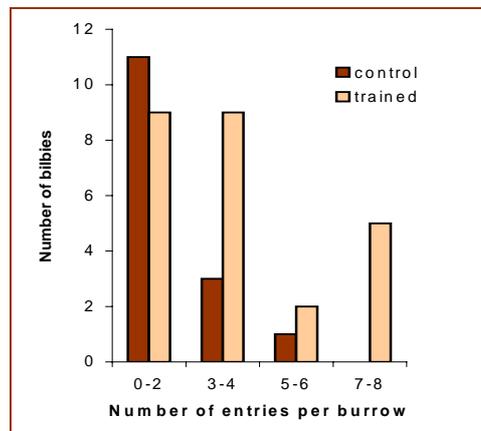


Figure 22. Number of entries per burrow used by trained and control bilbies

## RESEARCH

### One-way gate trials

A long-term goal of Arid Recovery is to re-establish populations of threatened species outside the reserve. Fenced reserves provide an unnatural barrier for the dispersal of animals across the landscape. In the absence of predators, animals in the reserve may eventually become limited by resources. One such method to avoid this problem is to use one-way gates to allow bilbies to disperse outside the reserve but prevent wild bilbies and feral animals from entering the reserve.

One-way gates were trialled in the Northern Expansion pen, and although targeting bilbies, were also tested on Burrowing Bettongs and Western Barred Bandicoots. Four basic designs were tested, trialling two different variables: underground vs. above-ground and a push-through door vs. a lift-up door (Figure 23).

Gates were rotated every second night to reduce location bias. Over a 36-day trial period and with a total of eight bettongs, 9 bilbies and 7 bandicoots being placed into the pen over this period, only one bandicoot, four bettongs and two bilbies used any of the gates.

Due to the low sample sizes there did not appear to be any preference between gates, although the low usage may have been attributed to the over-abundance of bettongs in the enclosure causing the bilbies and bandicoots to avoid the area where the gates were located. Further testing needs to be undertaken with bilbies without the presence of bettongs, as well as experiments to test the resistance of the gates to feral animals.

An important factor in the design will also be ease of maintenance. These trials indicated that underground designs will be more difficult to maintain as sand has to be removed at least twice a week in order to keep the entrance open for animal usage. Wooden designs will also wear rapidly and may need replacing every year.

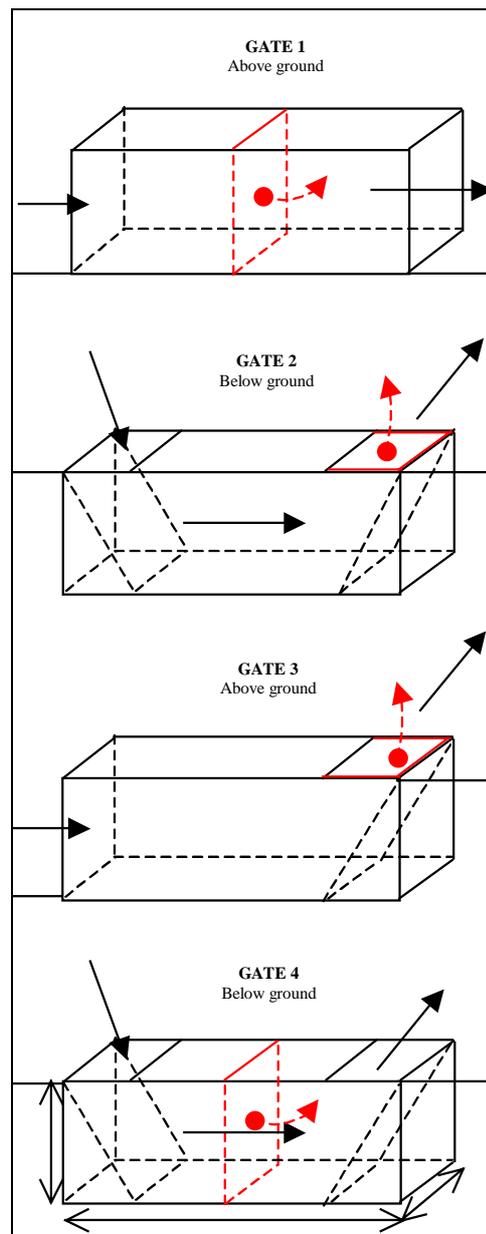


Figure 23. Gates are numbered from 1-4 and each test two different variables- below-ground versus above-ground design, and a push-through door versus a lift-up door.

## RESEARCH

### A trial release and home range establishment and shelter preferences of the numbat in Arid Recovery Reserve

Five numbats were transferred from Scotia Sanctuary in NSW into the Arid Recovery Reserve in late November 2005. Numbats were monitored daily for the first month to determine their survival, home range establishment and habitat preferences.

Results from the monitoring showed that the numbats travelled on average 1.4 km from their release site over the first month whilst they were exploring their new environment and finding optimal habitat.

Only one of the males remained in the vicinity of his initial release site, with the largest movement being recorded by one of the females (5.1 km over two days). This female managed to climb over or through the fence and was found in the Northern Expansion. She was captured and returned to the Main Expansion where she still remains at present.

A total of 165 fixes were recorded for the five numbats. Three different methods were used to determine home range. The GIS polygon method provided a home range

of 37 - 116 ha and a mean of 67 ha. Similar results were found using the Minimum Convex Polygon (MCP) method (range 30 - 133 ha; mean 67 ha). The Harmonic Mean Contours (HMC) method had a home range of 28 - 92 ha with a mean of 65 ha. This is slightly higher than the mean home range recorded in other studies (50 ha; Friend 1994).

Animals were found inactive in burrows on 45 occasions at temperatures ranging from 20 - 44°C. Animals were active in temperatures ranging from 19 - 40°C. The earliest any animal was confirmed as being active was at 06:34 and the latest was 20:37, although more research needs to be conducted throughout the night to determine if any activity occurs during these hours.

Animals were located primarily in *Dodonaea viscosa* habitat (Figure 24) and on the dunes which provided the greatest cover. Overall, burrows were used more often than logs during the day and night. This is probably a reflection of the relative availability of both refuges. Further research needs to be undertaken to determine the home range of numbats during winter and to determine their diet and foraging habitat.

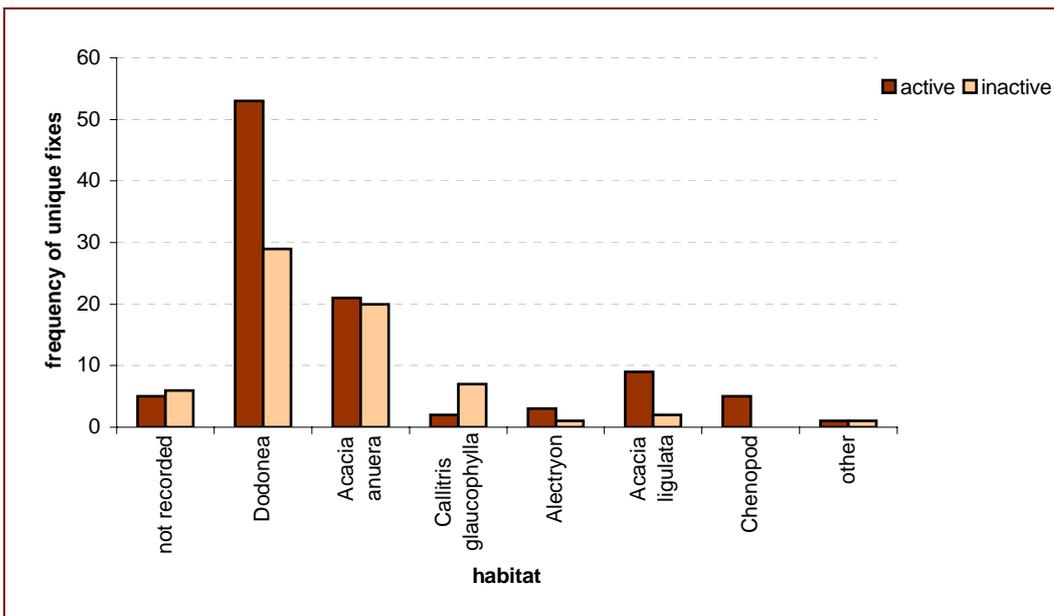


Figure 24. The frequency of unique active and inactive fixes obtained from each habitat type.

## RESEARCH

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### **Distribution, health and habitat requirements of Western Barred Bandicoots in the Arid Recovery Reserve, and a captive breeding trial for future transfers**

*A component of the Masters research of Karl Newport, Sydney University*

Since their release in 2001, Western Barred Bandicoots have been slow to spread and establish a population size similar to that seen in Greater Bilbies and Burrowing Bettongs. As the Arid Recovery bandicoots are one of the few populations that are free of the papilloma virus, sourcing bandicoots from other populations is difficult.

In 2005 a decision was made to establish a small breeding group within the Main Enclosure, with the view to translocating individuals to the Northern Expansion to create a second population.

Initial track counts conducted in April 2005 showed that bandicoots were starting to establish in the southern dunes of the Main Enclosure, although track counts were lower in these dunes compared to the north-west and north-east quarters. An assessment of vegetation parameters showed that there is no significant habitat associated with high densities of bandicoot tracks.

Trapping and hand-net captures of bandicoots in May and June yielded seventeen bandicoots (10,7). All bandicoots caught in this period were Roxby-born, and all but one male were previously unrecorded. No bandicoots displayed clinical signs of the papilloma virus or any sign of Chlamydia.



Two males and five females were placed in the 10 ha Main Release Pen (MRP) and were fed a supplementary diet of green vegetables, high-protein feed, bird seed and an insectivore dietary supplement. Weight and condition were checked regularly, and by mid-July 2005, all five females were carrying pouch young. The onset of breeding was apparently triggered by the heavy rainfall experienced in June and July.

Breeding continued into October, with some individual females going through three cycles of breeding. The large number of potential juveniles were not represented in capture rates, with only four juveniles (2,2) caught in the MRP. It was noted that two males invaded the release pen, which means that some juveniles may have escaped.

The success of the breeding program was heartening and bodes well for future bandicoot breeding programs. We were able to maintain a small number of bandicoots through three breeding cycles, and although capture rates for juveniles were low, we have added possibly 10-15 new individuals to the population. Further consideration will be given to sourcing bandicoots from other disease-free populations, in conjunction with an in situ breeding program.

## RESEARCH

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### Reproductive Suppression and Sociality in the Spinifex Hopping-mouse (*Notomys alexis*)

*A component of the honours research of Karleah Trengrove, University of Adelaide*

This study investigated the reproductive condition and sociality of the Spinifex Hopping-mouse in and around the Arid Recovery Reserve. The aims of the project were to determine:

- Whether reproductive activity can be accurately ascertained by external examination
- If a difference in population density results in changes in reproductive activity
- Whether high population density results in reproductive suppression
- Burrow use, and composition, that occurred in two populations of differing density

Two populations of Spinifex Hopping-mice, of different density, were examined to determine whether high population density results in reproductive suppression of hopping-mice, and to determine their social organisation. A laboratory colony was used to determine if the reproductive condition of individuals could be ascertained by external examination alone.

Microscopic examination showed that females with a non-perforate vagina had statistically smaller ovarian follicles and uterine weights than perforate animals (shown in Figure 26 & Figure 27). This indicates that non-perforate females had lower levels of pituitary follicle stimulating hormone (FSH) and ovarian follicular oestradiol. Males could not be accurately assessed by external examination, since characters such as scrotal bulge and pigmentation did not correlate with testes weight, ventral prostate weight or sperm presence in the cauda epididymides.



In the field, it was ascertained that the high density population (within a predator-proof enclosure) had a large number of non-perforate animals, even following rainfall events (Figure 27). No breeding was recorded in this population. However, the low-density population (outside of the predator-proof enclosure) had at least some perforate animals in all months but May, and breeding animals were recorded in August and September following rains, including both pregnant and lactating females.

The high density population did appear to be reproductively suppressed, probably due to suppression of pituitary FSH and ovarian follicular oestradiol secretion. The next step would be to determine how living in a high population density suppresses reproductive function in female hopping-mice. Some studies on Northern Hemisphere rodents suggest that hormone response in the pituitary due to the stress of living in a high density population is responsible, however this has not been studied on Australian native rodents.

Spool and line tracking of individual hopping-mice to their burrows indicated that they live in groups of 2-3 animals within the burrow, and that groups are generally of mixed sex. These results are similar to limited information from other studies. Further research is needed to clarify the social structure and behaviour of hopping-mice to explain how reproductive suppression occurs in this species.

## RESEARCH

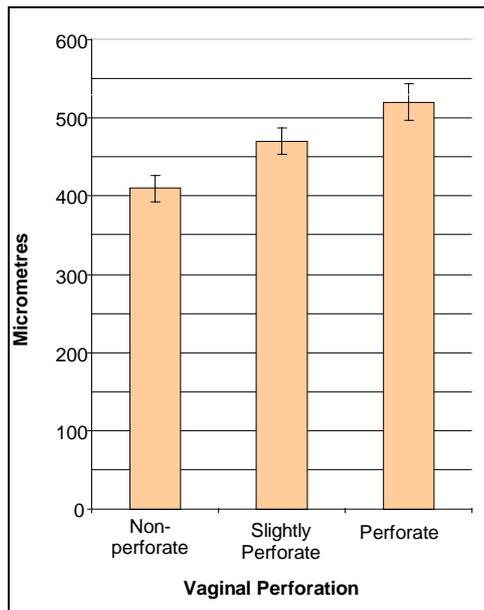


Figure 25. Maximum follicular diameter of female hopping-mice with different vaginal perforation

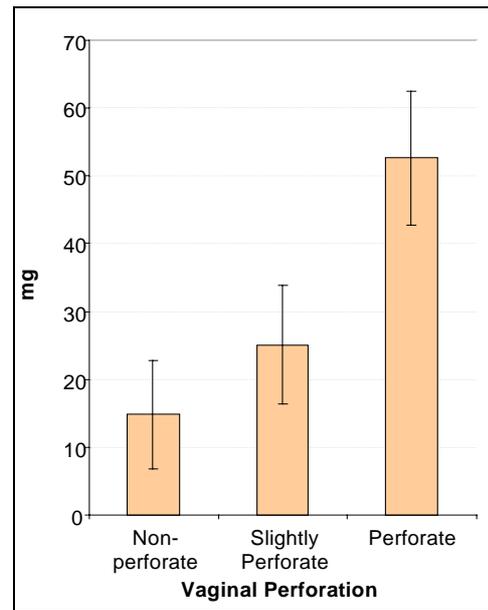


Figure 26. Uterine weight of female hopping mice with different vaginal perforation

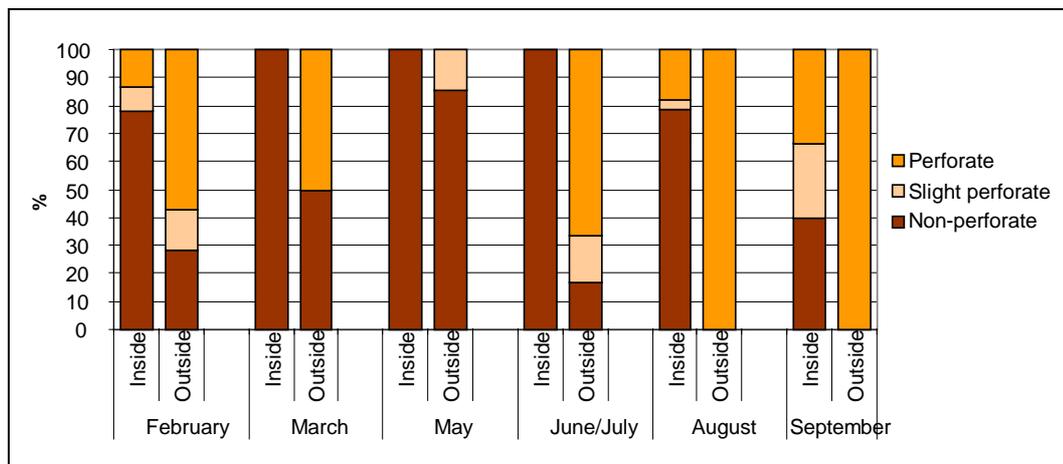


Figure 27. Vaginal perforation of female hopping-mice caught inside and outside the Arid Recovery Reserve.

## RESEARCH

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### **Greater Bilbies and Burrowing Bettongs as ecosystem engineers: What are the impacts of their reintroduction to the soil seed bank of arid ecosystems?**

*A component of the PhD research of Janet Newell, University of Adelaide*

Surveys of the soil seed bank at Arid Recovery in 2004 showed that seed numbers and species diversity in the top 2 cm of dunes inside the reserve are lower compared to outside the reserve (Annual Report 2004). An understanding of how the reintroduction of ecosystem engineers such as bilbies and bettongs affect the soil seed bank will help in understanding their role in the restoration of ecological processes within the reserve.

Both bilbies and bettongs create numerous foraging diggings, which at Arid Recovery, average 11 cm x 7 cm x 9.6 cm in size. Surveys of the numbers of diggings within the Main Enclosure of the Reserve over the past 1.5 years have shown that the foraging activity of bilbies and bettongs vary greatly over time and between vegetation types (Figure 28). There were generally more diggings in the dunes than in mulga and swale. The overall rate of digging was highest in December 2003 and lowest in September 2004. So far we haven't been able to relate this large variability to any particular factor, though it might be related to the rainfall and/or availability of different food resources, including seeds.

Previous research at Arid Recovery has shown that bilby and bettong diggings create fertile patches (Annual Report 2004) that accumulate litter and seeds, and facilitate seedling germination (Sparkes 2001).

A trial using beads as substitute seeds found that a high percentage of the beads sprinkled on the soil surface became trapped in diggings (up to 90% at higher densities of diggings). The beads then



became buried at varying depths as the diggings filled in. This suggests that bilby and bettong diggings might affect both the horizontal and vertical distribution of the soil seed bank.

Bilbies and bettongs might also affect the soil seed bank through predation of seeds. Foraging experiments showed that both species feed on a wide variety of seeds, ranging from large *Dodonaea viscosa* seeds to tiny *Dactyloctenium radulans* seeds. Other experiments have shown that bilbies and bettongs will dig at least 30cm deep for seeds, though they prefer to dig for larger, shallower caches (Figure 29). Other observations and experimental data suggest that bilbies and bettongs might also use old foraging diggings as seed supermarkets, eating the seeds that collect there.

Numerous anecdotal observations have suggested that bilbies at various locations throughout Australia dig up the seed caches of harvester ants for the seeds. In order to confirm this, harvester ant (*Pheidole* sp.) nests outside the reserve were 'fed' up to a cup of coloured rice, left overnight, and then carefully excavated to determine where the rice was cached. The rice was found at depths ranging from 1cm to 40cm deep (average 14.7cm, s.e. 1.7), and the caches contained on average 4.1g (s.e. 0.9) of rice. Most (83%) of the nests that were fed within the reserve were dug up by bilbies within one night of being 'fed' rice, confirming that bilbies may use harvester ant caches as food resources.

**PHOTO:** BILBY DIGS IN THE ARID RECOVERY RESERVE – PHOTOGRAPHER: MICHELLE DUBOIS

## RESEARCH

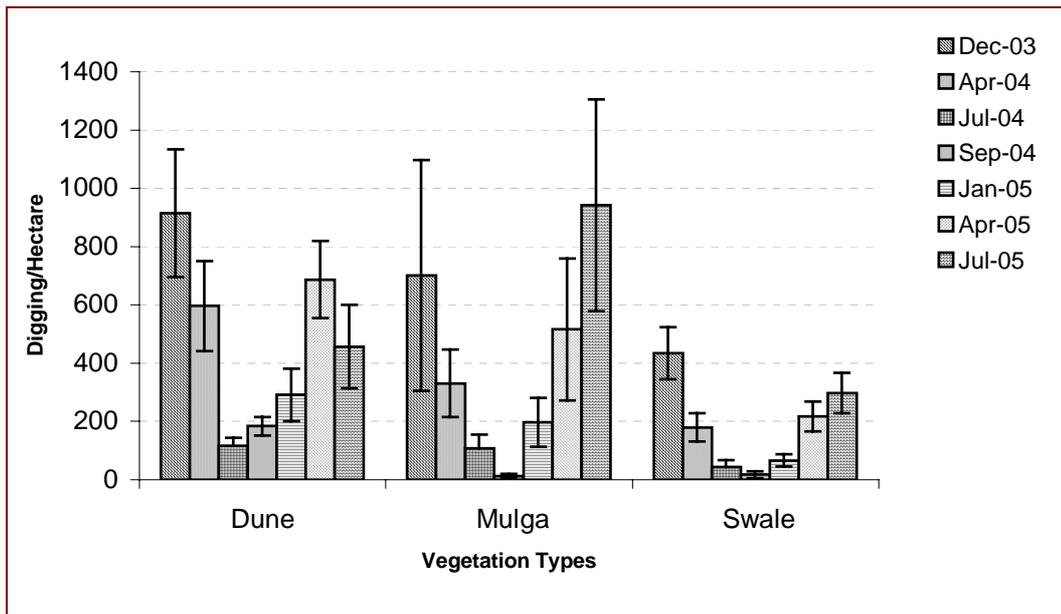


Figure 28. The average number of diggings per hectare ( $\pm$  s.e.) over a two week period in the Main Exclosure during each sampling period. The three main vegetation types, dune, mulga and swale are shown separately.

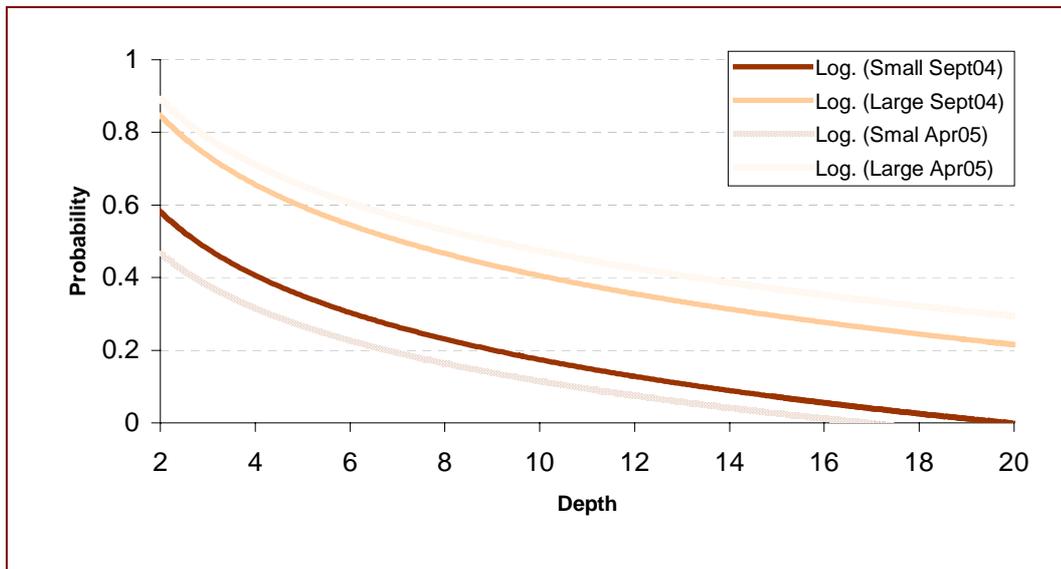


Figure 29. The probability that a buried sample of rice was dug up from different depths by bilbies and bettongs during feeding trials conducted in September 2004 and April 2005. The small samples consisted of three rice grains, while large samples consisted of one teaspoon of rice.

## RESEARCH

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### RESEARCH PLANNED FOR 2006

#### **Determining the home range, habitat use, foraging behaviour and diet from further numbat releases in the Arid Recovery Reserve**

The Numbat Recovery Team will assess the success of the trial translocation after June 2006 and, if approved, a full-scale release of a further 20 numbats will be undertaken in November 2006.

November is the only month that female numbats are not caring for their young. These twenty numbats will be studied by radio-telemetry techniques to determine their survival, home range, habitat use, shelter sites and times of activity.

Further research will also be conducted in 2006 to determine numbat diet and foraging site preferences.

#### **A trial reintroduction of the Woma Python into the Arid Recovery Reserve**

Woma Pythons *Aspidities ramsayi* bred at the Adelaide Zoo will hopefully be released into the Arid Recovery Reserve in 2006. Woma Pythons are believed to have become extremely rare (possibly locally extinct) in the Roxby Downs region.

The Woma Python is a predator of many of the native mammals that are abundant inside the Arid Recovery Reserve. It will be the first predator re-introduced into the reserve, in an attempt to restore a natural ecological balance required for the populations to become self-sustaining. A reptile is an ideal choice as even if they favour species that are less abundant (such as stick-nest rats) their metabolic rates and activity patterns are low enough not to have a large impact.



The woma release has been delayed for over a year whilst tests to confirm that the snakes have not been exposed to an exotic virus are undertaken. The womas will be cleared for release as soon as their health status is confirmed. Half of the womas will be placed into a pen and supplied with supplementary food in a "soft release". The others will be placed directly into the reserve and will not be provided supplementary food in a "hard release". Womas will be monitored by radio-telemetry techniques to determine survival, movements, diet and other aspects of their ecology.

#### **One-way gates**

Results from the one-way gate trial in 2005 were not conclusive in determining the best design and ease of use/maintenance. Further testing needs to be undertaken with bilbies without the presence of bettongs as well as experiments to test the resistance of the gates to feral animals. An important factor in the design will also be ease of maintenance. These trials indicated that underground designs will be more difficult to maintain as sand has to be removed at least twice a week in order to keep the entrance open for animal usage. Further designs will be trialled in 2006 using different materials.

## RESEARCH

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### Home range determination of foxes and feral cats.

In 2005 aerial baiting was conducted in a zone of 20 km around Arid Recovery and was conducted quarterly. However, reinvasion rates still remained high. More research is needed into the mechanisms of reinvasion. Results may allow us to target reinvasion corridors to maximise baiting efficiency. An additional observation is that fox and cat activity often declines in both baited and unbaited areas after baiting. This suggests that animals in the unbaited zone may be moving into the baited area and either taking baits or simply facilitating an overall reduction in cat/fox density over a large area. Answering these questions would have major implications for how, when and where baiting is conducted. Research questions that need to be addressed include the following:

- Do cats/foxes that don't take baits inside the baited zone change their activity after baiting or increase their home range to take over areas left vacant by baited animals? Does this mean that no change in track transects is recorded between baited and unbaited areas even though cat/fox numbers are lower?
- Is baiting only killing small, hungry or inexperienced cats and foxes?
- Do cats and foxes infiltrate in from outside the baited zone when there is a lower concentration of cats/foxes after aerial baiting? How and when does reinvasion occur from the unbaited zone into the baited zone and through what conduits (roads, dunes, creek lines etc)?

Foxes and cats will be fitted with GPS data-logger collars both inside and outside the baited zone. Activity, survival, reinvasion and home range will be determined and compared both before and after aerial baiting.



### The Potential Role of a Keystone Predator in the Arid Zone: Suppression of Introduced Mammals

This project, conducted in conjunction with Arian Wallach, a PhD candidate from University of Technology Sydney, aims to discover whether ecosystem restoration through the establishment of the dingo is an effective and long-term solution to the impact of invasive mammals. The study will address the question of whether the dingo has the potential to decrease the abundance and distribution of introduced mesopredators.

This study will also focus on determining whether there is a difference between the trophic regulatory impact of non-disturbed dingoes (stable packs) in comparison with persecuted dingoes (non-territorial individuals). Interactions between dingoes, cats and foxes will be studied around Arid Recovery on Stuart Creek Station (north of the dog fence) and compared with cat and fox levels south of the dog fence, which is free from dingoes.

## PUBLICITY, EDUCATION AND AWARENESS

More than 425 known media items have been generated by Arid Recovery since 1997, with 70 items of publicity recorded in 2005 (Table 11). Highlights included state television coverage and two documentaries for international television companies. As part of their support for the bilby predator awareness training project, Haighs Chocolates displayed interpretive posters in their stores in the lead up to Easter 2005.

The Arid Recovery website was enhanced in 2005 with the addition of an exclusive Friends of Arid Recovery members' section. The information on the site is regularly updated and has become a valuable source of information, regularly accessed by a wide range of people from around the world.

Visits to the site steadily increased throughout 2003 and 2004 and this trend continued in 2005 with visitor numbers increasing by 61%. Visits to the website were higher than previous years for every month in 2005, except November when updates were being made to the website (Figure 30).

Students from around Australia were involved in Arid Recovery in 2005. Talks and visits were also conducted with Roxby Downs Area School, St Barbara's Catholic School, Blanchetown Primary School, Roxby Downs Kindergarten and BHP Billiton Olympic Dam – Environment Seminars (see Table 12).

Public tours of the reserve are run by the Friends of Arid Recovery through the Visitor Information Centre in Roxby Downs. Friends group volunteers lead

groups on an interpretive walk to the viewing platform at sunset followed by time in the viewing hide to observe nocturnal fauna. Thirty-one tours were conducted in 2005. New viewing platform signs were constructed this year which present the most up-to-date information in relation to the Arid Recovery program.

Arid Recovery is increasingly featured on BHP Billiton's itineraries for visitors including tours and BBQ's and in 2005 a farewell dinner as well as a dinner/tour with the SA Premier, BHP Billiton Vice-president and the Olympic Dam operations management team.

The mining industry maintains a strong interest in Arid Recovery and eleven visits were undertaken at the reserve for BHP Billiton operations and corporate staff. Arid Recovery also hosted a visit to the reserve and presentation for students at the Australian Institute of Mining and Metallurgy (AusIMM) Australian Mineral Venture.

In 2004, Arid Recovery became a priority program under the Rangelands Integrated Natural Resource Management (INRM) Group. This State and Commonwealth government program (funded by both the State and the Natural Heritage Trust) aims to achieve sustainable natural resource management on a regional scale. Through this program, information and techniques developed by Arid Recovery can be communicated and applied throughout the rangelands. An NRM Board meeting and dinner was hosted by Arid Recovery in 2005.

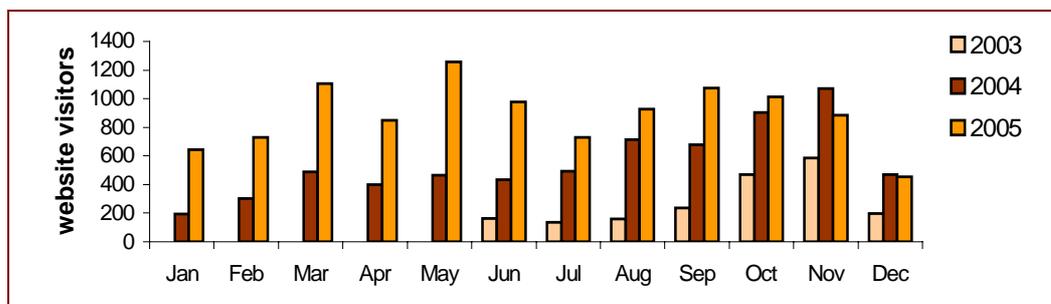


Figure 30. Visitors to the Arid Recovery website each month since tracking began in June 2003.

## PUBLICITY, EDUCATION AND AWARENESS

Table 11. Known items of publicity generated by Arid Recovery in 2005

Date	Organisation	Details
<b>Radio</b>		
07-Jan-05	ABC Local (SA)	Interview: External bilby release
10-Jan-05	ABC Local (SA)	Interview: New research re “smart” bilbies
04-Apr-05	ABC North & West	Interview: Bilby Release – genetic diversity
05-Apr-05	ABC Adelaide	Interview: Bilby Release – genetic diversity
04-May-05	ABC Port Pirie	Interview with Andrew Male on morning show: Aerial Baiting
25-May-05	ABC Local (SA)	Interview re Monarto bilby release update and western barred bandicoot update
28-May-05	ABC News (all)	News item re bilby deaths
2-Jun-05	ABC Port Pirie	Interview with Roger Taylor re Monarto bilby deaths
8-July-05	ABC North & West	Interview re bilby training project
18-Jul-05	ABC Adelaide	Interview with Peter Goers re Arid Recovery
31-Aug-05	ABC Radio (North and West)	Interview with Roger Taylor re Open Day and Burrowing Bettongs
7-Sept-05	ABC Radio North and West	Interview about Numbat release and Threatened Species Day. Open Day also mentioned
<b>Olympic Dam Intranet</b>		
21-Jan-05	Note From Bruce #5	ASMV visit to Reserve
12-Apr-05	Weekly Environment Update	Update on Arid Recovery activities
21-Apr-05	Note From Bruce #20	Mention of bilby release
29-Apr-05	Note From Bruce #21	Banksia Awards finalists congratulations
May-05	Dam News	Article re Banksia awards and front page pic
Sept-05	The Dam News	Article: Arid Recovery Opens Its Gate Article about success of Open Day
7-Nov-05	Olympic Dam Weekly Review	Arid Recovery mentioned regarding Premier Mike Rann having dinner at the Reserve
<b>Internet</b>		
28-May-05	ABC News Online	Article: Released bilbies die in reserve
9-Jun-05	Australian Geographic	Copy of ABC news article (removed)
27-Oct-05	Eyre Peninsula Tribune	Article: Parks group awarded. Arid Recovery mentioned
<b>Television</b>		
27-Apr-05	Rai-3	Italian film crew on site – taking footage for wildlife channel.
13-Apr-05	Channel 10	News Item: Bilby Release
3-Jun-05	Channel 10	Interview regarding Monarto bilbies
5-July-05	Rai-3 (Italian television network)	Italian film crew on site taking footage for travel channel

## PUBLICITY, EDUCATION AND AWARENESS

Table 11 continued.

Date	Organisation	Details
<b>Print</b>		
17-Feb-05	The Monitor	Front page article: Theft puts reserve at risk
17-Feb-05	The Monitor	Article: High mammal rates at outback reserve
18-Feb-05	Roxby Downs Sun	Article: Thieves hit eco project
18-Feb-05	Roxby Downs Sun	Article: Award winning project
12-Mar-05	The Advertiser	Article: Help bring back the bilbies
15-Mar-05	WBCSD (not yet published)	Arid Recovery profiled in briefing paper: "Marketing & Sustainable Development"
07-Apr-05	The Advertiser	Article: Big job for little fella
14-Apr-05	The Monitor	Article: SA's unique Arid Recovery reserve (in Flinders and Outback Tourism Feature)
14-Apr-05	The Monitor	Article: New additions to local bilby population
28-Apr-05	The Monitor	Baiting warnings: article on page 3, colour warning poster on page 20, BW warning poster on page 22.
May-05	Roxby Downs SA-School Camp Experience	Pamphlet advertising Roxby Downs to schools for a camping destination.
May-05	Roxby Downs Tourist Brochure	Advertising for Arid Recovery Tours
19-May-05	Eco Voice	Article: Banksia Awards 2005 Finalists
20-May-05	Roxby Downs Sun	Article: Arid Recovery in running for major award
25-May-05	RDCP Publication	Arid Recovery included in promotional package "Roxby Downs School Camp Experience"
26-May-05	The Monitor	Article: 2005 Banksia awards
5-Jun-05	Banksia Foundation	Profiled in finalists' booklet for presentation
10-Jun-05	Roxby Downs Sun	Article: Environmentalist's narrow miss at Banksia awards
24-Jun-05	Roxby Downs Sun	Article: Zoo bilbies perish in arid conditions
27-Jun-05	Envirofund Article	Interview with Jane Hammond about Envirofund focusing on Bilbies
8-Jul-05	Roxby Downs Sun	Article: Bilbies learn the truth about cats
24-Jul-05	Sunday Mail	Listed as "hot" in Peter Goers' "What's Hot, What's Not" list
4-Aug-05	The Monitor	Advertising in the Community Calendar for Open Day
4-Aug-05	The Monitor	Article: Bandicoot Baby Boom expected at the Reserve
5-Aug-05	Roxby Downs Sun	Advertising: Baiting Season Begins Article: Proven Success for Feral Control Program
18-Aug-05	The Monitor	Article: Arid Recovery Open Day
18-Aug-05	The Monitor	Baiting Warnings: Article about baits and baiting program Article: Far North in Focus Baiting warnings

## PUBLICITY, EDUCATION AND AWARENESS

Table 11 continued.

Date	Organisation	Details
<b>Print (continued)</b>		
1-Sept-05	The Monitor	Article: Open Day Information
1-Sept-05	The Monitor	Editorial: Open Day
15-Sept-05	The Monitor	Article: Rain can't dampen Open Day fun
2-Oct -05	Sunday Mail	Article: 13 skinks, a snake, goanna – from one cat No wonder Roxby wants them outlawed
13-Oct-05	The Monitor	Article: Teaching old bilbies new tricks
10-Nov-05	The Monitor	Far North In Focus: Aerial Baiting Article
10-Nov-05	The Monitor	Article: Drink a toast to the Numbats
24-Nov-05	The Monitor	OD Update mentions Mike Rann's visit to the Arid Recovery Reserve
15-Dec-05	The Monitor	Article: Numbats released at Arid Recovery
15-Dec-05	The Monitor	Numbat's 1st Christmas picture (by Dave Kovac) featured on Mini Monitors page

Table 12. Education and awareness initiatives generated during 2005 and to date (from 1998).

Details	Target Audience	2005	Total
<b>Media Items</b>			
See Table 11 for details	General public	70	425
<b>Interpretive displays</b>			
Roxby Downs Market Day	Roxby Downs community	6	28
Outback Fringe Festival in Roxby Downs	General Public	1	2
Easter Stall and Display Roxby Mall	Roxby Downs community	1	2
Roxby Pageant Float	Roxby Downs community	1	4
Glendambo Field Day	Pastoralists		1
National Parks festival	General public		3
Environmental Expo	General public		1
BHP Billiton Family Day	Mining community		4
World Environment Day	School children		4
National Science Week	School children		2
Olympic Dam Expansion	WMC employees		1
Eclipse at Roxby Downs	General Public		1
Royal Adelaide Show	General Public		1
Alligator Festival Port Augusta	Aboriginal School Children		1
Information Night for Roxby Residents	Roxby Downs community		1
Business and Community Partnerships awards presentation	Business and community members		1
Friends of Parks Forum	Friends of Parks Members		1

## PUBLICITY, EDUCATION AND AWARENESS

Table 12 continued.

Details	Target Audience	2005	Total
<b>Talks</b>			
Friends of Parks Events	Friends of Parks Members	1	3
Roxby Downs Area School	Local school students	2	7
St Barbara's Parish School	Local school students	1	1
Roxby Downs Kindergarten	Pre-school students	1	1
BHP Billiton Environment Seminars	Scientific Mining community	1	5
Friends of the Australian Arid Lands Botanic Gardens	General Public		3
Natural Resource Management Forum	Pastoralists		1
National Parks Forum	National Parks staff		1
World Environment day	Local school students		5
Northern Industries Forum	Mining and industry delegates		1
Field Naturalist Society	Roxby Downs community		1
Environment Institute	Professionals		1
Adelaide Investigator Centre	School/Uni students		1
Port Pirie School	School students		1
Australian Koala Foundation	Scientific Community		1
Federal Minister for Environment and advisors	Federal Politicians		1
Field naturalists groups– Adelaide	General public		3
Adelaide University Seminar	Scientific community		1
Field Naturalists – interstate	General Public		1
Adelaide Zoo	Zoo Volunteers		1
Project Presentation to NRM group	NRM board and other project proponents		2
Business and Community Partnerships	Business and community members		1
BHP Billiton environmental coordinators and high school teachers	Scientific and educational community		1
Local Community Awareness Aerial baiting	Andamooka community		2
CRES (Australian National University)	Scientific Community	1	1
Earthwatch presentation – Adelaide Zoo	General public		1
<b>University camps</b>			
University of Adelaide	University students	1	9
University of South Australia	University students		2

## PUBLICITY, EDUCATION AND AWARENESS

Table 12 continued.

Details	Target Audience	2005	Total
<b>Scientific Conferences and Functions</b>			
CRES (ANU) presentation	Scientific community	1	1
International Student Volunteers Conference	Scientific community	1	1
Premier/cabinet ministers function	Government	1	1
Banksia Awards Presentation	Scientific Community	1	2
SA Landcare Awards dinner	Scientific, government, public	1	2
Banrock Station Mammal Recovery Launch	Govt, scientific community	1	1
Bird Day Out conference	Scientific Community	1	1
Resource 2000	Mining Scientific community		1
Mammal Society of Australia	Scientific community		2
Ecological Society of Australia	Scientific community		6
Australian Rangelands Society	Scientific community		3
Australian Wildlife Management	Scientific community		2
Birds Australia	Scientific community		1
Australasian Vertebrate Pest	Scientific community		1
Earthwatch Conference	Scientific community and General Public		2
Australian Vet Conference	Veterinarians		1
Rotary Feral Cats Conference	Scientific community and General Public		2
Australia Native Plant Network Conference	Scientific community		1
Australian Minerals Conference	Mining Scientific community		2
Rangeland Pest Plant and Animal Control Conference	Scientific community		1
<b>Reserve Visits</b>			
Schools and universities	Students and children	3	32
Green Corps/CVA/ISV	Youth	3	11
Earthwatch	General public	2	6
Functions	BHP Billiton, Govt., public	4	
Garage Sale	General public	1	1
FAR meetings	Friends committee	8	
Steering Committee Meetings	Steering committee	2	
Other meetings	Government, public, industry	4	
Private tours	BHP Billiton, landholders, government	21	
Public Tours (paid)	General public	31	68
Open days, working bees, animal releases	General public	3	17
Indigenous training camps	Indigenous community		4

## VOLUNTEERS AND COMMUNITY INVOLVEMENT

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Over 600 people have actively assisted Arid Recovery on a voluntary basis since its inception in July 1997. Participants have come from a wide range of backgrounds and include:

- Friends of Arid Recovery (474)
- BHP Billiton staff (26)
- University of Adelaide Students (110)
- University of SA Students (26)
- National Parks & Government staff (21)
- CVA/Green Corps trainees (108)
- Members of indigenous groups (65)
- Earthwatch Volunteers (48)
- International Student Volunteers (32)

### UNIVERSITIES

A group of third year Ecological Restoration students from the University of Adelaide completed a one week research project on meat ant distribution around the reserve. Five groups of Ecological Restoration students have conducted projects at Arid Recovery to date.

Two Adelaide University students conducted PhD projects at the reserve in 2005. Janet Newell studied the impact of re-introduced species on the local seed bank and Josh Griffiths used the reserve to conduct an independent project on the ecology of the Greater Bilby.

Karleah Trengrove from the University of Adelaide completed her honours work on hopping mice in 2005 and Emmy Gerlach from the University of Adelaide commenced her project researching Ruby Saltbush *Enchyleana tomentosa*. Karl Newport commenced his Masters through Sydney University, investigating distribution and habitat preferences of the Western Barred Bandicoot.



### LOOK AND LEARN VISITS

Arid Recovery is a world leader in ecosystem recovery through the use of exclusion fencing. The success of the Arid Recovery fence design has been reproduced in Hawaii where an exclusion fence based on the Arid Recovery design has successfully protected the endangered Nene Geese *Branta sandvicensis* during moulting and breeding.

Many groups visit the reserve to learn about how the reserve was created and how techniques used at Arid Recovery can be used on their projects. Look and learn visitors to Arid Recovery in 2005 included staff from Banrock Station and DEH staff with the Bounceback program from the Flinders Ranges.

## VOLUNTEERS AND COMMUNITY INVOLVEMENT

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### INTERNATIONAL STUDENT VOLUNTEERS

The International Student Volunteer program provides opportunities for students from the USA to travel overseas and participate in conservation and community development programs as part of their college education.

Two International Student Volunteer groups visited the reserve in 2005 and completed the laying of all the remaining internal foot mesh to stop bilbies from digging out of the reserve.

They also participated in spotlighting, stick-nest rat nest surveys, weed control, building a boardwalk to the toilet, a shelter for the electric fence batteries and a fire-pit.

### EARTHWATCH

Earthwatch is an international organisation that supports global conservation research through financial and volunteer contributions. Arid Recovery hosted two Earthwatch expeditions in 2005.

Forty-eight Earthwatch volunteers have contributed to the Arid Recovery to date, with 16 participating in 2005. Volunteers come from all over the world including the United States, Japan, Denmark, Malaysia, China, Malta, Germany and England.

Earthwatch volunteers have made a valuable contribution to the collection of data at Arid Recovery, assisting in 2005 with stick-nest rat trapping, annual cage trapping, catching bilbies in the Second Expansion, conducting seed experiments at ant nests, radio-tracking sleepy lizards, measuring nests and burrows and spotlighting and netting bilbies.

## VOLUNTEERS AND COMMUNITY INVOLVEMENT

### FRIENDS OF ARID RECOVERY

The Friends of Arid Recovery (FAR) now has over 250 member households with members from as far afield as Germany and the United States. Membership includes BHP Billiton employees, primary, secondary and tertiary students, local pastoralists and soil boards, general public, National Parks Friends groups and employees, 4WD Clubs, Australian Geographic and local businesses.

The Friends group produces a quarterly newsletter that is distributed to all members and sponsors. The group coordinates volunteer involvement in Arid Recovery, staffs information displays, organises fundraisers and conducts working bees.

Fundraisers during 2005 included selling of merchandise, stalls at the Roxby Downs Market, a garage sale, a stall and barbeque at the Outback Fringe Festival, raffles and the making and selling of chocolate bilbies over Easter. Other activities organised and assisted by the Friends group this year included the open day, tag-along tours of the reserve, checking cat traps, assisting with annual trapping for small mammals and reptiles, radio-tracking bilbies and sleepy lizards, bandicoot trapping, data entry and hide feeding.

The third Arid Recovery open day was run by the Friends group in early September. This was the most successful open day to date with more than 200 people attending.



Activities included nature walks, children's scavenger hunt, radio-tracking, damper cooking and a colouring competition for the children. The Friends group aim to host another open day next year.

During 2005, FAR applied for four grants (Table 13) and received or secured over \$60,000. Many local businesses and landholders also sponsored Arid Recovery through the use of their goods and services. Lavrick Engineering sponsored \$50 worth of free fuel every month. Friends members also assisted with radio-tracking, spotlighting, hide feeding, bandicoot feeding, research projects and general monitoring programs.

Table 13. Grants applied for and monies received/secured by FAR during 2005.

Grant	Amount Applied	Received (or secured)
Threatened Species Network (WWF)	\$9,000	\$9,000
Landcare Australia/Banrock Station	\$3,000	\$3,000
Rangelands INRM 05-06	\$50,000	\$49,000
Haigh's Chocolates	\$5,000	\$5,000
<b>TOTAL</b>	<b>\$67,000</b>	<b>\$66,000</b>

**PHOTO:** FRIENDS OF ARID RECOVERY VOLUNTEER GAVIN IBBETT DISPLAYS DAMPER COOKED AS PART OF A BUSH COOKING DEMONSTRATION AT THE 2005 ARID RECOVERY OPEN DAY – PHOTO COURTESY OF THE MONITOR NEWSPAPER

## AWARDS

Arid Recovery volunteers, partners and staff have been consistently recognised for their hard work and success through winning several awards and being chosen as a finalist or highly recommended for others (Table 14).

In 2005 Arid Recovery was a finalist in both the SA Landcare Awards and the prestigious Banksia Environmental Awards.



Table 14. Awards received by Arid Recovery to date.

<b>2005</b>	
Banksia Environmental Awards	Finalist
Landcare Community Awards	Finalist
<b>2004</b>	
KESAB Award for Environmental Excellence	Winner
Friends Of Parks Special Award for Pest Animal Control	Winner
UN World Environment Day Awards	Finalist
<b>2003</b>	
Prime Minister's Award for Excellence in Community Business Partnerships	State Winner
KESAB Award for Environmental Excellence	Winner
Bushcare Nature Conservation Awards	Finalist
Landcare Community Awards	Finalist
UN World Environment Day Awards :	
- Excellence in Land Management	Finalist
- Best Community Based Environmental Project	Finalist
Banksia Foundation Awards	Finalist
<b>2002</b>	
National Australia Bank Community Link Award	Winner
Friends of Parks – Best Wildlife Award	Highly Commended
KESAB Award for Environmental Education	Winner
<b>2001</b>	
SA Great Regional Award for Science and Environment	Winner
WMC Resources “DAM Best” Award	Winner
SA ALCOA Landcare community group	Finalist
<b>2000</b>	
Resource 2000 – corporate citizenship	Winner
Resource 2000 – special award for Environmental Excellence	Winner

**PHOTO:** ARID RECOVERY CO-FOUNDERS JOHN READ AND KATHERINE MOSEBY AT THE 2005 BANKSIA ENVIRONMENTAL AWARDS CEREMONY – PHOTO COURTESY OF THE BANKSIA FOUNDATION

# BUDGET

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## 2005 BUDGET

### Contributions

Over \$650,000 of in-kind and monetary contributions were received from 15 organisations in 2005 (Table 15). Monetary contributions comprised \$445,100 of the total contributions, with BHP Billiton contributing 46% of the total contributions (financial and in-kind).

BHP Billiton was the largest single monetary contributor, providing 67% of the finances. BHP Billiton's operating contribution was higher in 2005 than previous years due to the employment of an additional staff member for rabbit control work in the expansion and an extra staff member for coordinating the education programs. The Friends group privately raised 28% of monetary costs.

In-kind contributions represented 32% of the total contributions to Arid Recovery. Major in-kind contributors included the Friends of Arid Recovery, University of Adelaide, Earthwatch and International Student Volunteers (Table 15). In-kind contributions involved the donation of volunteer assistance for animal and endangered species monitoring and transfers, feral animal control, infrastructure maintenance and research. Other in-kind contributions included vehicles, transport costs, electrical servicing and plane hire.

In-kind labour contributions are valued at \$20 per hour for unskilled labour and \$25 or \$30 per hour for professional labour, following standard Natural Heritage Trust recommendations outlined by the Commonwealth Government. Professional in-kind contributions include monitoring and expert advice by DEH, Australian Wildlife Conservancy, CALM, Rangelands INRM, and Outback SA staff, and steering committee members' contributions.

BHP Billiton provide a highly significant amount of in-kind support that is not quantified in this report. Staff from both the Land Management Department and Environment Section have operational involvement in Arid Recovery as part of their work program.

In 2005 these included contributions from John Read (Land Manager), Pete Paisley (Land Management Coordinator) and Greg Kammermann (Land Management Projects Officer), Maree Jackson (Land Management Administrator). Other significant in-kind contributions from BHP Billiton include office space and facilities, land resources and administrative and maintenance support.

### Expenditure

Major expenditure items included wages, fencing materials and research and reintroduction activities (Table 15). Wages include two full time positions comprised of one full time Manager and one full time Ecologist. The casual Research Coordinator and Publicity Coordinator positions were maintained in 2005, and a part-time position of Education Coordinator was created in 2005. A Maintenance Officer was also employed for one day a week to conduct fence checks and maintenance and two casual Feral Animal Control Officers were employed for 6 months to conduct rabbit control in the Red Lake Expansion.

Other major expense items included the fuel and maintenance for the 4WDs and volunteer associated costs such as fuel and food reimbursements.

## PROPOSED 2006-07 BUDGET

### Annual Contributions and Expenditure

Over \$425,000 of funding has already been secured for 2006. Some of this funding includes monies also received in 2005 that are carried over into 2006. Major contributors are BHP Billiton, SA Arid Lands NRM Board, DEH, Foundation for Australia's Most Endangered Species (FAME), and WWF (Threatened Species Network). Funding has also been sought from the Rangelands Action Project (RAP) and the Nature Foundation SA.

The main costs in 2006 will be wages, fuel, feral animal control and monitoring, endangered species reintroduction and monitoring, research projects and educational/publicity materials and infrastructure.

## BUDGET

Table 15. Arid Recovery Contributions and Expenditure during 2005.

2004 Contributions	2005 monetary	2005 in-kind	2005 total
<b>Contributors</b>			
BHP Billiton (operating)	248,319		248,319
BHP Billiton (capital)	50,810		50,810
SA Dept. for Environment & Heritage	10,500	8,559	19,059
University of Adelaide		25,693	25,693
Adelaide Zoo		1,550	1,550
CALM WA		250	250
Outback SA		1,250	1,250
International Student Volunteers		23,440	23,440
Australian Wildlife Conservancy		1,875	1,875
Olympic Aviation		1,250	1,250
IVS Industrial Solutions		500	500
Tom Bunworth (Electrical)		400	400
Earthwatch	12,018	24,640	36,658
<b>Friends of Arid Recovery</b>			
In-kind support		122,869	122,869
Fundraising	12,641		12,641
Donations	6,782		6,782
<b>Grants</b>			
<i>Landcare Australia/Banrock Station</i>	3,000		3,000
<i>WWF - TSN</i>	14,860		14,860
<i>Envirofund (NHT)</i>	15,320		15,320
<i>Rangelands INRM Group</i>	65,000	1,500	66,500
<b>Sponsors</b>			
Haighs Chocolates	5,000		5,000
Lavrack Engineering	850		850
<b>Total Contributions</b>	<b>445,100</b>	<b>213,776</b>	<b>658,876</b>
<b>2004 Expenditure</b>	<b>BHP Billiton</b>	<b>Friends / DEH</b>	<b>Total</b>
Wages	155,254		155,254
Vehicle Costs	20,426	8,489	28,915
Research & Reintroductions	2,481	13,071	15,552
Fauna & Veg Monitoring		4,340	4,340
Feral Animal Control	42,173	61,916	104,089
Fencing	225		225
Reserve Infrastructure		5,659	5,659
Education & Awareness		5,725	5,725
Fundraising Costs		1,745	1,745
General Stores	15,103	6,803	21,906
Communications/Administration/Postage	1,567	792	2,359
Travel & Accommodation	9,093	106	9,199
Personnel Expenses	1,998	4,958	6,957
Volunteer Reimbursements		7,724	7,724
CAPITAL: Quad Bike	9,054		9,054
CAPITAL: Fencing Materials	41,756		41,756
<b>Total Expenditure</b>	<b>299,129</b>	<b>121,329</b>	<b>420,458</b>
<b>Funds held by Friends of Arid Recovery</b>			
Opening balance of account as at 1 January 2005			96,352
Closing balance of account as at 31 December 2005			69,194

## BUDGET

Table 16. Annual In-Kind Contributions

Contributor	1998	1999	2000	2001	2002	2003	2004	2005
Aboriginal Land Trust		1,800	4,000				1,000	
Australian Wildlife Conservancy								1,875
BP			100					
CALM W.A.			5,000					250
Coates Hire		2,000						
Conservation Volunteers Aust.		13,200	2,400		11,520		7,680	
Cowell Electric			150	150	200			
CSIRO W.A.		2,000						
DEH*	3,000	3,400	1,700	2,040	2,500	5,839	13,880	8,559
Dept. WALABI						2,000	3,150	
Earthwatch							12,800	24,640
Eurest			550	300	200			
Foodland			60					
Friends of Arid Recovery	23,975	30,774	63,845	67,740	79,680	80,832	98,150	122,869
Garry Baker Building			1,500			150		
Greencorps	8,400	38,400	135,600	71,400				
Heading contractors				1,000				
Int'l Student Volunteers							27,360	23,440
IVS Industrial Solution								500
Lavrick Engineering		1,200	660	387				
Northpoint Toyota		1,000						
Olympic Aviation Pty Ltd								1,250
Olympic Dam Maintenance						1,500		
Olympic Dam Tours			400					
Olympic Dam Transport		1,000	2,180	1,550	1,000			
Outback SA								1,250
Pastoral Management Branch	520	1,760						
PIRSA (APCC)	700	350	1,100		3,000	4,000		
Rangelands INRM Group								1,500
Readymix			855			300		
Roxby Downs Area School	985	2,370		180		500		
Roxby Downs Motor Inn			50					
Roxby Downs Racing Club						180		
Royal Zoological Soc. of S.A.			4,000	3,000	3,000	4,000	400	1,550
SBS			340					
SDS				250				
Specialised Tyres		800	1,000	865	500	480		
Tom Bunworth (Electrical)								400
Trek About Tours			400					
Tubemakers Roxby Downs				200				
University of Adelaide	21,000	36,120	17,300	12,700	7,000	13,975	32,355	25,693
University of Queensland							1,240	
University of SA		14,400		9,000				
Wreckair hire			200	250	200			
<b>Total Contributions</b>	<b>58,580</b>	<b>150,574</b>	<b>243,390</b>	<b>171,012</b>	<b>108,800</b>	<b>113,756</b>	<b>198,015</b>	<b>213,776</b>

\* This in kind contribution does not include costs of maintaining breeding colonies of endangered species or genetic databases.

## BUDGET

Table 17. Annual Financial Contributions

Income	1998	1999	2000	2001	2002	2003	2004	2005
<b>Contributors</b>								
BHPB (operating)	32,344	116,500	167,467	111,038	164,761	194,555	215,225	248,319
BHPB (capital)				38,000	9,081	38,000	161,929	50,810
Dept. Environment	18,000	4,420	3,700		8,000	5,250	10,500	10,500
University of Adelaide		3,000	2,540					
Earthwatch						26,793	16,548	12,018
Land Mgmt Research Grant			21,080					
BHP (fencing)		35,000						
Dog Fence Board			13,500					
Lavrick Engineering							350	850
Macro Meats		164	102	214		500		
Australia Geographic				10,000				
Aboriginal Lands Trust			2,350	4,000				
Wesfarmers			300					
RZSSA			1,000					
Haighs								5,000
<b>Friends of Arid Recovery</b>								
Donations				1,573	6,047	4,079	4,670	6,782
Fundraising	2,000	3,953	12,096	5,814	13,160	7,803	6,086	12,641
<b>Grants</b>								
<i>Friends of Parks Directors</i>			1,000					
<i>Friends of Parks Inc.</i>			1,000	5,000	2,500	2,000		
<i>Landcare Aust/Banrock</i>								3,000
<i>Native Veg. Fund (DEH)</i>				4,095		2,100		
<i>Nature Foundation SA</i>		2,750	7,470		3,957		3,500	
<i>NHT Envirofund</i>		29,991	28,030	12,000		17,050	51,986	15,320
<i>NHT Rabbit Abatement</i>				58,990	30,210			
<i>Rangeland Action Project</i>				6,045				
<i>Rangelands INRM Group</i>						8,000	32,510	65,000
<i>WCF</i>			4,050	1,344	896	2,073		
<i>WWF - TSN</i>		3,930	11,610	1,290	3,900	4,260		14,860
<b>Total Income</b>	<b>52,344</b>	<b>199,708</b>	<b>277,295</b>	<b>259,403</b>	<b>242,512</b>	<b>312,463</b>	<b>503,303</b>	<b>445,100</b>

# BUDGET

Table 18. Annual Expenditure

Expenditure	1998	1999	2000	2001	2002	2003	2004	2005
Wages	63,824	90,107	90,490	121,817	134,701	160,150	168,272	155,254
Vehicle Costs		12,868	12,855	9,254	20,139	17,208	23,001	28,915
Research & Reintroductions	2,372	10,629	16,241	13,607	24,046	4,672	11,425	15,552
Fauna & Veg Monitoring					937	3,843	858	4,340
Feral Species Control		2,730	4,153	4,437	15,326	23,487	437	104,089
Fencing		8,103	1,992				8,646	225
Reserve Infrastructure		0	0	11,278	3,560	314	10,249	5,659
Education & Awareness		1,460	338	1,440	11,572	11,664	6,669	5,725
Fundraising Costs		1,295	2,240		8,472	5,320	933	1,745
General Stores		19,794	8,025	2,371	14,023	53,838	33,374	21,906
Comms/Admin/Postage	1,045	122	381	595	2,673	6,273	4,044	2,359
Travel & Accommodation	1,389	4,933	4,576	8,505	14,465	14,845	6,480	9,199
Personnel Expenses							2,475	6,957
Volunteer Reimbursements							3,753	7,724
<b>Capital</b>								
4WD Toyota Hilux				38,000		38,000		
Fencing materials	8,234	59,079	110,000	4,137			152,329	41,756
4 wheel motorbike			6,000		9,081		9,600	9,054
<b>Total Expenditure</b>		<b>211,120</b>	<b>257,291</b>	<b>215,441</b>	<b>258,995</b>	<b>339,614</b>	<b>442,545</b>	<b>420,458</b>

## WORKPLANS AND LONG TERM ACTIONS

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Tasks for next year are outlined in the 2006 Workplan (Appendix A). The following long-term actions have been formulated based on Arid Recovery objectives outlined on page 2 of this report.

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### Establishment of a cat, fox and rabbit free reserve

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Achieved for a 60 km<sup>2</sup> area in April 2001.

In 2004 the Red Lake Expansion fence was completed adding an additional 26 km<sup>2</sup> to the reserve. Rabbits are currently being removed from this area and hope to be eradicated by June 2006. Following this cats and foxes will be removed by December 2006. Fences within the 60 km<sup>2</sup> section were checked once per week in 2005.

Quarterly checks are conducting internally to detect any presence of feral animals. Internal foot mesh was completed in 2005 to prevent rabbits from entering the reserve.

Fence checking and feral monitoring will continue to be conducted in 2006. Fences will also be checked once per week in the Red Lake Expansion area.



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### Establishment of a regional buffer zone outside the reserve where cat, fox and rabbits are controlled

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Aerial baiting for foxes and cats has been conducted every year since 2002 and in 2005 included a quarterly baiting effort in a 20km baited zone around the reserve perimeter. Aerial baiting will be conducted twice in 2006 and is then dependent on analysis of feral monitoring results. Monitoring of track activity of rabbits cats and foxes in baited and control areas will continue to be conducted until June 2006.

Twelve permanent audio lures and leg hold traps are set around the reserve perimeter and have been checked daily since 2002. However, due to the significant effort and low capture rate, trapping will only be

conducted over a one week period each month in 2006.

Spotlight counts have been conducted quarterly to determine the rabbit, fox and cat pressure on the fence. Shooting around the perimeter has been opportunistic, but will be conducted more regularly in 2006 to replace reduced trapping effort.

The establishment of a buffer zone will not only reduce feral pressure on the fence, but reduced feral populations will enable wild re-introduced animals (bilbies) and other native animals to become established.

## WORKPLANS AND LONG TERM ACTIONS

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### Re-establishment of endemic species, particularly threatened or locally extinct species, within and beyond the Arid Recovery Reserve

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Four locally extinct species have been successfully re-introduced into Arid Recovery to date. In 2005 a trial re-introduction of the numbat was completed. A transfer of Western Barred Bandicoots was also conducted from the Main Exclosure to the Northern Expansion. In 2006 Arid Recovery will continue to pursue the possibility of a second release of Western Barred Bandicoots from WA for genetic purposes and another transfer from the Main Exclosure into the Northern Expansion. Through the creation of a predator proof fence, the reserve now contains ten times the amount of native mammals compared with the outside. The Spinifex Hopping-mouse, Plains Rat and Bolam's Mouse have all benefited through

the creation of the reserve. However, to create a more self-sustaining system, Arid Recovery plans to trial a re-introduction of a predator into the reserve. The Woma Python will hopefully be re-introduced some time during 2006.

A long-term goal of Arid Recovery is to re-establish populations of threatened species outside the reserve. In 2004 Arid Recovery trialled a external release of Greater Bilbies. Several bilbies also escaped prior to the installation of foot-mesh and have become established in the wild. Arid Recovery plans to conduct another trial release of predator trained and untrained bilbies into the wild in 2007.

### MONITORING

---

#### Monitor the processes of ecological restoration and provide transferable information and techniques for broadscale environmental management of Australia's arid lands.

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Annual monitoring of the impacts of feral and re-introduced species on the native vegetation and ecosystem function is undertaken through the use of photopoints, vegetation transects, exclosures and seedling recruitment, growth and survival studies. In 2005 no vegetation monitoring was conducted as it was decided to analyse previous years results and use this to determine the most effective monitoring program. Landscape Function Analysis will also be undertaken due to the establishment of 14 new monitoring sites.

Monitoring of the condition, density and reproductive status of native and re-introduced animals was conducted in 2005 through annual trapping for small vertebrates, annual cage trapping, nest/burrow monitoring, quarterly track and fixed trapping transects, bird transects, mist-netting, spotlighting, radio-telemetry (sleepy lizards, bilbies and numbats) and opportunistic trapping (bandicoots and bilbies).

In 2005 regular spotlight counts were conducted in all areas of the reserve to compare with track counts for efficiency of monitoring methods. These spotlighting counts will not be conducted in 2006 as track counts are deemed a more reliable monitoring method. Burrow and warren sites were also monitored.

Nest monitoring for stick-nest rats will be conducted biannually, but annual trapping will no longer be conducted for this species. The annual cage trapping will be conducted again but will be modified using a mark-recapture monitoring technique. Track counts in the Northern Expansion will also be modified using rubber matting to sweep the dunes so tracks are seen more clearly (current methods use wheel ruts which are difficult for viewing tracks).

In 2006 small vertebrate monitoring data from the past eight years will be statistically analysed and a review of current monitoring methods will be completed. Numbats will be radio-tracked each week in 2006.

## WORKPLANS AND LONG TERM ACTIONS

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### RESEARCH

---

#### **Research the processes of ecological restoration and provide transferable information and techniques for broadscale environmental management of Australia's arid lands.**

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In 2005 three research students conducted scholarship projects at the reserve. In addition, four new/ongoing Arid Recovery research projects were also undertaken and two honours students, two PhD students and one Masters student were also

conducting research. Two scientific papers were published and two Earthwatch trips were conducted in 2005. Three - five papers will be submitted for publication in 2006.

New research projects or continuing projects in 2006 will include the following:

- A trial reintroduction of Woma Pythons
- A trial reintroduction of Numbats
- Design of a one way gate system
- The role of dingoes in suppressing secondary predators
- Home ranges of cats and foxes
- Set interim population limits
- Vegetation mapping of the Northern Expansion
- Sleepy lizard home range

### DEMONSTRATION

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#### **Increase the profile of Arid Recovery as a demonstration of the value of conservation partnerships.**

---

In 2006 Arid Recovery plans to maintain the number of media releases and website hits (although these are likely to increase). Three awards will also be applied for and a conference attended by each staff member.

Arid Recovery aims to raise the profile of the reserve by publishing more material in tourism brochures and on other interpretive materials.

#### **Develop and maintain formal and informal networks between stakeholders.**

---

In 2005 networks between Arid Recovery and Rangelands INRM, WWF - Threatened Species Network, CALM and Envirofund were maintained.

New linkages were created with Australian Wildlife Conservancy at Scotia Sanctuary in terms of assisting each other with re-introduction programs and exchanging ideas for monitoring programs.

New external support has also come from Banrock Station for the numbat re-introduction and from Haigh's Chocolates with the predator training for bilbies.

Arid Recovery also established a new link with the Foundation for Australia's Most Endangered Species (FAME) and have put in an application for support with the numbat re-introduction program in 2006.

# WORKPLANS AND LONG TERM ACTIONS

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## EDUCATION AND TRAINING

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### Increase awareness of conservation and sustainable management issues and the value of industry-backed partnerships to address these issues.

---

Achieved through public tours of the reserve, market stalls, the website, school presentations/visits to the reserve and publicity material. Friends of Arid Recovery conducted 31 tours in the First Expansion area in 2005. A new viewing platform display was created to provide visitors with the most recent information regarding the Arid Recovery program. One undergraduate university research group visited the reserve and three scholarship students conducted research in 2005.

In 2006 Arid Recovery (through FAR) plan to increase the number of public tours to the reserve, increase publicity material (especially in magazines), attend field days and have more group visits to the reserve (i.e. indigenous training camps, university camps, school of the air camps, one ISV trip and an Earthwatch teachers camp). Earthwatch expeditions will not be undertaken in 2006.



The interpretive display in the Roxby Downs Cultural Precinct Visitors Centre will be upgraded in 2006 and a new Borefield Road display and self-guided interpretive walk constructed. A new portable display will also be available for market days, field days and conferences in 2006.

A school education pack on arid zone conservation will also be completed in 2006 which can be used by primary schools throughout Australia.

### Objectives: Encouraging and developing arid zone restoration ecologists and land managers.

---

In 2005 a new position at Arid Recovery was created. An Education Co-ordinator was employed on a part-time basis to direct education programs for Arid Recovery into the future. Although no presentations were given by Arid Recovery at conferences in 2005, each staff member will present at a minimum of one conference in 2006. Arid Recovery staff were trained in the latest GIS applications and received firearms training. In 2005, three scholarship students, one

university group, two honours students, two PhD students and one masters student conducted work at Arid Recovery. For 2006, two scholarship students, one university group, one honours student, one masters student and three PhD students will be undertaking research in conjunction with Arid Recovery. Training for 2006 will consist of snake handling and writing grant applications.

**PHOTO:** ARID RECOVERY ECOLOGIST JENNY STOTT DISPLAYING A BEARDED DRAGON FOR LOCAL CHILDREN AT THE 2005 ARID RECOVERY OPEN DAY – PHOTO: MICHELLE DUBOIS

# APPENDICES

## APPENDIX A: 2006 WORKPLAN

Task	P	daily	weekly	ft/nt	month	Ann	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
<b>Re-introductions</b>																		
Numbat TP and reintroduction	1																	
Womas	2																	
More WBB's from WA	3																	
WBB breeding/transfer	1																	
<b>Native Flora and Fauna Monitoring</b>																		
Stick-nest rat nest monitoring	1																	
Numbat monitoring	1																	
Seedling monitoring sites	3																	
Standard plant sites	1																	
Annual pitfalls	1																	
Annual cage trapping	1																	
Bird monitoring design	3																	
Annual Veg & pitfall data analysis	1																	
Review current monitoring program	2																	
Track transects	1																	
External bilby survey	1																	
LFA monitoring	1																	
Burrow monitoring	1																	
Bilby netting	1																	
<b>Infrastructure</b>																		
Red lake fence repairs	2																	
Clearing fenceline-firebreak	2																	
Red lake displays	2																	
New displays VIC	2																	
Partition in sleeping quarters	3																	
Fence audit	1																	
Plumb rainwater to kitchen	2																	
<b>Research projects</b>																		
Bilby training and release	1																	
One way gates	1																	
Set interim population limit	2																	
Veg mapping	2																	
Sleepy lizards	2																	
Cat toxin trial	2																	
Cat trap vs baiting trial																		
Cat home range	2																	
Echidnas	1																	
Dingoes	2																	

# APPENDICES

## Appendix A: 2006 Workplan (continued)

Task	P	daily	weekly	ft/nt	month	Ann	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
<b>Reporting</b>																		
Annual report	1																	
Annual research report BHPB	1																	
Student/research project reports	1																	
Collate AR research reports	3																	
Monthly reports	1																	
Earthwatch report																		
<b>Grants</b>																		
Grant management	1																	
Nature Foundation Grant application	1																	
FAME Grant application	1																	
AAS Grant application	1																	
INRM tracker reporting	1																	
WCF Temperature grant summer/winter	1																	
TSN Numbats	1																	
Landcare Australia - numbats	1																	
Diet of bettongs and bilbies	1																	
Comparison of monitoring methods gra	1																	
<b>Administration</b>																		
Ordering and quotes	1																	
Paying bills	1																	
Filing	2																	
Update volunteer hours database	1																	
Update publicity/visits database	1																	
Photodatabase	2																	
MOU update	1																	
Five year plan update	1																	
Update reworks	2																	
Pays	1																	
MYOB update	1																	
Create procedures document	1																	
Update procedures document	1																	
Staff meetings	1																	
Stock take of merchandise	2																	
Update forms & permits	1																	
<b>Friends Group</b>																		
Newsletters	2																	
Membership list	1																	
Audit friends group accounts	1																	

# APPENDICES

## Appendix A: 2006 Workplan (continued)

Task	P	daily	weekly	ft/nt	month	Ann	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
<b>Feral Animal Control</b>																		
Red lake rabbit eradication	1																	
Aerial baiting program	1																	
Rostered, buffer feral animal control	3																	
<b>Routine activities</b>																		
Perimeter fence check	1																	
Internal fence check	1																	
Rainfall	1																	
Charging	1																	
Electric fence check	1																	
Cat traps-check	1																	
Cat traps- reset	1																	
Cat trap efficiency (faps)	1																	
Vehicle check	1																	
Vehicle forms and servicing	1																	
Battery checks	1																	
Plants in fence	2																	
Feed at hide 2x per week	1																	
Equipment maintenance	1	As Required																
<b>OH&amp;S</b>																		
Check fire extinguishers/first aid kits	1																	
Update induction document	1																	
Safety audit	1																	
Check main gate emergency procedure	1																	
<b>Scientific papers</b>																		
Diet paper-bilby/bettong	1																	
Vertebrate and veg monitoring	1																	
Reintroduction methods	1																	
Cat baiting	2																	
Bilby external release	2																	
Comparison of monitoring methods	3																	
Seedling project	3																	
One-way gates	3																	
Burrows	3																	
Hopping mice breeding	3																	
Sleepy lizards	3																	
<b>Feral Monitoring</b>																		
Weed monitoring	2																	
Check exclosures for rabbits / cats	1																	
Aerial baiting review	1																	
Spotlight transect around exclosure	2																	

# APPENDICES

Appendix A: 2006 Workplan (continued)

Task	P	daily	weekly	ff/nt	month	Ann	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
<b>Education/awareness</b>																		
Tour guide training	1																	
Monitor/Sun - Media Release - Monthly	1				■													
T.V. Program: Children's Program	3													■				
RoxFM: Info Spots	2																	
Statewide Media Release - Quarterly	1						■			■			■			■		
Dam News Article - Quarterly	1						■			■			■			■		
Magazine Article: Across The Outback	2											■	■					
Magazine Article: Stock Journal	2										■							
Borefield Rd interp	1										■							
School of the Air: supply resources	2												■					
Telemetry Field Day - Display/Stall	2								■									
Royal Adelaide Show - Display/Stall	2															■		
Croc Week - Display/Stall	2					■												
BHP Billiton HSEC Award	1											■						
BHP Billiton management visits	1																	
Indigenous Group visit from Maree	3					■												
School of the Air: host camp	3					■												
Local school visits to Reserve	1																	
Adelaide University: student camps	2															■		
Flinders University: student visits/camps	3					■												
Scholarships	1								■								■	
ISV - One Group	1													■				
Website	1						■			■			■			■		
School Pack on the website	1							■										
Source portable display materials	2																	
Develop "school camp" publicity materi	3															■		
Review & redevelop AR info brochure	2												■					
Develop "Annual Report Summary"	2							■	■									
Inclusion in regional tourism materials	2													■				
Earthwatch (teachers)	2									■						■		
National Parks Forum	1					■												
Conferences	2					■												
<b>Training and Development</b>																		
Snake handling	3					■												
Writing grant applications	3					■												
<b>Other</b>																		
Remove bilbies from 2nd expansion	1						■	■	■	■								
Student/volunteer management	1						■	■	■	■	■	■	■	■	■	■	■	■
BHPB Vac student	1						■	■										■

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