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Mission Statement

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

Project Summary

The Arid Recovery Project is a joint conservation initiative between WMC Resources, Friends of the Arid Recovery Project, the Department for Environment and Heritage (DEH) and the University of Adelaide. The project was implemented in June 1997 to take advantage of rabbit numbers reduced by calicivirus by removing feral animals from an arid zone landscape. The entire 60km² Arid Recovery Reserve, which is located 5km north of the Olympic Dam mine in northern South Australia, is now completely enclosed within a rabbit, cat and fox-proof fence. The project aims are as follows:

1) To facilitate ecological restoration of arid ecosystems through:
   - Removal and exclusion of feral animals
   - Recovery of existing native vegetation
   - Re-establishment of threatened species
   - Adaptive management based on monitoring outcomes

2) To monitor and research the processes of ecological restoration and provide transferable information and resources for environmental management of Australia's arid lands including;
   - Arid zone recovery trends and techniques
   - Re-introduction and rehabilitation protocols
   - Cost-effective large-scale feral animal control
   - A source of acclimatised animals for other arid zone re-introduction sites

3) To demonstrate how mining, pastoralism, tourism and conservation organisations can work together to achieve sustainable ecological outcomes.

4) To provide education and training opportunities which will:
   - increase community and industry awareness of arid zone conservation issues
   - encourage and develop arid zone restoration ecologists

The project depends heavily on volunteer labour and is assisted by the local community, conservation organisations, students and indigenous groups. An Arid Recovery Committee oversees the running of the project with a member of each founding organisation represented. The Arid Recovery Project has been planned in stages to allow monitoring of project progress. Project stages and their progress are outlined in Table 1.

Table 1: Project stages and current progress

Stage no.	Details	Start date	Finish date	Results so far
1	Construction of a 14km² exclosure	August 1997	January 1998	*Exclosure constructed by contractors and volunteers*
2	Removal of rabbits	October 1998	January 1999	*All rabbits removed from exclosure after over 8000 hours of volunteer effort*
3	Establishment of a plant and animal monitoring system	August 1997	April 1998	*Plant sites established with Pastoral Management Branch; Animal sites established with Adelaide University students*
4	Electrification of the fence and removal of cats and foxes	January 1999	March 1999	*Audio lures used to eradicate the last cat*
5	Re-introduction of between 3 and 5 nationally threatened species	April 1999	April 2000	*Greater Stick-nest Rats re-introduced in April 1999; Burrowing Bettong re-introduced in October 1999; Greater Bilby re-introduced in April 2000*
6	Establishment of a regional buffer zone	January 1999	ongoing	*Audio lures, fumigation, trapping, baiting and shooting all used to reduce cat, fox and rabbit numbers in buffer zone*
7	Increase the size of the main exclosure to 60km² to accommodate the re-introduction of wide-ranging species and to maximise the chance of intercepting patchy rainfall	May 1999	Dec 2000	*First(8km²) and second (8 km²) expansion areas fenced and all rabbits eradicated. Third and final 30km² expansion area fenced and rabbit control in progress*
8	Increase community awareness and participation in arid zone conservation	June 1999	ongoing	*Information displays, brochures, talks, attendance at expos, festivals, field days etc. Over 160 items of publicity generated to date.*

Major Achievements in 2000

During 2000, many achievements were made at the Arid Recovery Project. The most notable achievements include:

- **Completely fencing the entire 60km² Reserve area** *The fencing was completed by the second Green Corp team to be based at the site and the entire Reserve is now fenced with more than 30km of rabbit, cat and fox-proof netting. The official fence closing ceremony was conducted on December 21st 2000 and attracted both television, print and radio publicity*.

- **Re-introducing the Greater Bilby** *In April 2000, 9 bilbies from the captive breeding program coordinated by the S.A. Bilby Recovery Team were released into the main exclosure. Bilbies began breeding immediately and numbers at January 2001 are now estimated at over 20 animals. This is the first time bilbies have been back into the S.A. arid zone since their local extinction in the 1930's.*

- **Re-introducing the Burrowing Bettong**. *10 bettongs were obtained from W.A. for a trial release in 1999. Based on the success of this release a further 20 bettongs were released in September 2000. There have been no known mortalities of Burrowing Bettongs to date, with breeding still occurring. Estimates of Burrowing Bettongs at January 2001 are 45-55 animals.*

- **Fencing and eradicating rabbits from the 8km² second expansion area.** *The fencing was completed by the first Green Corp team to be based at the site and rabbit eradication was completed in April 2000. Over 30 km² of the project area is now rabbit-free.*

- **Raising more than $12 000 through fundraisers and membership by the Friends of the Arid Recovery Project.** The Friends group increased its membership to over 120 and raised funds towards the costs of re-introducing threatened species.

Project Team

The project team is made up of committee members and project officers. The Project supports two full time positions made up of a Project Coordinator and part time project officers.

Katherine Moseby- Project Coordinator
Andrew Freeman- Feral Animal Control Officer
Nicki Munro- Casual Project Officer
Jackie Bice- Casual Project Officer, Interim Project Coordinator
Greg Kammermann- Fencing Coordinator

Committee members in 2000

Dr John Read- WMC Land Management representative
Peter Copley- Department for Environment and Heritage (NP&W S.A.) representative
Dr David Paton- University of Adelaide representative
Katherine Moseby- Friends of the Arid Recovery Project representative
Keith Ashby- WMC Environment Dept. representative

Fencing and expansion

The Arid Recovery Reserve comprises 60km² of arid land (Figure 1). Many habitats are present within the Reserve including chenopod (saltbush/bluebush) inter-dunal swales, *Acacia* dunes, native pine and mulga sandplains, canegrass swamps, canegrass dunes and claypans. The area is bordered to the north by the Dog Fence, the east by the Borefield road and to the south by the Olympic Dam Special Mine Lease. The Reserve is situated partly on the Mine Lease (7km²) and partly on adjoining pastoral properties including Roxby Downs Station (49km²) and Stuart Creek Station (2km²) leased by WMC Resources, and privately leased Mulgaria Station (1km²) and Billa Kalina Station (1km²). The project is within the boundaries of three soil conservation board districts namely Kingoonya, Marla-Oodnadatta and Marree. In order to facilitate manageable and effective rabbit control, the Reserve was gradually fenced in sections until the whole 60km² was finally enclosed in December 2000. The area is divided into a main 14km² electrified exclosure where endangered species are first re-introduced, two 8km² expansion areas adjoining the main exclosure which are also now rabbit-free, and a northern 30km² expansion area. The northern boundary of

the project is now part of the Dog Fence and has been re-aligned with assistance from the Dog Fence Board. Rabbit and cat eradication is currently in progress within the final northern expansion area and the entire 60km² Reserve is expected to be rabbit, cat and fox-free by May 2001.

Feral animal control

Rabbits

Spotlight transects indicate that rabbit densities in the Roxby Downs area are fast approaching pre-Rabbit Calicivirus levels (Fig. 2). Recent spotlight counts estimate rabbit density at 50 per km². Spotlight counts underestimate true rabbit density and should be used as an indication of temporal trends only.

Rabbits were completely eradicated from the main 14km² exclosure in early 1999. Rabbit control began in the first 8km² expansion area in May 1999 and was completed in September 1999. It is estimated that between 500 and 800 rabbits were eradicated from this area. Rabbit control began within the second 8km² expansion area in November 1999 and was declared rabbit-free in April 2000. More than 1000 rabbits are thought to have been eradicated. Both expansion areas are checked for rabbits on a regular basis and only 1 rabbit has since been found to gain entry through an exposed part of the foot netting on a dune. The problem was immediately rectified by placing heavy conveyor belt rubber over the netting and the rabbit was captured within 3 days. Rabbit eradication is currently underway in the 30km² northern expansion area but is not expected to be completed until May 2001. The large size of the area and the marked increase in rabbit density presents a challenge for this final stage of the project. Athough densities of rabbits outside the project are estimated at 50 per km², numbers within the northern expansion area have already been reduced to less than 10 per km² through baiting, trapping, shooting and fumigation. The alarming recent post-RCD increase in rabbit density suggests that the timing of rabbit eradication within the Arid Recovery Reserve was opportune and that outside densities may soon become too high for effective large scale eradication of this kind.

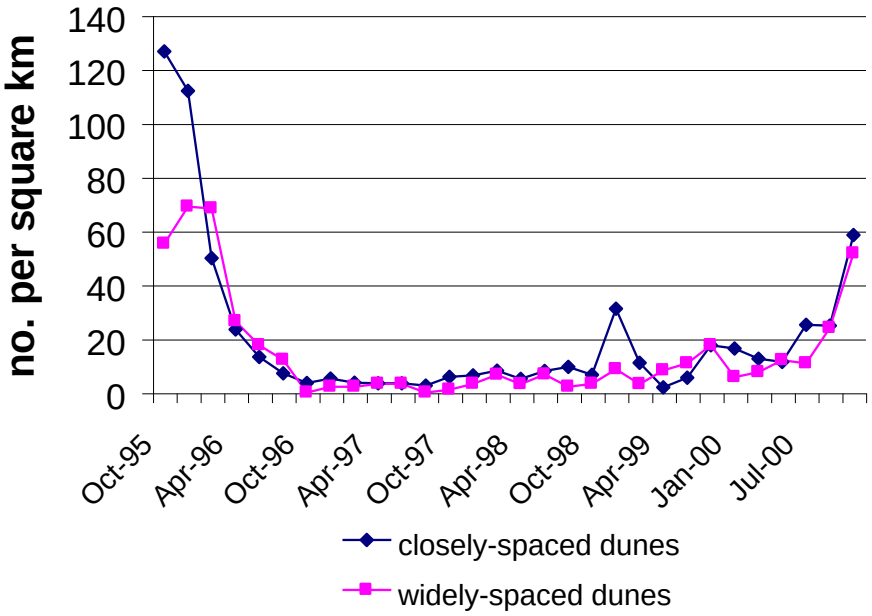

Figure 2: Rabbit density (no. per km²) spotlight counts conducted by WMC staff since the arrival of RCD in 1996. Shown at a lower scale to illustrate post RCD increases in rabbit density.

Cats and foxes

Cats and foxes were completely eradicated from the main exclosure in early 1999. No cats or foxes have gained access to the main exclosure since the last cat was eradicated. Six cats and four kittens have been trapped in the northern expansion area to date. At present only one cat is known to be still present within the northern expansion area (and entire 60km² Reserve) and it has been fitted with a radio collar for research purposes. This cat will be eradicated when rabbit numbers have been reduced further. Audio lures and soft leg-hold traps are continuously set outside the 30km Reserve fence. During 2000, 11 cats and 14 foxes were captured using this method (trap nights 3260, trap success 0.77%). A further 2 cats were shot and three captured opportunistically in cage traps set outside the Reserve fence. Trap success is comparable to 1999 levels with 10 cats and 4 foxes captured in 1710 trap nights and 0.82% trap success. The higher number of foxes captured in 2000 using lures and leghold traps contrasts with WMC Environmental Department spotlight transects, which consistently record higher densities of cats than foxes (long term average is 0.56 per km² for foxes compared with 0.73 per km² for cats). One possible explanation is the use of different audio lures. In 1999 most lures were W.A. CALM Feline Attractant Phonics which emit a meow sound. In 2000, the project began using cheaper lures which emit a bird-like call which may be more attractive to foxes. A summer scholarship student is currently exploring the different lures and their comparative attracting qualities for foxes and cats (see research section).

During late 2000, telemetry operated soft-jaw traps were purchased for use around the 30km Reserve fence. These traps emit a radio telemetry signal when a trap has been triggered that enables staff to check traps from a central location each day. By adopting this method, considerable savings will be made on time and fuel as a complete check of the Reserve perimeter will only be required once a week unless traps have been activated.

Re-establishment of native fauna

Over 60% of the original mammal fauna in the Roxby Downs area has become locally or completely extinct since European settlement. Some bird species have also declined and many plant species are now rare in the Reserve area. The Arid Recovery Project aims to restore as much as possible of the original fauna and flora to the Reserve through natural re-establishment and planned re-introductions. Re-introductions are research-based to enable information to be obtained on how the animals survive in the arid zone and whether long term re-establishment is possible. Some species such as the Spinifex Hopping-mouse have re-established naturally in the Reserve and it is hoped that some rare plant species such as Sandalwood will also increase in abundance. A sub-fossil deposit found 30km from Roxby Downs was used to determine which mammal species formerly occurred in the region and which could potentially be re-introduced (see below). Species which have already been re-introduced are in bold.

Greater Stick-nest Rat
Burrowing Bettong
Greater Bilby
Western-barred Bandicoot
Golden Bandicoot
Kultarr
Ampurta

Rare bird species such as the Bush Thick-knee and Plains Wanderer have also been recorded from the Roxby Downs region in the past and could potentially be re-introduced into the Reserve. Woma Pythons may also have been in the area and could be re-introduced if sufficient evidence of their past presence can be obtained.

Greater Stick-nest Rat

The Greater Stick-nest Rat (*Leporillus conditor*) is a native rodent which 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 one off-shore island in S.A. DEH (NP&W SA) conducted a re-introduction program for the stick-nest rat which successfully re-introduced the rats to 3 off-shore islands. However, attempts to re-introduce the rats to the mainland proved unsuccessful due to the presence of introduced and native predators.

100 Greater Stick-nest Rats were released into the main 14 square km exclosure in April and June 1999. Thirty six rats were radio collared and all radio-collared females bred over the winter months. There was no loss to predation over the winter but half of the radio-collared rats died from dehydration/heat stress over summer 1999/2000. Goanna predation was responsible for only a few rat deaths. No breeding was recorded over the summer months but heavy rains in late February 2000 triggered breeding in the stick-nest rats with young recorded in early April. Rat numbers continued to increase over winter 2000 with track transects indicating an almost 100% increase in rat tracks recorded between May and October 2000 (Fig.4). Females with distended teats were captured between April and November inclusive and 31 new Roxby-born rats were captured opportunistically in 2000. Future densities of rats are expected to be highest over winter with an annual summer die-off due to high temperatures. However, the summer death rate is expected to decrease as nests become larger and more developed, and as rats are now utilising bettong and bilby holes for shelter.

A nest fidelity study has been initiated with traps set biannually at 17 known nest sites to record individuals present. Initial data suggest nests mainly house adult female and their latest offspring. Nests are often being taken over by non-related rats if the original female dies. Offspring do not appear to remain at the mother's nest for long periods but may disperse to other areas. In two instances, a female was found to inhabit the same nest for over 19 months whilst another was recaptured at the same nest after 10 months. Individual male rats have been captured at more than one nest suggesting that males are promiscuous. During 2001, further study will be conducted to determine if multiple paternity exists in Stick-nest Rats or if females are monogamous. Juvenile dispersal will also be further investigated.

Four kilometre track transects were conducted in May and October 2000 along two longitudinal dunes inside the main exclosure to provide information on the current density of the rat population The transects traverse approximately one third of the dunes in the project area and are located 2km apart. Both transects suggest that the rat density increased significantly over the winter months (Fig. 3). These transects will be repeated in March to determine the extent of the summer die-off.

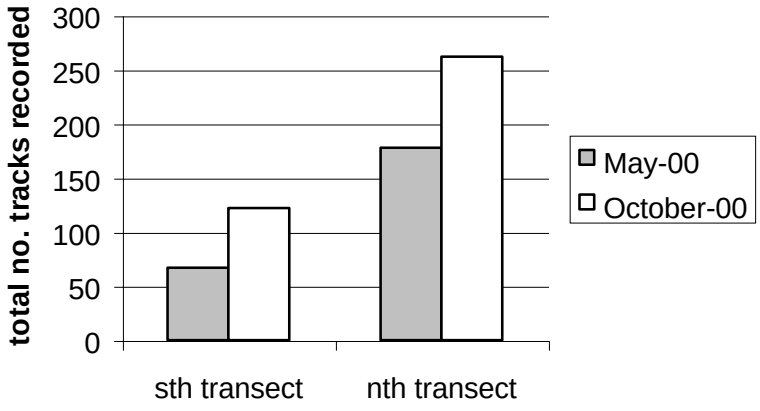

Fig. 3: Stick-nest Rat tracks recorded along two 4km transects within the exclosure.

Burrowing Bettong

The Burrowing Bettong is a small marsupial rat-kangaroo and is the only macropod to live in burrows. The species used to occur in the Roxby Downs area but became extinct on the mainland in the 1940's. Burrowing Bettongs are now present naturally on only 3 off-shore islands in W.A. The Burrowing Bettong (or Boodie) is about the size of a rabbit and eats a variety of foods including insects, roots, tubers, green vegetation, fungi and seed. Old warrens which are thought to have belonged to Burrowing Bettongs have been found within the Reserve and Burrowing Bettong remains were found within a sub-fossil deposit located 30km from Roxby Downs. In October 1999, 10 Burrowing Bettongs (7 female and 3 male) were obtained from Herrisson Prong in Shark Bay, W.A. and released into a 10ha pen inside the main exclosure. The success of this trial release led to the release of a further 20 animals (12 females, 8 males) in September 2000. The full scale release was comprised of bettongs from Bernier Island in W.A. which were captured in cage traps and hand nets. Arid Recovery Staff and Friends group members assisted CALM in the capture of the bettongs which were flown to Roxby Downs in a small 4 seater plane. Funds from the Threatened Species Network, WWF Australia were used to transport the animals to S.A. Females from both the trial and main release have been captured with pouch young and a total of 13 new Roxby-born animals have been captured to January 2001. None of the 30 released bettongs are known to have died and the current population estimate is between 45 and 55 animals.

Weights of the trial release bettongs have fluctuated since release but have remained above release weights. Higher weights were recorded in the first few months after release due to supplementary feeding within the release pen. Female weights fluctuated due to presence and absence of pouch young but male weights have remained relatively stable throughout the year and are usually between 1500g and 1600g.

Greater Bilby

9 Greater Bilbies were released into a 10ha pen within the main 14km² exclosure in April 2000. The release coincided with Easter and was publicised through TV, radio and print media. The 5 female and 4 male bilbies were obtained from the Monarto Captive Breeding Facility and were selected to maintain maximum genetic diversity. Bilbies were supplementary fed and watered for the first month and then allowed access to the entire 14km². Supplementary food and water was left in the release pen for a further month and then removed. No female bilbies were with pouch young on release but within 8 weeks, pouch young were recorded in all females. Females have bred continuously since release with second generation young now recorded out of the pouch. Pouch young were still being recorded in January 2001 despite over 40 degree temperatures and dry conditions. Seven Roxby-born pouch young have been captured and micro-chipped but the majority of young have proved elusive and hard to capture. By monitoring tracks outside known female burrows an estimate of emergence time and number of pouch young can be determined. A total of 75 holes have been recorded since release and it is now estimated that there are between 25 and 30 bilbies within the Reserve. There has been no known mortality of bilbies since release with between 5 and 10 bilbies fitted with radio-transmitters at any one time. Transmitters are attached to the base of the tail with elastoplast tape as per standard DEH practice. No difficulties have been encountered using this method but tail transmitters often fall off prematurely in burrows resulting in costly retrieval or replacement.

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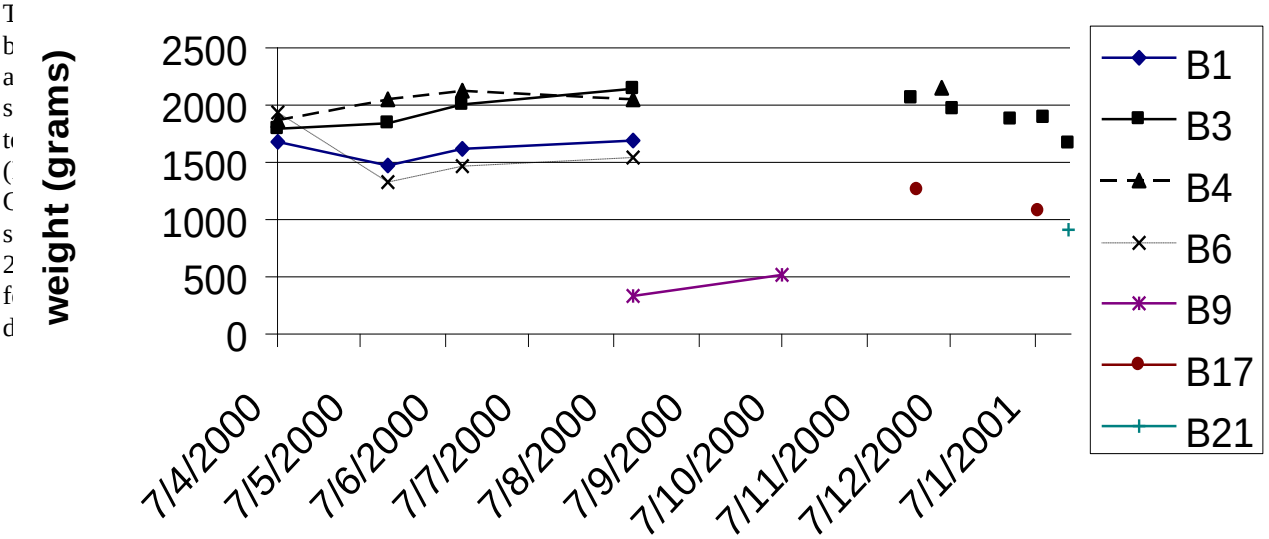

Fig.4:Weights of male Bilbies within the Arid Recovery Reserve. B1, B3, B4 and B6 are the original release males and B9, B17 and B21 are Roxby born young

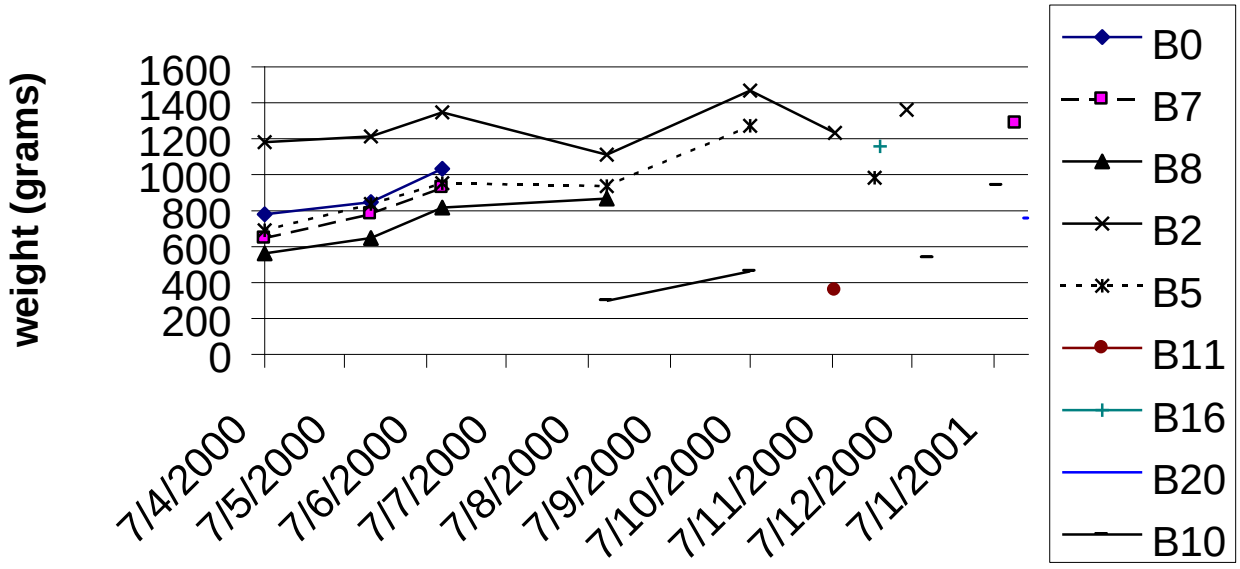

Fig. 5: Weights of females bilbies fitted with radio transmitters within the Reserve. B0, B7, B8, B2 and B5 are original release females and B11, B16, B20 and B10 are Roxby born individuals.

Western-barred Bandicoot

Western-barred Bandicoot remains were found within the sub-fossil deposit near Roxby Downs suggesting that they formerly occurred in the region. The species is listed as endangered with less than 3000 remaining in the wild. Western-barred Bandicoots are the smallest of the bandicoots and are only found naturally on Bernier and Dorre Island in W.A.. On September 25th 2000, CALM and Arid Recovery staff captured and transported twelve Western-barred Bandicoots from Bernier Island to Roxby Downs. This trial release represented the first release of WBB outside of W.A.. A vet check was performed by a vet from the Royal Zoological Society of S.A. prior to release and found 4 animals with traumatic eye problems including cataracts, corneal lesions and secondary glaucoma. These problems were not due to eye injuries upon capture. All animals received Ivermectin subcutaneously, topical 5% Carbaryl powder and a vitamin E injection prior to release. One animal died during manual restraint whilst being checked by the vet but the remaining 11 bandicoots were released into the 10ha release pen inside the Arid Recovery Reserve.

The 11 bandicoots were held within the 10 ha release pen for 1 month. During this time the bandicoots were radio-tracked regularly and used 48 nest sites over the one month period. Nest sites were all on dunes and under leaf litter. Nest sites were found under Umbrella Wattle, Hopbush, Bullock Bush, a grass clump (*Paractenium sp*.) and a tumble weed (*Salsola kali*). The overstorey plant species of six nest sites were not identified. Interestingly, bandicoots appeared to favour hopbush and avoid mulga (Table 2). Nests were comprised of a 10-15cm depression in the sand under a bush and covered with a layer of up to 10cm of leaf litter. Nests were hard to identify and would have been extremely difficult to locate without radio-tracking.

Table 2: Number of Western-barred Bandicoot nest sites found under each overstorey species within the 10 ha pen. The percentage of total overstorey cover is also presented for each overstorey species.

Overstorey species	No. nests	% of total overstorey cover
D. viscosa- Hopbush	22	15
A. ligulata- Umbrella Wattle	15	26
A. oleafolius- Bullock Bush	3	17
A. aneura- Mulga	0	36
Senna artemisioides- Desert Cassia	0	6
Other/Unidentified	8	0
Total	48	100

After one month, information obtained from W.A with regards to a possible virus on Bernier Island and in captive bred animals prompted the relocation of the bandicoots to Adelaide Zoo for quarantine and observation. Two young were subsequently born in captivity from a female which conceived whilst at Roxby Downs. No other pouch young have been recorded since the WBB were placed in captivity. A number of tests have been conducted by the Royal Zoological Society of S.A. but as yet a virus has not been identified. If further tests prove negative then the WBB may be re-released to the Arid Recovery Reserve in early 2001.

Short-beaked Echidna

In October 2000, an echidna was captured within the northern expansion area of the Reserve. This is only the fourth record of an echidna from Roxby Downs and the first for the Arid Recovery Reserve. Its distinctive tracks make it unlikely that others have been missed in the area previously. The echidna could not be released into the northern expansion area due to its likely death from the intensive fumigation currently being conducted for rabbit control. The echidna was fitted with a radio transmitter attached to its spines and temporarily released into the rabbit-free main 14km² exclosure. The echidna has been tracked weekly for the last 4 months and has been found to use a variety of bilby and bettong warrens within the Reserve, sometimes sharing with resident bettongs. The echidna is behaving nocturnally and often returns to the same burrow each night. The echidna has been found to move up to 4km in a night. In November 2000, a second echidna was captured approximately 1km north of the Reserve near the Dog Fence. This echidna was also fitted with a transmitter and released into the 14km² Reserve. At present both echidnas are occupying different areas of the Reserve with no interaction recorded. The sex of the echidnas is unknown.

Research

Four research papers are currently in preparation with a fifth already submitted to a scientific journal. These journal articles include:

- The comparative dietary preferences of the Greater Stick-nest Rat and European Rabbit- submitted to Australian Journal of Mammalogy, Sarah Ryan and Katherine Moseby. (Funding provided by Nature Foundation S.A.)

- The activity of Sand Goannas and their predation on the re-introduced Greater Stick-nest Rat at Roxby Downs, Northern S.A. Julia Bolton and Katherine Moseby. To be submitted to Pacific Conservation Biology in Feb 2001.

- Habitat Preference of the Greater Stick-nest Rat- Sally O'Neil *et al*. To be submitted in 2001

- Trial Re-introduction of the Greater Stick-nest Rat in arid South Australia; shelter preferences, home range and impacts on perennial plant species. Katherine Moseby and Jackie Bice. To be submitted to The S.A. Naturalist in early 2001

- Influence of drought, landform and different herbivore grazing on survival of Bladder Saltbush and Low Bluebush. John Read. To be submitted to a national or international Rangeland Management journal in 2001.

Research is currently being conducted by Arid Recovery staff and two summer scholarship students from the University of Adelaide. Apart from the stick-nest rat nest fidelity study outlined earlier, four other major research studies commenced in 2000 including the following;

Diet of Burrowing Bettongs and Bilbies- Jackie Bice and Katherine Moseby

Funds from the Nature Foundation S.A. are being used to study the diet of the Burrowing Bettong and Bilby within the Reserve. The study involves the use of micro- and macroscopic analysis of scats. Bettong and bilby scats are being collected over 5 sampling periods, spaced over 12 months. A reference collection on loan from Jeff Foulkes from the Department for Environment and Heritage is being used to identify microscopic plant food items. Macroscopic study is also being used to identify large plant and invertebrate components. Scat analysis results are being verified through field identification of food items using tracks, diggings, cafeteria trials and observation. Results will be submitted to the Australian Journal of Zoology in 2001.

Ecology of the re-introduced Bilby in northern S.A.- Katherine Moseby and Erin O'Donnell

Funds from the Wildlife Conservation Fund are being used to study the home range, habitat use, burrow usage, reproduction and dispersal of the Greater Bilbies within the Reserve. This summer scholarship study expands on earlier data collected after the bilby release in April 2000 and is examining the impact of summer conditions on bilby ecology. Information is being compiled using radio-tracking data and trapping results. Interim results suggest that males have significantly larger home ranges than females with some males roaming more than 5km in a night. Females appear to have ranges of only 1-2km^2 and juveniles have been found to disperse up to 3km. Breeding has been continuous since re-introduction, even in summer. Female bilbies use a number of different burrows with males visiting females and often swapping burrows each night. Results will be submitted to an Australian scientific journal.

A comparison of audio and olfactory attractants for feral cats and foxes in the Roxby Downs area.

A second summer scholarship study is being conducted by a University of Adelaide graduate over summer 2000/2001. Soft leg-hold traps are used by the project for control of cats and foxes in the buffer zone and this project is comparing different types of lures to attract cats and foxes to the traps. The use of meat lures leads to high captures of non-target species so audio and olfactory lures are being trialed. Feline Attracting Phonics obtained from CALM in W.A. which emit a cat meow sound are being compared with bird call devices and pongo (a mixture of cat urine and faeces). Additional trials are being used to determine if cats will jump low netting fences to access lures and traps. If so, then these traps can be used in areas within the Reserve where endangered species are present if a cat or fox gains access. These fences are also being trialed with bettongs and bilbies to ensure that these species cannot gain access to the traps.

Seedling germination and growth rates of selected perennial species under rabbit, cattle and native mammal grazing regimes. Nicki Munro and Katherine Moseby

The number and growth rate of selected plant seedlings are being recorded at sites under a variety of grazing regimes. These include rabbit grazing only, cattle and rabbit grazing, grazing by re-introduced mammal species and no grazing by rabbits, cattle or re-introduced species. Plant species targeted are those known to be preferred by rabbits, stock and re-introduced species and include Mulga (*Acacia aneura*), Native Plum (*Santalum lanceolatum*), Bullock Bush (*Alectryon oleifolius*), Cassia (*Senna artemisiodes)* and Hopbush (*Dodonaea viscosa*). Results to date include an increase in the number of mulga seedlings within adult mulga patches inside the Arid Recovery Reserve compared with rabbit or rabbit and stock sites (Fig. 6). Both Rabbit and Arid Recovery sites contained sub-adult Mulgas indicating that these sites have experienced comparable grazing pressure prior to the commencement of the Arid Recovery Project. Thus

recent recruitment of Mulgas in the Arid Recovery Project suggests a positive start to plant regeneration. The lack of any subadult or seedling Mulga plants at sites situated between 1 and 4km from stock watering points suggests a long term impact of stock on the recruitment of Mulga. Rabbits also appear to impact recruitment and long term monitoring of these sites will help determine the extent and severity of this impact. Funding has been applied for from the Native Vegetation Fund at DEH to extend this study to the other plant species.

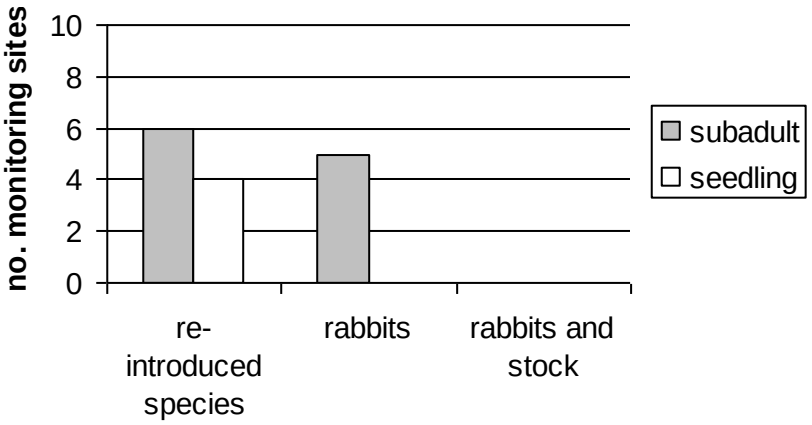

Figure 6: Number of monitoring sites with seedling and subadult mulgas. Total 10 sites in each treatment. Seedlings were classified at individuals less than 50cm high with single, non-woody stems and subadults are less than 2m. No seedlings or subadults were found at rabbit and stock sites.

Influence of drought, landform and different herbivore grazing on survival of Bladder Saltbush and Low Bluebush. John Read

A high percentage of adult saltbush and many bluebush died during the drought of 1999-2000. Long term monitoring sites were re-assessed after the drought to compare survivorship in sandy and rocky terrain and to determine the influence of browsing by stick-nest rats, rabbits and cattle on the chenopod shrubs. Results indicate that water stress was the most significant cause of death. Most saltbushes and many bluebushes which did not accumulate water from deep sand or run-off died, whilst most bushes in slightly wetter areas survived although they lost many leaves. Heavy cattle browsing prior to the drought was detrimental to shrub survivorship but there was no significant impact of the relatively low levels of rat or rabbit browsing.

monitoring sites

The monitoring of plants and animals within the Arid Recovery Reserve increased significantly during 2000 due to the implementation of the seedling study (Table 3). The number of monitoring sites increased from 100 to 114 and now includes small fenced exclosures in areas of high rat density or around plant species which are highly favoured by the rats.

Table 3: Type and number of monitoring sites in the Arid Recovery Reserve area during 2000

Type of monitoring site	Method	No.	Reason
Plant	Jessop transects, step point, species list and abundance	29	Investigate regeneration of native plants after removal of rabbits and domestic stock

Plant	small exclosures	4	Investigate effect of stick-nest rats on survival and recruitment of *Gunniopsis quadrifida*
Plant	small exclosures	3	Investigate effect of stick-nest rats on vegetation in preferred habitat areas.
Plant	Mulga seedling counts	40	Investigate impact of stock, rabbits and re-introduced species on recruitment of Mulga
Small vertebrates	pitfall sites	29	Investigate response of native animals to removal of introduced herbivores and predators
Birds	bird transects	12km	Investigate response of birds to removal of feral cats and rabbits including increases in structure and vegetation cover and lower predation levels.
Birds	Mist netting	3	Investigate site fidelity, longevity and habitat preference of native bird species
Birds	Bird Atlas sites	6	Investigate the effect of cattle grazing on bird life.
Stick-nest rats	radio tracking	21	Investigate reproduction, survival, habitat preference of re-introduced species
Greater Bilbies	radio tracking	11	Investigate reproduction, survival, habitat use of re-introduced species
Burrowing Bettongs	radio tracking	30	Investigate reproduction, survival, habitat preference of re-introduced species.
Echidnas	radio tracking	2	Investigate reproduction, survival, habitat preference of native species.

76 plant, 9 bird, 29 vertebrate long term monitoring sites. Total = 114
Total animals radio tracked in 2000 = 64

Vegetation sites

24 vegetation monitoring sites were established by Arid Recovery staff and Department for Environment and Heritage staff in 1997 and are monitored annually. These are pastoral reference sites and are used to monitor changes in vegetation cover, diversity and recruitment with the removal of rabbits and stock. Twelve sites were placed outside the main 14km² exclosure and 12 inside. Jessup transects, step point, photopoint and species lists were recorded. However, due to the considerable expansion of the Reserve, 6 of the original outside sites situated in rabbit and stock areas are now situated within rabbit-free expansion areas of the Reserve. In 2000, 5 additional sites were established to compensate for the loss of outside sites. These sites were established to the south and east of the Reserve and there are now 18 inside sites and 11 outside. However, for the purposes of the 2000 annual monitoring, only results from the original sites which remain inside and outside the main exclosure are presented.

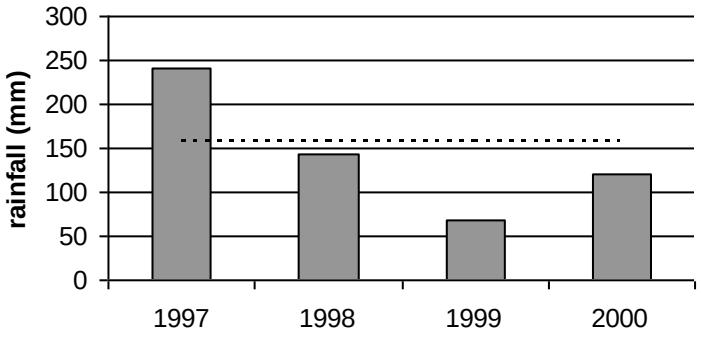

Figure 7: Annual rainfall recorded at the Olympic Dam Mine situated 5km from the Reserve in 1997,1998 and 1999. A rain gauge was established at the site in 2000 and is presented here. Average rainfall is 160mm and is represented by a dotted line.

Rabbits were present at all vegetation monitoring sites in 1997 but eradicated from the main exclosure in early 1999. Vegetation cover is highly dependant on rainfall and annual rainfall has remained below average since rabbit eradication (Fig.7). The only significant rainfall recorded in 2000 was approximately 75mm in February. Despite three consecutive years of below average rainfall, this February rain was enough to trigger a significant vegetation response at rabbit-free sites. Results indicate that the annual dune vegetation showed a response to the removal of rabbits and stock through an increase in vegetation cover of grass and annual species (Fig. 8). Annual cover at dune sites was tested using a BACI (before, after, control, impact) design and a 2 way ANOVA to test for differences in cover between years and between inside and outside sites. There was a significant difference in the annual vegetation cover between inside and outside sites ($F=11.24$, $DF=1$, $P=0.0058$) but no significant difference between years ($F=0.0205$, $DF=1$, $P=0.8886$). A significant interaction term ($F=10.97$, $DF=1$, $P=0.0062$) indicated that inside and outside sites were responding differently between years and Fig. 8 illustrates that this was due to an increase in annual cover at inside sites relative to outside sites. While annual cover declined at outside sites, cover increased in rabbit-free areas despite below average rainfall. These rabbit-free sites are expected to exhibit a much greater response after a wet year.

When perennial vegetation was tested (Fig. 9) there was no significant difference in the vegetation cover between inside and outside sites ($F=3.0608$, $DF=1$, $P=0.1057$) or over time ($F=2.1974$, $DF\ 1$, $P=0.1640$) and no significant interaction term ($F=0.0297$, $DF=1$, $P=.8661$). Cover of annual and ephemeral species is much more rainfall dependent and thus it is to be expected that the annual vegetation species would be the first to show a response to removal of rabbits. Perennial species are more likely to reflect long term vegetation cover trends which would not be expected after only 2 years of rabbit eradication.

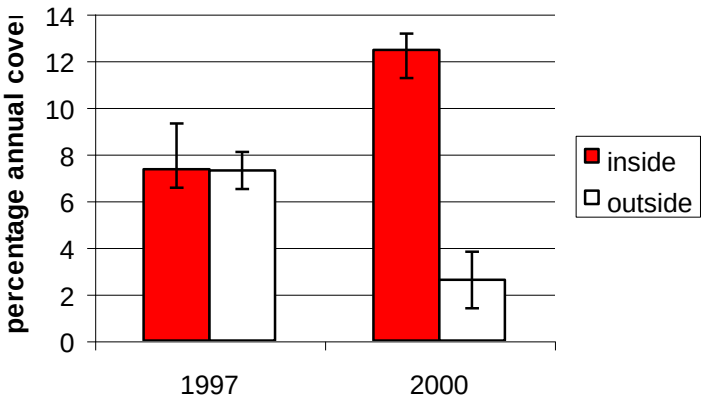

Figure 8 : Percentage annual vegetation cover on dune sites inside and outside the exclosure. Total sites 5 inside, 3 outside.

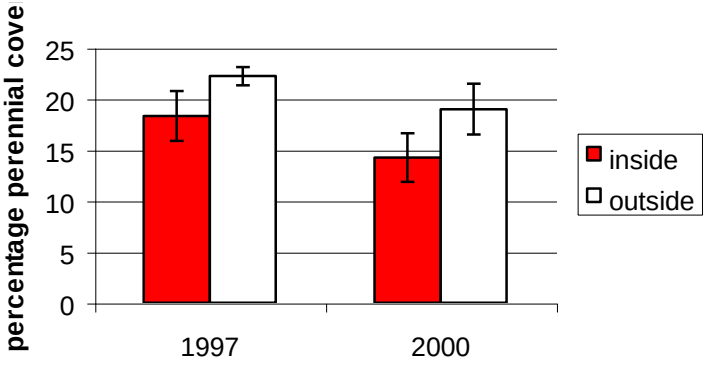

Figure 9: Percentage perennial vegetation cover of dune sites inside and outside the exclosure. Total sites 5 inside, 3 outside.

Vegetation on swales remained more stable than dune sites as they are mainly comprised of perennial species which are less affected by rainfall . However, vegetation cover of annual swale species did remain stable despite the low rainfall whilst outside sites showed a drop in annual cover (Fig. 10). Perennial cover decreased at both inside and outside sites due to a widespread massive die-off of saltbush shrubs prior to the February 2000 rains (Fig.11).

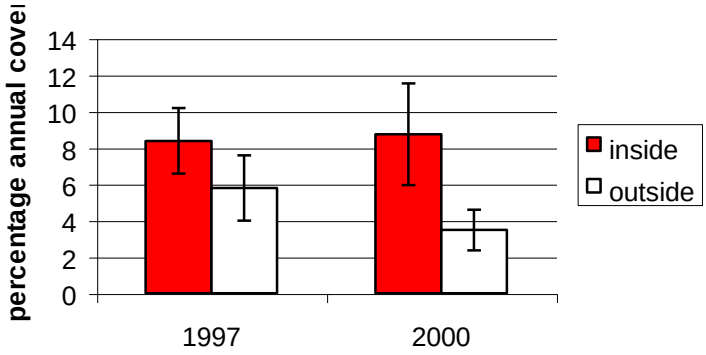

Figure 10: Percentage annual vegetation cover on swale sites inside and outside the exclosure. Total sites 5 inside, 2 outside

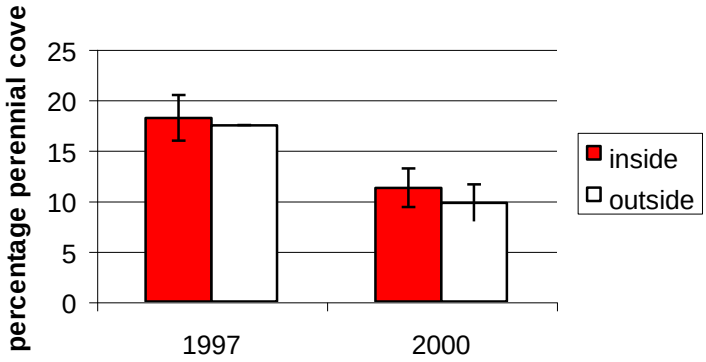

Figure 11: Percentage perennial vegetation cover on swale sites inside and outside the exclosure. Total sites 5 inside, 2 outside.

Fauna sites

Fauna sites are situated adjacent to vegetation sites and trapped annually to determine changes in the abundance and diversity of reptiles and small mammals. Results from the three years of animal trapping (pitfall and elliott traps) have revealed little difference in native fauna captures between sites inside and outside the exclosure (Fig. 12,13). Native mammal and reptile trends were consistent between inside and outside sites, but native mammal abundance was highest in 1999 whilst reptile captures were higher in 1998. Reptile captures are highly correlated with temperature and temperatures during the April trapping period can be very variable. The average minimum temperature over the trapping period in 1999 (12°C) and 2000 (13°C) was noticeably cooler than in 1998 (17°C). Trapping sites are now conducted in late February during warm weather. However, yearly fluctuations in reptile captures are of secondary importance; the fact that both inside and outside sites show similar trends is of more interest. These similarities indicate that sites inside and outside the exclosure are well matched and any differences in abundance recorded in future years can potentially be attributed to changes within the exclosure area.

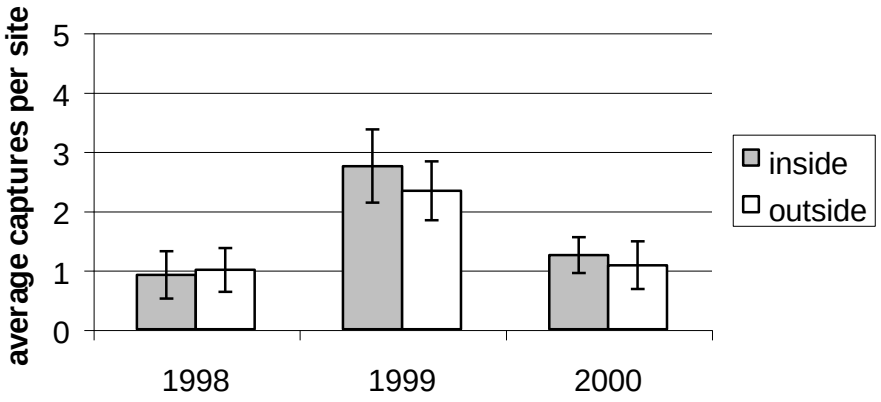

Fig. 12: Average no. of native mammals captured at inside and outside pitfall and elliott sites. Native mammal captures were very low. Total number of sites was 12 inside and 12 outside for 1998 and 1999, and 16 inside and 12 outside for 2000.

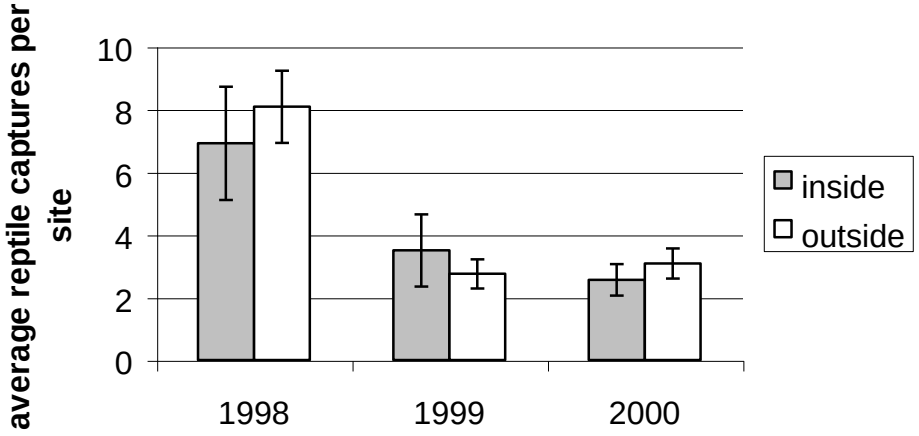

Fig. 13: The average number of reptiles captured at inside and outside sites.
Bars indicate standard error.

More introduced house mice were captured inside the exclosure than outside during 1998 and 1999 but low levels were recorded in 2000 (Fig.14). This increase in inside sites was due to the large amount of free-feed oats that were being laid during this period for control of rabbits. Free-feed oats were not followed by poisoning due to the low number of rabbits eating the free-feeds. House mice are exceptionally fast breeders and were able to respond quickly to increases in food supply but are also extremely scarce during dry conditions.

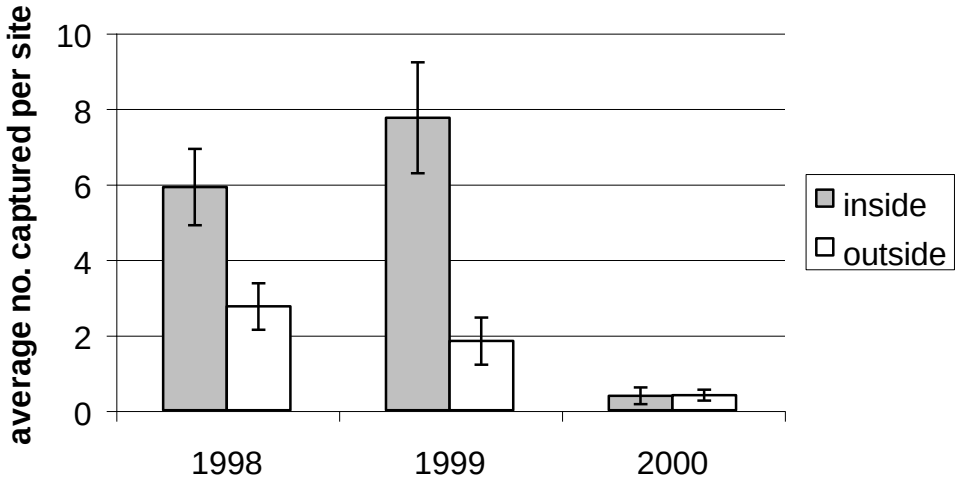

Figure 14: Average number of house mice captured at sites inside and outside the exclosure. Each site comprises 6 pitfall traps and 15 elliott traps. Bars indicate standard error.

Publicity, education and community awareness

Over 160 media items have been generated by the Arid Recovery Project since 1997 with the majority of media interest focused on the re-introduction of locally-extinct mammals (Table 4). School children from the Roxby Downs Area School were involved in the project through year 9 and 11 science projects, work experience students, nocturnal tours and activities, and tours on World Environment Day. The Arid Recovery project is increasingly featured on WMC itineraries for visitors including project tours and BBQ's. Other visits this year included the Adelaide City Council, Natural Heritage Trust committee, Kingoonya Soil Board, CSIRO scientists, Labour Party politicians, WMC board members, Field Naturalist Club, Aboriginal Lands Trust, Greening Australia, ATCV, Arid Lands Botanic Gardens, Muiriden College, Ceduna Area School and Adelaide University.

Table 4: Items of publicity generated by the project in 2000

Medium	Date	Media Group	Item
Radio	March 15, 2000	Triple M	Report re project status and Burrowing Bettong release
	March 15, 2000	3D Radio	Report re Burrowing Bettong release

	April 19, 2000	5CK	Interview re Greater Bilby release
	April 19, 2000	5AN	Interview re Greater Bilby release
	April 19, 2000	5DN	Interview re Greater Bilby release
	April 20, 2000	5AA	Interview re Greater Bilby release
	April 20, 2000	SAFM	Report re Greater Bilby release
	April 20, 2000	3D Radio	Report re Greater Bilby release
	April 20, 2000	5UV	Report re Greater Bilby release
	May 3, 2000	Metropolitan ABC	Interview re project status
	August, 2000	Regional ABC	Interview re Greater Bilby Progress
	September 13, 2000	Regional ABC	Interview re: Western-barred Bandicoot release
	September, 2000	Metropolitan radio	Interview re: Western-barred Bandicoot release
	September 21, 2000	W.A. ABC	Interview with Tony Friend from CALM re: Western-barred Bandicoots
	October 3, 2000	Regional ABC	ICurdimurka Fundraising Walk
	November 21, 2000	ABC radio Darwin	Interview re: project and bilbies
	November 22, 2000	Sci-Files (distributed to 200 radio stations nationally)	Inerview re: project for science program aired throughout Australia
	December 20, 2000	ABC Pt Augusta	Interview re: fence closure ceremony
Print	January 14, 2000	The Dam News newsletter	Green Corps involvement
	January 21, 2000	Northern Sun	Green Corps involvement
	March, 2000	Australian Mining	Project status
	March, 2000	Tomorrow	Project status

	March, 2000	WBCSD	Biodiversity case study
	March 31, 2000	Northern Sun	Greater Bilby release
	April, 2000	Red Dunes newsletter	Greater Bilby release
	April 9, 2000	Sunday Mail	Greater Bilby release
	April 20, 2000	The Advertiser	Greater Bilby release
	April 21, 2000	The Dam News newsletter	Greater Bilby release
	April 23, 2000	Sunday Mail	Letter to the Editor
	April, 2000	Adelaidean	Bilby release
	May, 2000	Groundwork	Greater Bilby release
	May 5, 2000	The Dam News newsletter	Greater Bilby progress
	May 12, 2000	Northern Sun	Greater Bilby progress
	May 20, 2000	Aussie Post	Greater Bilby release
	May 23, 2000	The Advertiser	Threatened species in South Australia
	May, 2000	Biology Society Newsletter	Stick-nest Rat/Goanna study
	August 16, 2000	Nature Foundation Newsletter	Stick-nest Rat progress
	August 2000-present	Natural Heritage Trust Website	Project progress and achievements
	August, 2000	WWF Newsletter	Stick-nest Rat progress
	September 13, 2000	Red Dunes Newsletter	Curdimurka Fundraising Walk
	September 7,13 2000	WMC Tuesday Update	Project progress
	September, 2000	Northern Sun	Curdimurka Fundraising Walk
	September, 2000	Dam News	Curdimurka Fundraising Walk

	September, 2000	Landcare Annual Report	Project status
	September, 2000	Advertiser	Article re: Western-barred Bandicoot release
	September, 2000	Danthonia Newsletter	Plant Monitoring at the Project Site
	September, 2000	Geo Magazine	Two page article on Project
	October 14, 2000	Northern Sun	Curdimurka Walk for the Bandicoots
	October 12, 2000	Dam News	Curdimurka Walk for the Bandicoots
	October, 2000	Zoo News	Bilby release at Easter
	November, 2000	Press release	Bilbies- Rob Morrison
	November, 2000	Nature Foundation Newsletter	Progress of Burrowing Bettongs
	November 21, 2000	The Adelaidean	Bilby summer project
	November, 2000	Northern Sun	Project update
	November 22, 2000	Northern Sun	Social dinner
	November 29, 2000	Campus Review	Bilby progress and award
	November, 2000	National Geographic Web Site	Information on the Bilbies and the project
	November, 2000	Beyond 2000 Web Site	Bilbies
	December 4, 2000	Red Dunes	Front page article on fence closure
	December 7, 2000	Kalgoorlie Miner	Two page article on project
	December 22, 2000	Advertiser	Fence closure ceremony
	December, 2000	Nature of Biology (textbook)	2 page case study on Arid Recovery Project
TV	March 15, 2000	Imparja Television	News item re project

	April, 2000	ABC	Behind the News report re project
	April 20, 2000	Channel 9	News item re Greater Bilby Release
	April 20, 2000	Channel 9 Lateline	News item re Greater Bilby Release
	May 5, 2000	ABC	Stateline report re project
	September 22, 2000	W.A. commercial TV	News item on Western-barred Bandicoot release
	September 24, 2000	W.A. commercial TV	News item on Western-barred Bandicoot release
	September 23, 2000	ABC	News item on Western-barred Bandicoot release, interview with Adrian Stokes from DEH
	December 22, 2000	Channel 10	News item re: fence closing ceremony
	December 22, 2000	Imparja	News item re: fence closing ceremony

The project increased its public awareness and education campaign during 2000 with information disseminated to a wider audience through a range of media (Table 5).

Table 5: Education and awareness initiatives generated by the project to date

type of publication or activity	**details**	**target audience**	**quantity to Dec 2000**
Information brochures		General public	4000
Information displays	Glendambo Field Day	Pastoralists	1
	National Parks festival	General public	2
	Environmental Expo	General public	1
	Roxby Downs Market Day	Roxby Downs community	5
	WMC Family Day	Mining community	2
	Roxby Pageant Float	Roxby Downs community	1
	World Environment Day	School children	4
	Olympic Dam Expansion	WMC employees	1
Talks	Friends of the Arid Lands BG	Conservationists	2
	Natural Resource Management Forum	Pastoralists	1
	National Parks Forum	National Parks staff	1
	World Environment day	Roxby Downs school students	5
	Northern Industries Forum	Mining and industry delegates	1
Scientific Conferences	Resource 2000	Mining Scientific community	1
	Mammal Society of Australia	Scientific community	1
	Ecological Society of Australia	Scientific community	1
	Rangelands Society	Scientific community	1
University camps		University students	3
School educational visits		School children	10
Green Corp		Youth	3
Indigenous training camps		Aboriginal groups	1

Open days, working bees		Friends members, general public	8
Media articles		General public	163
Permanent Information Displays		Visitors	3

Volunteers and community involvement

Over 300 people have actively assisted the Arid Recovery Project on a voluntary basis since its inception in July 1997. Participants came from a wide range of backgrounds and include:

- Friends members and volunteers >100
- WMC Resources staff- 15
- University of Adelaide students- 65
- National Parks staff and Government staff- 10
- ATCV/Greencorp trainees- 75
- Members of Indigenous organisations- 17

Friends of the Arid Recovery Project

The Friends of the Arid Recovery Project now has over 120 member households with members from as far afield as W.A. and New Zealand. Membership includes WMC 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 which is distributed to all members and sponsors. The group coordinates volunteer involvement in the project, organises fundraisers and conducts working bees. Fundraisers during 2000 included a 150km walk from Roxby Downs to Curdimurka to raise money for the Western-barred Bandicoots ($8000 raised), selling tee-shirts and stubby holders, BBQ stalls at WMC Family Day, running the bar at the Glendambo B&S Ball and organising a fundraising dinner and 2 raffles. Over $12 000 was raised through fundraisers and membership in 2000. Other activities organised by the Friends group this year included coordinating the Bilby and Bettong releases, organising the fence closing ceremony, assisting with rabbit control and fencing and helping monitor the released animals. Between 15 and 20 Friends members attended each release with many members' children given the opportunity to see and release an endangered species. Members of the Friends group also organised and staffed information displays at WMC Family Day, World Environment Day, National Parks Expo and Roxby Downs market days.

During 2000, the Friends group applied for 9 grants (Table 6) and received over $55 000. Many local businesses also sponsored the Arid Recovery Project through the use of their goods and services (Table 7). A sponsors' BBQ and nocturnal viewing of the bilbies was organised in 2000 to thank the sponsors for their support. Macro Meats (kangaroo meat producers) are donating 15% of the profits of kangaroo sales above base sale levels in Roxby Downs to the Arid Recovery Project. The Arid Recovery Project supports the ecologically sustainable harvesting of kangaroos for meat production and always purchases kangaroo meat for Friends group functions and visitor BBQs

Table 6: Grants applied for and monies received by the Friends Group during 2000

Grant	Amount	Received
National Parks Foundation	7 430	7 430
WWF Threatened Species Network	11 610	11 610
Perpetual Grants	12 050	0
Directors Grants (Friends of Parks) 1999	4 800	1 000
Natural Heritage Trust	28 030	28 030
NHT Friends on ground projects grants	5 000	1 000
Directors Grants (Friends of Parks) 2000	2 000	1 200 (received after Dec 2000)
Wildlife Conservation Fund	4 050	4 050

Wildlife Conservation Fund	2 240	2 240 (received after Dec 2000)

Table 7: Sponsorship secured by the Friends Group during 2000

Sponsor	Sponsored item	Value in 2000	not used 31/12/00
Lavricks Engineering	50 litres fuel per month	$660	
Olympic Dam Transport	Car maintenance	$1500	
K. and L. Greenfield	Donation	$1000	
Specialised Tyres	Set of tyres and free puncture repair	$1000	
Vetcare	Animal care		*
Oasis	1 dinner for raffle	$50	
SBS contractors	Hire of Graders, trucks, fork lifts	$340	
Heading contractors	Equipment hire	$1000	*
Readymix Quarry	Quarry products	$855	
Olympic Dam Tours	Donation and bus hire	$500	
Trekabout tours	Bus hire	$400	
Wesfarmers	Donation	$300	
Foodland	Ice	$60	
Eurest	BBQ- food	$550	
BP	Repairs to Bike	$100	
SDS	Crane hire		*
Wreckair Hire	Equipment hire	$200	
Cowell Electric	Pump out portable toilet	$150	
Garry Baker Building	Paint, doors, locks etc	$1500	
Macro meats	15% of kangaroo meat profits at RD	$102	
TOTAL		**$10 267**	

Aboriginal Lands Trust

Nine members of the Aboriginal Lands Trust attended a training camp held at the Arid Recovery Project in May 2000. The trainees were from Aboriginal lands across the state and were trained in feral-proof fencing, feral animal control, vegetation monitoring, radio-tracking and endangered species trapping. The training camps are conducted in association with the Aboriginal Lands Trust and are designed to encourage and assist Aboriginal groups with planning similar conservation ventures on Aboriginal Land. All members appeared to enjoy and benefit from the camp and another 2 camps are planned for 2001.

Green Corps/ATCV

Two Green Corps teams and one Australian Trust for Conservation Volunteers group assisted the project during 2000. The ATCV team assisted with fencing the third expansion area. The first Green Corps team led by Nicki Munro commenced at the project site during October 1999 and completed 14 weeks of work over summer 1999/2000. A second Green Corp team led by Ray Emmerson began work at the project site in July 2000 and graduated in December 2000. The 10 member team completely fenced the third expansion area, helped eradicate rabbits, designed a site tour, painted the buildings at the site and assisted with monitoring. The Green Corps teams were housed at the WMC single persons' quarters at Camp 1 where the team assisted with landscaping and paving in part exchange for accommodation costs. The Arid Recovery Project has submitted another Green Corp application for a team in 2001. If successful this team will assist with the building of a viewing hide and an ephemeral watering point, buffer zone fox and rabbit control, and radio-tracking.

University of Adelaide

30 University of Adelaide students camped at the Arid Recovery Reserve in April 2000. The students conducted the annual fauna monitoring as well as bird banding, rabbit control and radio-tracking. The

student camp coincided with the Greater Bilby release and students were able to learn radio-tracking skills and gain first-hand experience of endangered species management. Students were also given a surface tour of the mine and Environmental Department to increase their understanding of environmental issues associated with mining.

Awards

The Friends group applied for four awards during 2000 including the Prime Minister Environmental Awards, the Readers Digest Environmental Award, the National Bank Community Awards and the Resource 2000 Awards. The project was successful in receiving a special Resource 2000 Award for corporate citizenship. Although the project did not strictly meet the mining criteria for the Environmental Excellence Award, the judges gave a special award based on its strong and unique environmental and community achievements.

2000 Budget

Contributions

Over $500 000 in kind and monetary contributions were received from 34 organisations in 2000 (Table 8). This was nearly $150 000 more than in 1999. The increase in funding contributions was due to fencing materials needed to complete the project fence during 2000. Monetary contributions comprised approximately 50% of the total contributions, with WMC and the Natural Heritage Trust the major contributors. WMC was the largest contributor, donating one third of the total project contributions. Most of the WMC funds were used for wages and fencing materials. $74 000 was received from other organisations.

In kind contributions represented nearly half of the total contributions to the project in 2000. Twenty two businesses and organisations contributed in kind to the project compared with 10 in 1999. Major in kind contributors included Greencorp, the Friends group, and the University of Adelaide. In kind contributions involved the donation of volunteer labour for plant, animal and endangered species monitoring, veterinary assistance and quarantine facilities, research, fencing, road construction, fuel, feral animal control, car parts and food. The majority of labour required for fencing the expansion areas was provided by volunteers and trainees. In kind labour contributions are valued at $15 per hour for unspecialised labour and $25 per hour for professional labour, following standard Natural Heritage Trust recommendations outlined by the Commonwealth Government. Professional in kind contributions include re-introduction organisation by DEH staff, time donated by University of Adelaide and DEH committee members and volunteer supervisors.

Expenditure

Major expenditure items included wages and fencing materials required to complete the project expansion. Wages include two full time positions comprised of one full time project coordinator and 2 part time project officers. Other major expense items were radio-collars and transport of threatened species, fuel for the 4WD, a second quad bike and volunteer associated costs such as fuel and food reimbursements. Depreciation for the fence has not been included in this year's annual report but will be included as of 2001 now that the fencing is completed.

Table 8: Arid Recovery Project: Contributions and Expenditure during 2000

Contributions	2000 in kind	2000 monetary	2000 total
Olympic Dam Corporation (WMC Resources)		167 467	167 467
Land Management Research Grant		21 080	21 080
National Heritage Trust		28030	28030
University of Adelaide	17300	2540	19840
DEH	1700	3700	5400
Friends of the Arid Recovery Project	63 845		63845
-Membership fees		385	385
-Donations and fundraisers		11 711	11 711
-DEH Friends Grants		1 000	1 000
-Friends of Parks NHT on ground projects		1 000	1 000
--Wildlife Conservation Fund		4 050	4 050
--Nature Foundation		7 470	7 470
--WWF- threatened species network		11 610	11 610
--bank account		3 489	3 489
Dog Fence Board		13 500	13 500
Aboriginal Lands Trust	4 000	2 350	6350
Wesfarmers		300	300
Macro Meats		102	102
Royal Zoological Society of South Australia	4000	1000	5000
Greencorp	135 600		135 600
CALM W.A	5 000		5 000
ATCV	2 400		2 400
Olympic Dam Transport	2 180		2 180
Gary Baker Building	1 500		1 500
DPI	1100		1100
Specialised Tyres	1000		1000
SBS Tuck Hire	340		340
Readymix Roadbase	855		855
BP	100		100
Wreckair	200		200
Trekabout Tours	400		400
ODT Tours	400		400
Foodland	60		60
Lavrick Nominees	660		660
Eurest	550		550
Cowell Electrics	150		150
Roxby Downs Motor Inn	50		50
Total Contributions	**243 390**	**280 784**	**524 174**
Expenditure			
Wages			
project coordinator and assistant project officer			90 490
Operating			
Minor capital items (fencing clip guns, fumigator etc.)			7 702
Vehicle running costs			10 855
Endangered species re-introductions (radio collars, transport etc.)			16 241
Communications			274
Travel/accommodation for volunteers			4 576
Fundraiser outlays			2 240
Information displays and publicity			338
Feral animal control			4 153
Bank fees			107
Sundry			323
Fence maintenance			1 992
Capital			
fencing materials			110 000
4 wheel motorbike			6 000
Total Expenditure			**255 291**
Funds remaining			**25 493***

*These funds are external grants received for monitoring, research and endangered species re-introductions to be conducted in 2001 and are already committed funds.

Proposed Budget and Workplan 2001

Annual contributions and expenditure

The project expenditure in 2001 will be lower than 2000 due to the completion of the fence and thus minimal expenditure on fencing materials. Total contributions are still expected to exceed $300 000 (Tables 9 and 10) of which WMC will contribute one third. $69 500 has already been secured by the project for 2001 from the Natural Heritage Trust. The main project costs in 2001 will be wages, fuel, fence maintenance, feral animal control and monitoring. Research, information dissemination and volunteer costs will also increase as the project shifts its focus from feral animal control and fencing to maintenance, endangered species research and education and public awareness.

Table 9: Annual In Kind Contributions

Contributor	1998	1999	2000 forecast	2000 actual	2001 forecast
Pastoral Management Branch	520	1 760	2 000	0	2 000
DEH"	3000	3 400	5 000	1 700	5 000
University of Adelaide	21 000	36 120	32 400	17 300	17 000
University of South Australia		14 400			
Lavricks engineering		1 200	660	660	660
Northpoint Toyota		1 000			
Coates Hire		2 000			
Specialised tyres		800	800	1000	1000
Royal Zoological Society of S.A.			0	4000	1000
BP			0	100	?
Olympic Dam Transport		1 000	1 000	2180	1000
Wreckair hire			1 000	200	1000
SBS			1 000	340	?
Eurest			0	550	?
Cowell Electric			0	150	?
Olympic Dam Tours			0	400	?
Trek About Tours			0	400	?
Foodland			0	60	?
Readymix			1 000	855	?
Heading contractors			1 000	0	?
Roxby Downs Motor Inn			0	50	?
ATCV		13 200	10 000	2 400	
Gary Baker Building			0	1500	?
CALM W.A.			0	5000	?
Aboriginal Land Trust		1 800	14 800	4000	4000
Greencorps	8 400	38 400	88 200	135 600	84 000
Roxby Downs Area School	985	2 370	2 500	0	0
Community	5030	**	**	**	**
Friends of the Arid Recovery Project	18 945	30 774	30 300	63 845	45 000
Primary Industries S.A.	700	350	1 000	1100	1000
CSIRO W.A.		2 000	2 000+	0	2000
total	**58 580**	**144 574**	**188 200**	**243 390**	**164 660**

** now included in Friends Group

" This in kind contribution does not include costs of maintaining breeding colonies of endangered species or genetic data bases. These costs would be considerable.

Table 10: Annual Financial Contributions. *=Funds Already Secured

income source	1997 (6 months)	1998	1999	**2000 budgeted**	**2000 actual**	2001 proposed
ODC (operating and capital)	10 000	32 344	116 500	**160 000**	**167 467**	115 000
WMC corporate	150 000					
Land Management Research Grant					**21 080**	
CUDiv Corporate Affairs	30 000					
Dept. Environment	3 000	18 000	4 420	**5 000**	**3700**	5 000
University of Adelaide			3 000	**4 000**	**2540**	2 000
Prizes/ awards		2 000				
BHP			35 000			
Friends of the Arid Recovery Project						
-Friends of Parks NHT on ground projects					**1000**	1000
- bank account			1 953		**3 489**	
- fundraisers and membership			3953	**2 000**	**12 096**	6 000
- Natural Heritage Trust			29 991	**28 030**	**28030**	69 500*
- WWF- Threatened Species Network			3 930	**0**	**11610**	
- Directors grants				**1 000**	**1000**	1200*
- Wildlife Conservation Fund				**4 050**	**4050**	2240*
- Macro Meats			164	**500**	**102**	500
-National Parks Foundation			2 750	**2 750**	**7470**	
Dog Fence Board					**13 500**	
Aboriginal Lands Trust				**6 000**	**2350**	2000
Wesfarmers					**300**	
Royal Zoological Society of S.A					**1000**	
Total income	**193 000**	**52 344**	**207 661**	**219 530**	**280 784**	**204 440**
Expenditure						
wages						
project coordinator and assistant	19 069	61 101	79 601	**80 000**	**90 490**	95 000
contractors wages and equip hire	51 706	2 723	10 506	**10 000**	**0**	0
operating						
Minor capital items			13 466	**6 000**	**7 702**	5 000
Vehicle running costs			7 868	**14 000**	**10 855**	15 000
Endangered species re-introductions	751	2 372	10 629	**15 570**	**16 241**	10 000
Fauna and veg monitoring				**2 850**		10 000
General stores			6 038	**2 000**	**323**	1 000
Communications			122	**300**	**274**	300
Volunteer travel/accommodation	573	1 389	4 933	**14 136**	**4 576**	8 000
Fundraiser outlays			1 295		**2 240**	3 000
Training and education camps						3 000
Bank Fees					**107**	100
Information displays and brochures			1 460	**2 650**	**338**	3 000
Feral animal control			2 730	**1 500**	**4 153**	4 000
Fencing equipment			3 097	**2 700**	**1 992**	1 000
Equipment hire			2 110	**2 000**		1 000
Freight		1 045		**1 000**		500
Electric fencing contractor			2 896			
Fence maintenance			5 000	**2 000**	**2 000**	3 000
Endangered species and native species research						18 000
Polypipe and Soak materials						7 000
Tourism infrastructure (hide, roads etc)						10 000
Incidentals			290	**1 000**		1 000
capital						
Fencing materials	101 777	8 234	59 079	**60 000**	**110 000**	5 000
4 wheel motorbike					**6 000**	
total expenditure	**173 876**	**76 864**	**211 120**	**217 706**	**255 591**	203 900
funds remaining	**$19 124**	**$-5 396**	**$-3 459**	**$1 824**	**$25 493**	$540

Long Term Objectives and 2001 Workplan

Core tasks required to achieve the project aims are outlined in Appendix A. A total of 555 working days are required. There are approximately 225 working days in a year, indicating that the project requires a minimum of two full time staff.

The following long term objectives have been formulated based on the project aims on page 1. These will be implemented gradually according to time and funding commitments but the proposed 2001 outcomes for each objective are outlined below.

Fencing and maintenance

Objective: Eradicate and continue to exclude rabbits, cats and foxes from the Reserve through regular checking and maintenance of the fence

Although the fencing is now completed, the fence requires weekly monitoring and maintenance. Only the main exclosure is electrified with the three expansion areas relying on regular trapping and the fence to exclude predators. During the fence testing stage only 2 out of 10 cats managed to scale the fence when it was not electrified compared with 0 out of 10 when it was electrified. This testing was extreme with feral cats held in a small pen trying hard to escape. It is unlikely the fence would be subject to this pressure in the wild but the entire fence may need to be electrified in 2001 if cats and foxes continually gain access. Regular monitoring of tracks within the exclosure will be used to determine if this is required.

Feral animal control

Objective: A buffer zone of 2km around the exclosure where cats and foxes are controlled. This will increase the effective Reserve area to 120km². A buffer zone of 500m around the exclosure where rabbits are controlled.

Rabbit eradication in the third expansion area is expected to be finished by early 2001 with cat eradication completed soon after. Once rabbits, cats and foxes are completely eliminated from the Reserve, a well-planned monitoring system will be established to ensure that all areas of the Reserve are checked for signs of rabbit biannually and signs of cats and foxes every week. Rabbit track transects will also be established at strategic places around the Reserve and checked weekly during fence checks. Audio lures and leg hold traps will be set around the Reserve perimeter and checked daily using biotelemetry. Monthly spotlight counts around the Reserve will be conducted to determine the fox and cat pressure on the fence and fox baiting will be conducted opportunistically depending on the results of spotlight counts.

Monitoring

Objective: 1) Annual monitoring of the impacts of feral and re-introduced species on the native vegetation through the use of photopoints, vegetation transects, exclosures and seedling recruitment, growth and survival studies.

2) Annual monitoring of condition, density and reproductive status of native and re-introduced animals through track and fixed trapping transects, radio telemetry and opportunistic trapping.

Seedling monitoring sites are already being established in areas of cattle, rabbits, re-introduced species and controls. These sites will be used to determine growth rates and germination of native plant species.

Animal and plant monitoring sites will be conducted in February and August respectively. Radio tracking will continue to be the main form of monitoring for re-introduced species but track transects will increase in importance and trapping transects will be established in 2001.

Threatened species re-introductions

Objective: The re-introduction of locally-extinct plants and animals depending on availability, ecosystem recovery, funding etc. Gradual access of re-introduced species to the entire 60km² Reserve.

The 8km² second expansion area will be kept free of all introduced and re-introduced species at present to allow monitoring and research studies to be implemented. Re-introduced species will first be allowed access to the first expansion area through controlled re-introductions. Gates will not be left open to allow unrestricted access between the main exclosure and expansion area. One way gates may be established to allow access to buffer zone areas. Release of bettongs and/or bilbies into the first expansion area may be implemented in 2001 but only after no cats, rabbits and foxes have been recorded within the expansion areas for 4 months.

Depending on the success of the Western-barred Bandicoot re-introduction, a full-scale release of bandicoots could be planned for late 2001. Within the next 5 years, the project also aims to establish criteria for judging if long term population viability of re-introduced species is successful. At present re-introductions will be considered successful if 3rd generation animals are present.

Education, Tourism and Public Awareness

Objective: 1) Identify and develop tourism within the first expansion area. Tourism will be coordinated by local tour operators.

2) Establish training and education camps at the project site.

Tourism access to the exclosure will always be restricted and require either an organised tour with a local tour operator or a customised tour with Arid Recovery staff. However, the public will have unrestricted access to the information displays situated next to the main gate on the Borefield Road. All tourism will be restricted to the 8km² first expansion area and no tourism will operate within the main 14km² exclosure.

Tours will include visits to the viewing platform and information displays, spotlight drives on established roads, self-guided walks and a hide placed near a soak area. Tourism is not expected to become a viable industry within the Reserve but may eventually make a valid contribution towards project costs. The project will receive a set fee per head from each tour operator who will operate independently of the project.

Training and education camps will be available for schools, universities, indigenous groups, Green Corp trainees and volunteers and will cover various levels of land management including feral animal control, fencing, endangered species monitoring, vegetation monitoring and research. To date the following activites have been organised but more will be planned as the year progresses:

- Update information displays present along the Borefield Road, which is used extensively by tourists during the winter months.
- Update the project brochure and distribute 2000 copies
- The 2000 annual report will be distributed to all contributors and potential sponsors.
- Scientific research papers on the project will be presented at conferences throughout Australia.
- Three scientific papers outlining project research will be published in scientific journals.

- Two groups from the Aboriginal Lands Trust will be visiting the site this year and receiving training in endangered species management from Arid Recovery staff.
- An open day is planned for mid-year which will attract sponsors, media, general public and representatives from contributing organisations.
- The portable information display and touch table will be displayed at the National Parks Festival, Glendambo Field day, Roxby Downs market days and other events.
- Articles are being prepared for Australian Geographic and other widely read magazines.
- One Greencorp team is expected to be based at the Reserve this year.
- At least two research students from the University of Adelaide will conduct research at the Reserve this year.
- Exposure will be increased through organised tours by Olympic Dam Tours, Trek-about and Diamantina tours.

Research

Objective: Coordinate research on the restoration of ecological processes and use results for adaptive management of the project. Disseminate information to other conservation and industry groups to improve management of arid lands.

Priority Research topics for the next 5 years are as follows (confirmed 2001 research topics in bold)

- **Comparison of perennial seedling germination and growth inside and outside the Reserve**.
- **Cat trapping trials to determine optimal trapping methods**
- **Comparison of diet of Burrowing Bettong and Greater Bilby using microscopic analysis of scats.**
- **Impact of Greater Bilby scratchings on soil, seed germination and invertebrates**
- **Nest sharing and dispersal in Greater Stick-nest Rats**
- **Habitat use and home range of re-introduced species** Comparison of the use of rabbit, bilby and bettong burrows by native fauna
- Bat survey
- Comparison of rabbit control methods
- Comparison of bird diversity and abundance inside and outside the Reserve
- Reproduction and dispersal of re-introduced species

Research projects will be conducted using a combination of volunteers and scientists. An application to obtain Earthwatch volunteers has been prepared and if successful, Earthwatch trips could begin in 2002. These volunteers travel from around the world to assist with conservation and research projects. The Arid Recovery Project application is for Earthwatch volunteers to assist with research into reptile, native mammal and plant species. Volunteers may also assist with annual monitoring.

Fire, drought and flood contingency plans

Objective: Establish soak areas for limited use only during drought conditions. Maintain fire break around fenceline.

Maintenance of a fire break around the exclosure by removing all vegetation within 4 metres of the fence. In the event of fire, ODC emergency services crew and Roxby Downs SES will be asked to fight the fire. Flood gates have been installed in case of flooding. If flooding does occur, the fenceline will be checked as soon as practical to enable timely repairs.

Although some mortality of plants and animals during natural droughts is expected and natural, fenced exclosures do not allow animals to naturally disperse long distances to look for food and moisture. Prior to European settlement, droughts and patchy rainfall in the arid zone would have forced animals to move to recent rainfall areas or eventually become locally extinct. If local extinction occurred these areas would

have been recolonised by animals from adjacent areas. However due to the imposition of a fence around the exclosure these natural processes cannot occur and the project will use soaks to mimic isolated rainfall events and prevent mass mortality during long droughts. These soaks will be off-takes from the ODC water pipeline and placed in natural depressions. No free water will be provided and soaks will be turned on and off as required. Decisions on timing and duration of soaks will be made by the committee based on information on recent rainfall, vegetation condition and mortality of re-introduced species.

Appendix A: Priority tasks

Priority aim	Method	Frequency	Duration (days)	No. people required	Annual total (days)
Maintain fenceline	Fence check	weekly	1	1	52
	Fence maintenance	as required		1	10
	Check electrics, fix faults	daily	.01 + 6	1	9.65
	Firebreak around exclosure	biannually	3	2	6
Keep exclosure rabbit-free	Check all 4 project areas for rabbit tracks	biannually	10	2	20
	Remove any re-established rabbits	annually	5	1	5
Maintain buffer zone	Set and check cat traps around fence line	daily	.125	1	45.6
	Poison oats for rabbits	annually	10	1	10
	Fumigating within 500m of fence line	annually	5	2	10
	Fox/cat baiting	biannually	2	2	4
Monitor restoration of in situ species	Standard vegetation monitoring sites	annually	5	2	10
	Additional vegetation exclosure sites	annually	3	2	6
	Standard reptile/mammal monitoring sites	annually	6	2	12
	Kangaroo census and cull	annually	2	2	4
	Bird transects	annually	5	1	5
Monitor re-introduced species	Track transects	biannually	2	1	4
	Trapping transects	biannually	4	2	16
	Radio-tracking	weekly	1	1	52
Ensure information dissemination	Present display at field days, talks	as required	6	1	6
	Present scientific papers at conference	annually	3	1	3
	Coordinate and lead visits	as required	12	1	12
	Enter monitoring data and analysis	annually	5	1	5
	Quarterly reports	quarterly	1	1	4
	Annual report	annually	8	1	8
Increase public profile	Publicity: photos, articles, interviews	monthly	2	1	24
Increase community support, participation	Friends group newsletter, coordination	quarterly	2	1	8
	Organise and supervise volunteers	as required	10	1-2	10
Training and education programs	Universities	annually	5	2	10
	Indigenous groups	annually	4	2	8
	Primary and Secondary schools	annually	4	2	8
	Volunteer coordination and supervision	as required	10	1	10
	Earthwatch, Green Corps, ATCV	annually	8	2	16
Maintain and coordinate funding	Grant applications and progress reports	quarterly	2	1	8
	Budget	monthly	.3	1	4
Administration	Ordering, filing, wages, permits	weekly	1	1	52
Research	Supervise research students	2 annually	10 each	1	20
	Conduct research, write scientific papers	2 annually	30 each	1	60