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Project Summary

The Arid Recovery Project is a joint conservation initiative between WMC Resources, Friends of the Arid Recovery Project, Department of Environment, Heritage and Aboriginal Affairs (DEHAA) and the University of Adelaide. The project was implemented in June 1997 with the aim of restoring 50km² of arid land in the vicinity of Roxby Downs to a semblance of its pre-European state. Specifically, the project aims to fence the area, remove introduced cats, foxes and rabbits, monitor the regeneration of vegetation and the response of the native fauna, and re-introduce locally extinct species. Another important aim of the project is to encourage and develop compatibility between mining, pastoralism, tourism and conservation initiatives. Further aims include increasing public awareness of arid zone environmental issues, encouraging the community to become involved in conservation projects and researching the ecology of arid zone fauna and flora. 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 as follows;

Table 1: Project stages and current progress

Stage no.	Details	Start date	Finish date	Results so far
1	Construction of a 14km ² enclosure	August 1997	January 1998	<i>Exclosure constructed by contractors and volunteers</i>
2	Removal of rabbits	January 1998	January 1999	<i>All rabbits removed from exclosure after over 8000 hours of volunteer effort</i>
3	Establishment of a plant and animal monitoring system	August 1997	April 1998	<i>Plant sites established with Pastoral Management Branch, Animal sites established with Adelaide University students</i>
4	Electrification of the fence and removal of cats and foxes	January 1999	March 1999	<i>Audio lures used to eradicate the last cat</i>
5	Re-introduction of up to 5 nationally threatened species	April 1999	2005	<i>Greater Stick-nest Rats re-introduced in April 1999 Burrowing Bettong re-introduced in October 1999</i>
6	Establishment of a regional buffer zone	January 1999	May 2002	<i>Audio lures, fumigation, trapping, baiting and shooting all used to reduce cat, fox and rabbit numbers in buffer zone</i>
7	Increase the size of the main enclosure to accommodate the re-introduction of wide-ranging species such as bilbies	May 1999	May 2001	<i>First 8 km² expansion area fenced and all rabbits eradicated. Second 8km² expansion area fenced and rabbit control in progress</i>
8	Increase community awareness and participation in arid zone conservation	June 1999	ongoing	<i>Information displays, brochures, talks, attendance at expos, festivals, field days etc. Over 100 items of publicity generated to date.</i>

Major Achievements in 1999

During 1999, many achievements were made at the Arid Recovery Project. The most notable achievements include;

- **Completely eradicating rabbits from the main 14km² enclosure.** *Eradicating rabbits from an area this size proved a monumental task with over 8000 hours donated by volunteers. Considering that the area once supported in excess of 600 rabbits per km² the benefits to plant and animal life will be considerable.*
- **Re-introducing the Greater Stick-nest Rat.** *100 Stick-nest Rats were released into the enclosure in April and June 1999. Rats built their characteristic stick-nests and began breeding almost immediately. The Greater Stick-nest Rat has been extinct on the mainland for 70 years and this release, if successful, constitutes the first wild mainland population of the species.*
- **Fencing and eradicating rabbits from the first expansion area.** *8km² adjacent to the main enclosure were fenced and all rabbits eradicated. Almost half of the project area (22km²) is now rabbit free.*
- **Re-introducing the Burrowing Bettong.** *10 bettongs were obtained from W.A. for a trial release within our project area. Burrowing Bettongs were once common in arid Australia but survive naturally on only 3 offshore islands in W.A.*

Project Team

The project team is made up of committee members and project officers. The Project Coordinator is the only full time position and other project officers are part time.

Katherine Moseby- Project Coordinator
Jackie Bice- Interim Project Coordinator
Andrew Freeman- Feral Animal Control Officer
Greg Kammermann- Fencing Coordinator
Sharon Rogers- Casual Project Officer

Committee members

Dr John Read- WMC Land Management representative
Peter Copley- National Parks 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 50km² 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 but mostly on Roxby Downs Station leased by WMC Resources. Five pastoral stations adjoin the reserve, namely Roxby Downs, Andamooka, Stuarts Creek, Mulgaria and Billakalina. In order to facilitate manageable and effective rabbit control, it was planned to gradually fence the reserve in sections until the whole 50km² was enclosed. At present 30km² of the total 50km² has been fenced including the main 14km² enclosure and 2 expansion areas of 8km² each. These expansion areas have complete 1.8m high fences on their external sides but short 90cm rabbit-proof fences on their northern internal fencelines. Recently Mulgaria Station has given permission for a 1.15km² section of pastoral land north of the project area to be included within the reserve. This acquisition will reduce fencing and maintenance costs as the entire northern boundary of

the reserve will now be the Dog Fence. However, the Dog Fence Board has indicated a wish to re-align the Dog Fence to avoid low lying swampy areas and Arid Recovery Staff are working with members of the board to mark out a fenceline which will suit both parties (see figure 1 for a possible option). 17 km of fenceline is required to finish fencing the perimeter of the reserve and this is planned for completion (including the Mulgaria section) during 2001. Once external fencing is completed, cat and fox eradication will be implemented.

Feral animal control

Rabbits

Spotlight transects indicate that rabbit densities in the Roxby Downs area remain at less than 10% of pre-RCD levels (Fig. 2). Although spotlight counts estimate rabbit density at less than 20 per km², these counts severely underestimate true rabbit density and should be used as an indication of temporal trends only. Since the RCD outbreak recorded in 1996, rabbit numbers have been gradually increasing (Fig. 3).

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Figure 2: Rabbit density counts (no. per km²) conducted by WMC staff every 2 months.

Rabbits were completely eradicated from the main 14km² enclosure in early 1999. Rabbit control began in the first expansion area in May 1999 and 389 rabbit holes were fumigated, 60 warrens exploded and 94 rabbits trapped. It is estimated that between 500 and 800 rabbits were eradicated from this area. Over 15 months of rabbit control were required to eradicate rabbits from the 14km² main enclosure but only 4 months were required to eradicate rabbits from the first 8km² expansion area. This increase in efficiency can be attributed to 3 factors;

- 1) The main enclosure was fenced with standard 40mm rabbit-proof netting which allowed small independent rabbits through the mesh holes. Once this fault was discovered, the original netting was overlain with smaller 30mm netting and rabbit eradication completed within 1 month of the new mesh being put in place. All rabbit fencing is now conducted using specially constructed 30mm netting.
- 2) The expansion area was only 8km² and a much more manageable size than the original 14km². Within the large enclosure rabbits were breeding at a rate high enough to maintain their population under all but the most intensive control conditions.
- 3) Our rabbit control methods have improved considerably since the original enclosure. The project has now formulated a staged methodology for rabbit eradication using the most efficient techniques. Eradication begins with spreading 1080 poison oat lines along all the sand dunes in the area during the dry summer months to maximise deaths. The area is then traversed on foot and all warrens marked. All active warrens are then fumigated. The area is then walked again and areas of remaining rabbit activity (tracks) marked. Fumigation and soft leg-hold traps are then used to eradicate the remaining rabbits. On average, all dunes within the area are walked at least 6-8 times each to ensure that all rabbits are eradicated.

Rabbit Calicivirus release

Rabbit eradication within the second 8km² expansion area began in November 1999. A release of Rabbit Calicivirus Disease was organised through the Animal and Plant Control Commission prior to the start of rabbit control in September 1999 to assist with rabbit control. 23 rabbits were captured within 2km of the second expansion area and inoculated with the disease. Rabbit spotlight counts (Table 2), warren checks and vegetation monitoring were conducted both before and after the release. No dead rabbits were found and spotlight counts showed a small drop in rabbit numbers but this is consistent with annual summer population fluctuations recorded in transects away from the reserve area (Fig. 3). Although Autumn and Spring are considered the best times to release RCD, possible reasons for failure of the virus to spread could include the dry conditions and low vector numbers (insects) present at the time of the release. Additionally, comparatively low rabbit density may have hindered transmission of the virus. After RCD was found to have an insignificant impact on the population in the second expansion area, poison oats were laid and warrens were mapped. However rabbits inoculated

with RCD are still likely to be present in the area as most rabbits that were innoculated were captured just outside the second expansion area where rabbit control is not being conducted. A Green Corps team is currently assisting with removal of the remaining rabbits.

Table 2: RCD rabbit transect results
length of transect=10.55km

date	number of rabbits	no.rabbits /km ²
20/09/99	4	9.48
28/09/99	RCD release	
4/10/99	5	11.85
21/10/99	3	7.11
8/11/99	2	4.74
25/11/99	1	2.37
2/02/00	2	4.74

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Figure 3: Rabbit density (no. per km²) spotlight counts conducted by WMC staff since the arrival of RCD in 1996. Includes the new RCD transect established by Arid Recovery staff prior to the release of RCD in September 1999.

Cats and foxes

Cats and foxes were completely eradicated from the main enclosure during early 1999 by shooting, trapping and the use of audio lures. After eradication, 10 audio lures and soft leg-hold traps obtained from CALM in W.A. were set continuously around the enclosure perimeter track. During 1999, 10 cats and 4 foxes were captured around the enclosure using this method (trap nights = 1710, trap success of audio lures = 0.82%) and a further 2 cats were shot. No cats or foxes have gained access to the enclosure since the last cat was eradicated in February 1999. Cats and foxes are still present in the two expansion areas due to the low internal fences on the northern side allowing access. At present cat and fox numbers are reduced in the expansion areas through shooting, baiting and trapping. When the area is completely fenced, full-scale eradication will commence.

Re-establishment of native fauna

Over 60% of the original mammal fauna in the Roxby Downs area has become locally or completely extinct. 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 survived in the arid zone and whether long term re-establishment is possible. Some species such as the Spinifex Hopping-mouse have become naturally re-established in the project area 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 Arid Recovery Reserve and which could potentially be re-introduced. The following species were present in the sub-fossil deposit and could potentially be re-introduced

Greater Stick-nest Rat
Burrowing Bettong
Greater Bilby
Western-barred Bandicoot

Golden Bandicoot
Kultarr
Mulgara

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.

The 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. DEHAA 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 predators. In September 1998, a trial release of 10 stick-nest rats was conducted inside a 10ha pen within the main enclosure at Roxby Downs. Positive results led to a further 90 stick-nest rats being released straight into the main enclosure in April and June 1999. Over 25 friends group members and university students assisted with each release. Released stick-nest rats immediately began building stick-nests and utilising a variety of shelters including cotton bush (*Maireana aphylla*), spiny saltbush (*Rhagodia spinescens*), old goanna and burrowing bettong warrens and graded roadside debris piles. Underground shelters and graded roadside piles were the most common shelters and provided the best cover and protection from heat and exposure. Thick bushes such as cotton bush and spiny saltbush were also favoured.

Table 3 : The usage of various daytime shelters by radio-collared stick-nest rats. Visits refers to the shelter used each time a rat was radiotracked during the daytime. Shelters used during the first month after release were ignored as they occurred before rats had a chance to settle down and choose shelter locations. More female rats were radio-collared than males.

	Total Male Rat Visits	Total Female Rat Visits	Total Rat Visits	Total no. rats which used each shelter type
Underground	25	54	79	16
Graded roadside pile	23	49	72	16
<i>Rhagodia spinescens</i>	2	56	58	7
<i>Maireana aphylla</i>	27	25	52	10
Dead <i>Acacia ligulata</i>	4	17	21	6
<i>Enchyolaena tomentosa</i>	3	5	8	4
<i>Zygochloa paradoxa</i>	3	4	7	4
<i>Dodonaea viscosa</i>	6	0	6	2
<i>Sarcostemma</i> sp.	1	1	2	2
total	94	211	305	

Over the winter months no predation events by introduced or native predators were recorded and all radio-collared female rats produced young. The first young were recorded in June 1999 and a total of 25 Roxby born rats have been captured up until January 2000 (14 female, 9 male and 2 unsexed). More young were known to have been born but were not captured for tagging. Fifty six rats have been radio collared at different times since release including some new rats born within the enclosure. It is estimated that at the beginning of summer (December), numbers had grown to approximately 150 rats (see appendix A). No records of breeding were obtained after November suggesting that breeding may not normally occur in the summer months. Only two natural deaths of radio collared rats were recorded over the winter months (not including deaths through re-collaring or stress-related deaths post-release). However, rat numbers declined significantly during the summer months with 14 radio-collared rat deaths recorded during December and January (see research section- goanna project). A rat census will be conducted at the end of summer to determine the approximate number of rats left inside the reserve.

Table 4: The number of released and Roxby-born rats as of January 2000 and the fate of radio-collared individuals.

Total rats released			100
no. known Roxby-born rats			25
total collared			56
deaths-	post-release trauma*	6	
	collar related+	4	
	natural	3	
	goanna predation	4	
	heat	3	
	unknown	6	26
slipped collar			5
missing or collar failure			9
collar removed			6
no. still collared			10

* = These deaths occurred between 2-3 days after release and represented older animals that had problems coping with their new environment.

+ = 3 of the 4 collar related deaths were due to capture myopathy during recollaring.

Burrowing Bettongs

The Burrowing Bettong is a small marsupial rat-kangaroo which used to live in burrows in the Roxby Downs area. The species became extinct on the mainland in the 1940's and is 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 project area. Bettong remains were also 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 enclosure. The bettongs are being provided with supplementary food and water until they become accustomed to local food. Some females have pouch young at various stages of development. Bettongs are gaining weight and maintaining condition. Bettongs are radio-collared and will be released into the main enclosure after the next rainfall event. Depending on information obtained on their home range, diet and habitat preference a full-scale release of bettongs may be planned for late 2000.

Research

Four studies were conducted by university students on stick-nest rats during 1999, two by University of Adelaide students, one by a University of S.A. student and one by a University of N.S.W. student. All results will be published in scientific journals but preliminary results are as follows;

Goanna Predation on the Greater Stick-nest Rat

Scholarship student: Julia Bolton, University of Adelaide

Goanna predation was expected to be significant over the summer months and a student scholarship was established to enable a university student to study this predator/prey interaction. The following aims were established;

- 1) Determine if goanna predation significantly effects the stick-nest rat population
- 2) Determine whether rat behaviour, shelter type or location effects vulnerability to goanna predation
- 3) Determine home range and feeding behaviour of goannas
- 4) Determine variability in goanna density in different habitat types.

21 stick-nest rats and 10 goannas were captured and fitted with radio transmitters at the beginning of summer. Statistics revealed that there were significantly more goanna tracks recorded on dune raked patches than swale patches. This suggests that rats present in dune habitats will be exposed to higher levels of goanna predation than those living out on the swales. Additionally, there were significantly more goanna tracks around rat nest bushes than control bushes suggesting that goannas may be attracted to the smell of rats whilst foraging for food. To date, goannas have preyed on a significant proportion of collared rats within the enclosure with extreme daytime temperatures (45 degrees celcius) also leading to rat deaths. Extremely dry conditions (absence of free water) also appears to be a contributing factor as the five rats present within the bettong release pen have access to drinking water and have so far survived the hot weather despite the presence of goannas in the pen. Rats which have survived within the main enclosure appear to be those in areas where goanna densities are low (swales) or in cooler areas such as underground or in extremely dense bushes.

Table 5: The fate of 21 rats radio-collared at the beginning of summer 1999.

no. rats collared	cause of death				total deaths	slipped collar	no. missing	no. alive
	goanna predation	heat	unknown but goanna scavenged	collar caught				
21	4	3	4	1	12	1	3	5

At least 3 uncollared rats have also been taken by goannas

Three of the four unknown causes of death occurred during the extremely hot week when some rats died from the heat and thus it is likely that most of them represent heat related deaths with subsequent scavenging by goannas. In most instances of goanna predation the body was ripped apart and consumed but the tail, limbs and fur were left. The soft underbelly and upper legs were usually eaten first. Rats were not eaten whole. Two uncollared rats were eaten by goannas and the carcasses were identical to the collared rats suggesting that it was the size of the rat not the collar that prevents goannas from eating them whole.

Goanna home range size averaged less than 50ha with the vast majority of activity on dune habitat, although goannas did venture out a short distance onto swales. Goannas were not active every day, even under optimum temperature conditions. One goanna fitted with a radio collar was discovered eating an untagged stick-nest rat outside the entrance to an underground nest. The goanna subsequently remained within the underground shelter for 13 days apparently digesting this large meal. A large number of burrows were utilised by each goanna but only some burrows were re-used. The majority of goanna scats contained invertebrate remains but stick-nest rat and other rodent hair were found in 1 and 3 of the 50 scats examined respectively.

Although goannas appear to be a significant predator of stick-nest rats there are still rats surviving in large swale areas remote from dunes and in thick bushes and stick-nests on dunes. It is expected that these rats will gradually increase the size of their nests until they are goanna-proof, and together with the swale rats, will ensure the survival of the species within the Arid Recovery Reserve.

Comparison of the diet of native and introduced herbivores

Honours Project: Sarah Ryan, University of Adelaide

This project aimed to determine the following;

- differences in dietary preference between Stick-nest Rats and rabbits
- predict the vegetation changes which may occur with the replacement of rabbits with rats within the enclosure.

To determine the differences in dietary preferences, cafeteria trials were established outside known rabbit and rat burrows using cuttings of locally available plants. Feeding behaviour of the stick-nest rats was also determined through direct observation and rabbit stomachs were examined. Results suggested that rats and rabbits have significantly different dietary preferences with stick-nest rats choosing species on the basis of water content whilst water content was not a significant factor in rabbit diet selection. Both species highly preferred the seedlings of certain perennial species such as mulga and *Acacia ligulata* but unlike the rats, rabbits also ate the adult cuttings of these species. Rabbits ate a greater selection of plant species than stick-nest rats. Stick nest rats preferred female saltbush leaves to male saltbush leaves despite a greater proportion of male saltbush in the enclosure. Female saltbush leaves were found to contain a higher water content than male leaves. Rabbits foraged more destructively than rats with rabbits eating more of each plant cuttings and regularly digging up cuttings and eating the base. Rats tended to spend less time foraging on individual bushes and were never noticed to dig at the base of bushes.

Table 6: Plant species favoured by rats and rabbits (> 30% consumed). Water content of favoured plants was also compared with water content of randomly selected plant species.

Stick-nest rats	Water Content	Rabbits	Water Content	Random	Water content
<i>Gunniopsis quadrifida</i>	90 ± 4.6	<i>Acacia aneura</i>	38 ± 0.6	<i>D. clavellatum</i>	85±0.2
<i>Calandrinia sp.</i>	93 ± 0.5	<i>Acacia papyrocarpa</i>	44 ± 0.4	<i>T. zeylanicum</i>	74±0.7
<i>Enchylaena tomentosa</i>	81 ± 2.7	<i>Acacia ligulata</i>	58 ± 2.2	<i>N. stimulans</i>	66±2.7
<i>Atriplex spongiosa</i>	81 ± 1.5	<i>Salsola kali</i>	77 ± 2.3	<i>S. lanceolatum</i>	61±0.2
<i>Atriplex velutinella</i>	81 ± 1.3	<i>Crotalaria eremara</i>	68.7	<i>Tribulus sp.</i>	61
<i>Sclerolaena divaricata</i>	90 ± 0.2	<i>Eriochlamys behrii</i>	58 ± 2.2	<i>S. ammophila</i>	55.5
		<i>Calandrinia sp.</i>	93 ± 0.5	<i>A. vesicaria</i>	54±0.9
				<i>R. spinescens</i>	53±0.4
				<i>E. longifolia</i>	50±0.7
				<i>A. oleifolium</i>	47±1.1
				<i>S. artemisiodes</i>	46±1.4
				<i>P. phylliraeoides</i>	44±0.8
				<i>D. viscosa</i>	39±3.7
Average	86%		62.3%		56.5%

Direct observations and scat density analysis showed that stick-nest rats spent significantly more time foraging along dune bases (average of .55 scats per quadrat) than dune (0.125) or swale (0.325) sites. Rats were observed feeding almost exclusively on *Enchyleana tomentosa* and *Atriplex vesicaria* leaves. The amount of time spent foraging on these species was significantly greater than that which would be expected if the rats were foraging randomly. However, cafeteria trials indicate that the species with the highest water content, *Gunniopsis quadrifida*, was the species most preferred by the rats. This species is uncommon in the project area. It was suggested that the density and recruitment of this species may be affected by the stick-nest rats in the future. It was recommended that some of these plants be fenced off inside small exclosures to allow the long term effect of rat grazing to be studied. This issue is dealt with in the monitoring section.

Habitat usage and behaviour of the Greater Stick-nest Rat

Honours project- Sally O'Neill, University of South Australia

This study aimed to define the habitat usage of re-introduced stick-nest rats through studying the floristics and structure of vegetation at stick-nest rat shelter sites. Stick-nest rats were found in a wide variety of vegetation types but showed a distinct preference for habitat based on nesting requirements. Habitat preference was based on structural density of nesting sites rather than floristics of surrounding vegetation. Nesting sites were in areas of high structural density from at least ground level to 50cm. Cotton bush, *M. aphylla*, was one favoured nesting bush due to its high foliage density at ground level. Vegetation transects indicate that nesting sites are limited as only one in every 500 bushes has a structural density suitable for a nesting site. These bushes include cotton bush and spiny saltbush, species which are only patchily distributed within the exclosure area. However, rats also utilised dead piles of branches and underground burrows as nesting sites increasing the amount of suitable habitat available. It was suggested that the availability of nest sites will be the major limiting factor effecting the density of rats within the reserve.

Stick-nest Rats were observed moving up to 700m from their nests during a night's foraging. Rats actively sought out specific food items whilst foraging including *Enchylaena tomentosa* and *Rhagodia spinescens*. These species were more likely to be eaten in dune-base habitats probably due to the increased water availability and therefore succulence of plants in these areas. Rats did not appear to actively seek out cover whilst foraging or increase their pace in open habitats. Interestingly rats moved considerable distances from their nest to consume plants that occurred close to their nest sites. This may be due to a desire to retain a high level of cover around nest sites for protection from predation and heat.

Modelling the naturally occurring and re-introduced populations of the Greater Stick-nest Rat, *Leporillus conditor*

Honours project: Alex Irwin, University of N.S.W.

The aim of this study was to model the naturally occurring and re-introduced populations of Stick-nest Rats and determine how management of the Greater Stick-nest Rat might be assisted. The influence of model parameters on the population was relatively consistent on the naturally occurring population but in re-introduced populations the female breeding rate was of considerably greater influence than any other parameter. Release size, frequency of release and sex ratio all had significant influence on the population trajectory. It was suggested that large release size and low frequency of release were optimum for re-introduced populations and a female-biased sex ratio of 1.25-1.5:1 for released animals. Decreasing the lag time between release and breeding was also important and could be achieved through release timing or the re-introduction of established breeding pairs. The possibility of cataracts as an indicator of inbreeding depression was also suggested.

Monitoring Sites

The amount of monitoring of plants and animals within the Arid Recovery Reserve increased significantly during 1999 due to the re-introduction of the stick-nest rats and bettongs. The number of monitoring sites increased from 100 to 113 and now includes small fenced exclosures in areas of high rat density or around plant species which are highly favoured by the rats.

Table 7: Type and number of monitoring sites in the Arid Recovery Reserve area.

Type of monitoring site	method	no.	reason
Plant	Jessop transects, step point, species list and abundance	24	Investigate regeneration of native plants after removal of rabbits and domestic stock
Plant	vegetation quadrats	52	Investigate effect of stick-nest rat grazing on native plant species
Plant	small exclosures	4	Investigate effect of stick-nest rats on survival and recruitment of <i>Gunniopsis quadrifida</i>
Plant	small exclosures	3	Investigate effect of stick-nest rats on vegetation in preferred habitat areas.
Small vertebrates	pitfall sites	24	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
Birds	Bird Atlas sites	6	Investigate the effect of cattle grazing on bird life.
Stick-nest rats	radio tracking	56	Investigate reproduction, survival, habitat preference of re-introduced species
Burrowing Bettongs	radio tracking	10	Investigate reproduction, survival, habitat preference of re-introduced species.

Vegetation sites

Preliminary results from the 24 vegetation sites indicate little significant difference in plant diversity between sites inside and outside the enclosure to date (Figures 4-6), although inside sites tend to have slightly more species. The decline in the number of species recorded between 1997 and 1999 reflects the low rainfall received over the past two years. Sites both inside and outside exhibited similar trends. The lack of difference in species diversity between inside and outside sites is most likely attributable to the absence of any significant rainfall events since the sites were established (1999 rainfall was less than half the 160mm average) and the fact that it is less than one year since rabbits were eradicated. However, numerous seedlings of perennial plant species have germinated within the enclosure including mulga, bullock bush, senna, dead finish and umbrella wattle. The wide spacing and patchy nature of these seedlings is probably responsible for the failure of the monitoring sites to detect a significant difference from outside sites. Time and a significant rainfall event should amplify this response to a scale large enough to be detected by our monitoring program.

Figures 4-6: Average number of plant species recorded at vegetation sites inside and outside the enclosure. Total sites = 12 inside, 12 outside (4 swale, 4 dune and 2 mulga).

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Step point data also revealed little difference in vegetation cover between inside and outside sites. Vegetation on swales remained relatively stable compared with a decline in vegetation cover at dune and mulga sites. Swale vegetation is mainly comprised of perennial species which are less affected by rainfall than the ephemeral species found in dune and mulga areas. Cover of ephemeral species is much more rainfall dependent and thus short term differences in vegetation cover are more likely to be recorded at dune and mulga sites with swale sites more likely to reflect long term vegetation cover trends.

Figures 7-9: Percentage vegetation cover for monitoring sites inside and outside the enclosure.

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Fauna sites

Results from the two years of animal trapping (pitfall and Elliott traps) have also revealed little difference in native fauna captures between sites inside and outside the enclosure to date. More introduced house mice were captured inside the enclosure than outside during both years of trapping. This increase in inside sites could be 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 are able to respond quickly to increases in food supply. Additionally, many areas within the enclosure were being disturbed through warren destruction etc and house mice are known to colonise disturbed areas. Native mammal and reptile trends were consistent between inside and outside sites but native mammal abundance increased over the trapping period while reptile captures declined. 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) was more than 5 °C cooler than in 1998 (17°C). 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 enclosure are well matched and any differences in abundance recorded in future years can potentially be attributed to changes within the enclosure area.

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Fig 10: Average number of house mice captured at sites inside and outside the enclosure. Total 12 sites inside, 12 sites outside. Each site comprises 6 pitfall traps and 15 elliott traps. Bars indicate standard error.

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Fig. 11: Total number of native mammals captured at inside and outside pitfall and elliott sites. Native mammal captures were too low and variable to calculate averages and standard errors. Total number of sites, 12 inside and 12 outside.

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Fig. 12: The average number of reptiles captured at inside (12) and outside (12) sites. Bars indicate standard error.

Publicity, education and community awareness

Over 100 media items have been generated by the Arid Recovery Project since 1997 with the majority of media interest generated by the re-introduction of locally extinct animals. Information displays were erected at the project's viewing platform in early 1999 and have been viewed by all visitors to the project. School children from the Roxby Downs Area School were involved in the project through year 9 and 11 science projects, work experience students and activities and talks on World Environment Day. The Arid Recovery project is increasingly featured on WMC itineraries for visitors including project tours and BBQ's.

Table 8: Education and awareness initiatives generated by the project to date

type of publication or activity	details	target audience	quantity to Dec 1999
Information brochures		general public	2000
Information displays	Glendambo Field Day	pastoralists	1
	National Parks festival	general public	1
	Environmental Expo	general public	1
	Roxby Downs Market Day	Roxby Downs community	4
	WMC Family Day	mining community	1
	Roxby Pageant Float	Roxby Downs community	1
	World Environment Day	school children	1
Talks	Friends of the Arid Lands BG	conservationists	1
	Natural Resource Management Forum	pastoralists	1
	National Parks Forum	National Parks staff	1
	World Environment day	Roxby Downs school students	3
	Northern Industries Forum	mining and industry delegates	1
University camps		university students	2
Open days, working bees		friends members, general public	5
Media articles		general public	93
Information displays		visitors	3

The following items of publicity were generated by the project during 1999 only:

Radio

- Feb 13th - Interview with ABC in Pt Augusta re rabbit party and achievements
- April 13th - radio interview on ABC 5AN
- April 13th -segment on regional 5CK north and west report on stick-nest rat release,
- April 15th - segment on the ABC National Country hour on stick-nest rat release at Roxby Downs,

- April 27th -segment on ABC radio statewide
- May 12th - Live interview with 5CK at 10.45am regarding the Big Walk and aims of the arid recovery project
- May 20th- Interview with radio reporter for ABC country hour and triple J on radio tracking rats at night
- June 4th - Radio interview with 5CK concerning World environment day and Arid Recovery Project
- October 13th- ABC news story on calicivirus release, overall project and rats. (Nance Hoxten Port Augusta)
- October 21st - Radio interview with ABC (Port Pirie) concerning involvement of Greencorp.
- November 24th - radio interview with local ABC (Melissa Angwin, ph 86384830), re Burrowing Bettong trial release.
- November- radio interview with ABC radio Alice Springs, Sally Mason re: status of burrowing bettong release.

Newspapers and magazines

- Jan 8th - Northern Sun newspaper. Half page article with photo outlining the Stick-nest Rat grazing trials in the ARP.
- Feb 13th - Article in advertiser, pg. 43 outlining the rabbit celebrations and achievements
- April - Article in Environment South Australia Magazine
- April 14th - Article in Advertiser, pg 29, and photo of stick-nest rat
- April 18th, Port Lincoln Times- half page article with photo on Stick-nest Rat release.
- May 1st- article in Land and Water News about stick-nest rat release
- May 18th - Front Page article in Northern Sun re Big Walk - total money raised \$1800.
- May 99- Article in Outback Magazine about rabbit-free status
- June 1st- Article in Pt Lincoln Times on Stick-nest rat progress
- June- Article in Outback magazine showing photographs of vegetation regeneration within the enclosure
- June 99-Article in Biological Society newsletter distributed to over 200 University students
- July 99- Article in Anode about Stick-nest Rat re-introduction
- July 10th - Article in the Advertiser concerning re-introductions of endangered species.
- Sept - full page article in Bulletin magazine
- Sept 19th - 2 page article in the Biology Society of South Australia Issue 5 - outline of project
- Oct 18th - 2 Articles in Northern Sun discussing calicivirus release and involvement of Greencorp.
- Oct 29th - Northern Sun, article on Greencorps launch at ARP site.
- Nov 8th- Article in Natural Resource Management Forum, Pt Augusta
- Nov- Article in "Rangeland Rabbit Control Book" by Bethany Greenfield re: rabbit control at Arid Recovery Project.
- Nov- 1page article in the Landcare Australia annual report and yearbook. Pg. 47.

Television

- April 1999- Filming of Stick nest rat release for documentary by Discovery Channel and ABC Natural History Unit
- April 14th - Evening news item on Stick-nest Rat release at Roxby Downs including footage of Reevesby Island shown on Channel 2
- April 14th - Evening news item on Stick-nest Rat release at Roxby Downs including footage of Reevesby Island shown on Channel 9
- April 14th - Evening news item on Stick-nest Rat release at Roxby Downs including footage of Reevesby Island shown on Channel 10.
- April 14th - Evening news item on Stick-nest Rat release at Roxby Downs including footage of Reevesby Island shown on Imparja.
- 16th April, segment on GTS television (Whyalla) on stick-nest rat release
- May 19th- ABC film crew filmed a 1 min segment on ARP to be shown immediately prior to the news
- May 20th- ABC Behind The News filmed a segment on the Stick-nest Rats at the ARP. Aired 15th June 99 and 16th June 99

- Oct 20th - French Media story to be aired in future on Discovery Channel about feral cats and their effect on native fauna.
- Oct 20th - ABC news segment about the Arid Recovery Project, updating the Stick-nest Rat release.

Talks, information displays

- March 1999- Information Displays completed at Viewing Platform, viewed by over 60 visitors at OEP opening.
- April 14th, Media release from Dorothy Kotz, S.A. minister for environment outlining Arid Recovery project and stick-nest rat release.
- May 22nd- Slide show and Talk at the Arid lands Botanic Gardens to Friends group about the project.
- June 5th- Display at National Parks Festival in Adelaide including handing out brochures about the project
- June 7th World Environment Day- Talks at the RDAS, colouring competition and Kangaroo Meat BBQ at the School
- July 15th 99- Open day at Glendambo for local pastoralists. Info display and brochures.
- July 28th 99- Talk at the Roxby Downs Area School to years 9 and 11 about school projects at the ARP site.
- August 11th- Year 9 students visited the ARP and learned about stick-nest rats and radiotracking
- August 18th- Yr 9 students, radiotracking
- August 21st - Visit by Heritage Consultative Committee to ARP.
- August 27th - Visit from Senior Advisors to Minister for Environment, and Senior DEHAA officers
- August 13th - Talk at Fauna Management Workshop, Orraparinna.
- Sept 18th - Display at local Roxby market.
- Sept 22nd - stall at WMC Family Day
- Oct 8th - National Industries Environmental Forum delegates from all over SA and Vic attended presentation at ARP site.
- Oct 12th - Roy Woodall and family attended presentation at ARP (Roy is WMC board member and was NPWS member.)
- Oct 16th - stall at Roxby local markets
- Oct 22-24th - stall at Environment Expo, Urrbrae Ag College, Adelaide. (attended by ~17 000 visitors)
- Oct 4th - Media release from CALM on Bettong translocation
- Oct 5th - media release by Dorothy Kotz on Bettong trial release
- Nov 8th - Talk at Natural Resource Management Forum, Pt Augusta
- Nov 10th - Visit to ARP site by WWF reps for resources (not TSN), and WMC corporate delegate - taken by Keith Ashby
- Nov 20th - Stall at local markets
- Dec- Pageant float in the Roxby Downs Pageant

Volunteers and community involvement

Over 221 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- 92
- WMC Resources staff- 7
- University of Adelaide students- 59
- National Parks staff- 8
- ATCV/Greencorp trainees- 55
- Members of Indigenous organisations- 9

Friends of the Arid Recovery Project

The Friends of the Arid Recovery Project now has over 80 member households with members from as far away as W.A. and New Zealand. 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 1999 included selling tee-shirts and stubby holders, holding BBQ stalls and organising a walk to Woomera. Other activities organised by the Friends group this year included coordinating the Stick-nest Rat and Bettong releases, assisting with rabbit control and helping fence the first 8km² expansion area. Between 15 and 20 friends members attended each release with many member's children given the opportunity to see, touch and release an endangered species. Members of the Friends group also organised and staffed information displays at expos, field days and market days.

Aboriginal Lands Trust

Three members of the Aboriginal Lands Trust assisted the Friends group with rabbit control during 1999. Rabbit warrens were exploded using dynamite and friends group members assisted. The Aboriginal Lands Trust will also be involved in the project in 2000 through three training camps at the Arid Recovery Project.

Green Corps/ATCV

One Greencorp team and one ATCV team assisted the project during 1999. The ATCV team assisted with putting in floppy top wires and electric fencing. A Greencorp team commenced at the project site during October 1999 and will complete 14 weeks of work at the site over the summer months. During 1999 the 10 member team, led by Nicki Munro, completely fenced the second 8km² expansion area and began eradicating rabbits. Despite the heat, the group has worked extremely hard and has also assisted with endangered species monitoring, construction of a self-guided walk, pitfall trapping and radio-tracking. The Green Corps team were housed at the WMC singles persons quarters at Camp 1 where the team assisted with landscaping and paving in exchange for accommodation costs.

University of Adelaide

30 University of Adelaide students camped at the Arid Recovery Site in April 1999. The students conducted the annual fauna monitoring as well as bird banding, rabbit control and stick-nest rat tracking. The student camp coincided with the stick-nest rat 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 two awards during 1999 including the Readers Digest Environmental Award and the National Bank Community Awards. Unfortunately, both of these applications were unsuccessful. The project coordinator also applied for the Resource Industry Awards and the Australian Mines and Energy Environmental Awards but was again unsuccessful.

1999 Budget

Contributors

Over \$350 000 was contributed to the project during 1999. WMC was the largest contributor, donating one third (\$116 500) of the total project contributions. Most of the WMC funds were used for wages for a project coordinator and assistant. The Natural Heritage Trust also contributed significantly to the project (\$29 991). BHP also contributed \$35,000, following discussion between the Arid Recovery Project and BHP about 40 mm netting purchased by the Project from BHP. BHP had advertised the netting as 'rabbit-proof' but the experience of the Project was that small independent rabbits were able to get through the mesh holes. This caused a significant delay in eradicating rabbits from our main enclosure. The BHP funds covered the purchase of smaller replacement netting and the balance was a donation to the Project.

During 1999, the Friends group applied for funding from 6 organisations (Table 9) and raised \$42 741. \$3 953 of this funding was raised through tee-shirt and stubby holder sales, fundraising BBQ and a fundraising walk. The fundraising walk from Roxby Downs to Woomera raised nearly \$2 000 alone.

Table 9: Grants applied for and monies received by the Friends Group during 1999

Grant	Amount	Received
National Parks Foundation	5 530	2 750 (half to be received during 2000)
WWF Threatened Species Network	3 930	3 930
South Australian Federation	10 000	0
Directors Grants- Friends of Parks Inc	4 800	1 000 (received after 31/12/99)
Natural Heritage Trust	29 991	29 991
Wildlife Conservation Fund	4 050	awaiting reply

During 1999, local businesses were approached for sponsorship by the Arid Recovery Project and the following businesses kindly offered the use of their services. Macro Meats (kangaroo meat producers) have just started 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 10: Sponsorship secured by the Friends Group during 1999

Sponsor	Sponsored item	Value	not used as of 31/12/99
Lavricks Engineering	100 litres fuel per month	\$1200 a year	
Coates Hire	Reduced equipment hire	\$2000	
Olympic Dam Transport	Car maintenance	\$1000 a year	
Specialised Tyres	Set of tyres	\$800	
Northpoint Toyota	Car parts	\$1000	
Vetcare	Animal care		*
National Australia Bank	Donation	\$100	
Oasis	1 dinner for raffle	\$50	
SBS contractors	Hire of Graders, trucks, fork lifts		*
Heading contractors	Equipment hire	\$1000	
Readymix Quarry	Quarry products		*
SDS	Crane hire		*
Wreckair Hire	Equipment hire		*
Macro meats	15% of kangaroo meat profits at Roxby Downs	\$164 [^]	

[^] = sponsorship only began in late 1999

In kind contributions represented nearly one half of the total contributions to the project in 1999. Ten organisations contributed in kind with the Friends group, Greencorp and the University of Adelaide the major contributors. In kind contributions involved the donation of volunteer labour for plant, animal and endangered species monitoring, research, fencing and feral animal control. The majority of labour required for fencing the expansion areas was provided by volunteers. In kind labour contributions are valued at \$15 per hour for unspecialised labour and \$25 for professional labour, following standard Natural Heritage Trust recommendations outlined by the Commonwealth Government. Professional in kind contributions include re-introduction organisation by DEHAA staff, time donated by University of Adelaide and DEHAA committee members and volunteer supervisors.

Table 11: Arid Recovery Project: Contributions and Expenditure during 1999

Contributions	1999 funding	1999 in kind	1999 total
Olympic Dam Corporation (WMC Resources)	116 500		116 500
Dept. Environment, Heritage and Aboriginal Affairs	4 420	5 160	9 580
BHP (retribution)	35 000		35 000
University of Adelaide	3 000	36 120	39 120
Friends of the Arid Recovery Project		30 774	30 774
- Balance brought forward	1 953		1 953
- Macro Meats	164		164
- Fundraisers	3 953		3 953
- Natural Heritage Trust	29 991		29 991
- National Parks Foundation	2 750		2 750
- WWF- threatened species network	3 930		3 930
Northpoint Toyota	1 000		1 000
Lavricks engineering	1 200		1 200
Olympic Dam Transport	1 000		1 000
Coates Hire	2 000		2 000
Specialised Tyre Management	800		800
University of South Australia		14 400	14 400
ATCV		13 200	13 200
Greencorp		38 400	38 400
Aboriginal Lands Trust		1 800	1 800
Roxby Downs Area School		2 370	2 370
Primary Industries S.A.		350	350
CSIRO W.A.		2 000	2 000
total contributions	207 661	144 574	352 235
Expenditure			
wages			
project coordinator and assistant contractor	79 601		
casual staff	10 506		
operating			
minor capital items (fencing clip guns, fumigator etc.)	13 466		
vehicle running costs	7 868		
endangered species re-introductions (radio collars, transport etc.)	10 629		
general stores (stationary, batteries, film, rubber matting etc.)	6 038		
communications	122		
travel/accommodation for volunteers	4 933		
tee-shirts for fundraising	1 295		
information displays	1 460		
feral animal control	2 730		
fencing equipment	3 097		
equipment hire	2 110		
fencing contractor	2 896		
fence maintenance	5 000		
incidentals	290		
capital			
fencing materials	59 079		
Total expenditure	211 120		
funds remaining	- \$3 459*		

* Natural Heritage Trust funding years run from Sept 30 to Oct 1. The 1999/2000 NHT contribution of \$28 030 was received in October 1999 and is not shown here. The budget deficit is thus not real as the NHT contribution arrived in October 1999.

Expenditure

Major expenditure items included fencing materials and wages. Fencing materials were required for both expansion areas and will continue to be a major expense until the fencing is finished in 2001. Wages include one full time project coordinator and 2 part time project officers. Other major expense items were radio collars for threatened species re-introductions, fuel for the 4WD and 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 when the fencing is completed.

Proposed Budget and Workplan 2000-2002

annual contributions and expenditure

The project expenditure will be highest during 1999/2000 and will then stabilise at approximately \$150 000 per annum plus up to \$150 000 in kind. The total project contribution will be up to \$300 000 of which WMC will contribute one third. High project expenditure in 1999/2000 is required to finish fencing the project area. Approximately 16km of fencing is needed to finish the fencing at a cost of \$100 000. It is hoped that these extra funds will be provided jointly by WMC (\$50 000 during 2000) and Natural Heritage Trust (\$50 000 during 2001). The main project costs once fencing is completed will be wages, fuel, fence maintenance, feral animal control, endangered species monitoring and volunteer associated costs.

Table 12: Annual In Kind Contributions

contributor	1998	1999	2000 forecast	2001 forecast	2002 forecast
Pastoral Management Branch	520	1 760	2 000	2 000	2 000
DEHAA	3000	3 400	5 000	5 000	5 000"
University of Adelaide	21 000	36 120	32 400	32 400	32 400
University of South Australia		14 400			
ATCV	0	13 200	10 000	10 000	10 000
Aboriginal Land Trust	0	1 800	14 800	?	?
Greencorps	8 400	38 400	88 200	84 000	84 000?#
Roxby Downs Area School	985	2 370	2 500	2 500	2 500
Community	5030	**	**	**	**
Friends of the Arid Recovery Project	18 945	30 774	30 300	30 000	30 000
Primary Industries S.A.	700	350	1 000	1 000	1 000
CSIRO W.A.		2 000	2 000+	?	?
total	58 580	144 574	188 200	166 900	82 900- 166 900

** now included in Friends Group

Depending on acquisition of a Greencorp team

" 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 13: Annual Financial Contributions

income source	1997 (only 6 months)	1998	1999	2000 proposed	2001 proposed	2002 proposed
ODC	10 000	32 344	116 500	160 000	115 000	115 000
WMC corporate	150 000					
CUDiv Corporate Affairs	30 000					
Dept. Environment	3 000	18 000	4 420	5 000	5 000	5 000
University of Adelaide prizes/ awards		2 000	3 000	4 000	4 000	4 000
BHP			35 000			
Friends of the Arid Recovery Project						
- bank account			1 953			
- fundraisers			3 953	2 000	2 000	2 100
- Natural Heritage Trust			29 991	28 030	50 000	28 000
- WWF- threatened species network			3 930		?	?
- Directors grants				1 000	?	?
- Wildlife Conservation Fund				4 050	?	?
- Macro Meats			164	500	500	500
-National Parks Foundation			2 750	2 750	?	?
Aboriginal Lands Trust				6 000	?	?
Lavricks engineering			1 200	1 200	1 200	1 200
Northpoint Toyota			1 000		?	?
Coates Hire			2 000			
Specialised tyres			800		?	?
Olympic Dam Transport			1 000	1 000	1 000	1 000
Wreckair hire				1 000	1 000	1 000
SBS				1 000	?	?
Readymix				1 000	?	?
Heading contractors				1 000	?	?
total income	193 000	52 344	207 661	219 530	179 700+	157 800+
Expenditure						
wages						
project coordinator and assistant	19 069	61 101	79 601	80 000	80 000	85 000
contractors wages and equip hire	51 706	2 723	10 506	10 000	10 000	10 000
operating						
minor capital items			13 466	6 000		5 000
vehicle running costs			7 868	14 000	14 000	14 000
endangered species re-introductions	751	2 372	10 629	15 570	5 000	15 000
fauna and veg monitoring				2 850	2 000	2 000
general stores			6 038	2 000	1 000	2 000
communications			122	300	300	300
volunteer travel/accommodation	573	1 389	4 933	14 136	10 000	10 000
tee-shirts for fundraising			1 295			
information displays			1 460	2 650		1 000
feral animal control			2 730	1 500	1 000	1 000
fencing equipment			3 097	2 700		
equipment hire			2 110	2 000	1 500	1 000
freight		1 045		1 000		1 000
electric fencing contractor			2 896			
fence maintenance			5 000	2 000	2 000	3 000
incidentals			290	1 000		
capital						
fencing materials	101 777	8 234	59 079	60 000	50 000	7 000
total expenditure	173 876	76 864	211 120	217 706	176 800	157 300
funds remaining	\$19 124	\$-5 396	\$-3 459	\$1 824	\$2 900	\$500

Table 14: Workplan 2000 summary

stage	activity	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	2001	2002
stage 5	Re-introduction of the Greater Bilby														
stage 6	Buffer zone to be maintained and expanded														
stage 7	Second 8km ² expansion area to be rabbit-free														
stage 7	Final (3 rd) expansion area fenced														
stage 7	Final (3 rd) expansion area rabbit-free														
stage 5	Erect telemetry towers for radio tracking endangered species														
stage 7	cat-proof fencing erected in third expansion area														
stage 5	Full scale re-introduction of Burrowing Bettongs														
stage 8	environmental awareness and education program														
stage 5	trial re-introduction of Western-barred Bandicoots														
stage 5	full-scale re-introduction of Western-barred Bandicoots													Sept	
stage 7	removal of all rabbits from the 50km ² project area													finish	
stage 7	removal of all cats./foxes from 50km ² project area													finish	
														Aug	

Workplan detail

Fencing

During 2000, it is proposed to finish rabbit fencing the entire 50km² reserve. This fencing in the third expansion area of the reserve (Fig. 1) will be completed using Friends group members, Greencorp trainees and ATCV volunteers. Once completed, cat fencing of the final expansion area will commence but may not be finished until May 2001 depending on the availability of volunteer labour. Based on current funding expectations, the 50km² reserve should be completely fenced by mid 2001. At this stage there are no plans to electrify the boundary fence unless there are significant breaches of the fence by cats and foxes. It is expected that not electrifying the fence may mean the occasional breach by cat and foxes but the reserve area should be large enough to support population sizes that can cope with the occasional predator. Any cats or foxes which enter the reserve would be eradicated as soon as possible. A weekly fence check will be conducted around both the reserve boundary fence and the main enclosure fence. An additional monthly check will be conducted around the internal rabbit fences within the reserve.

Feral animal control

Rabbit eradication in the second expansion area should be finished by April 2000. Rabbit eradication in the third expansion area will commence soon after and is expected to be finished by early 2001. Since the decimation of rabbit numbers from RCD in 1996, rabbit numbers have been gradually increasing in the project area. It is important to finish the rabbit eradication program before numbers become so high that complete eradication of rabbits is unattainable. Complete rabbit eradication is imperative for project success as cats and foxes will be eliminated from the whole 50km² and if any rabbits remain they will increase unchecked due to an absence of predation pressure. Re-introductions of endangered species will not occur in areas where there are rabbits as the rabbit is recognised as one of the threatening processes responsible for the local extinction of these species.

Once rabbits, cats and foxes are completely eliminated from the reserve area, a well-planned monitoring system will be established to ensure that all areas of the reserve are checked for signs of rabbit every year and for signs of cats and foxes every week. Rabbit track transects will also be established at strategic places around the enclosure and checked weekly during fence checks. Audial lures and leg hold traps will be set around the project perimeter and checked daily for cats and foxes. Monthly spotlight counts around the reserve area 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.

Threatened species re-introductions

A re-introduction of the Greater Bilby is planned for April 2000 followed by the full-scale re-introduction of Burrowing Bettongs in late 2000. Depending on funding availability, a trial re-introduction of Western-barred Bandicoots may also be planned. This release would coincide with the Bettong release as both species would come from W.A. and transport costs could be reduced. Once the expansion area is fully fenced in 2001, threatened species may be gradually allowed access to the total reserve area.

Education and Awareness

The education and community awareness facet of the project will be increased dramatically during 2000. To date the following activities have been organised but more will be planned as the year progresses;

- Information displays will be erected along the Borefield Road which is used extensively by tourists during the winter months.
- 2000 updated brochures will be printed and distributed.
- The 1999 annual report will be distributed to all contributors and potential sponsors.
- A paper on the project will be presented at the Resource 2000 Conference in Adelaide in August.
- Three scientific papers outlining project research will be published in scientific journals.
- One of the papers will be presented at the Mammal Society Conference in Alice Springs in April.

- Three separate groups from the Aboriginal Lands Trust will be visiting the site this year and receiving training in endangered species management from Arid Recovery Staff.
- Media articles are expected to increase dramatically once the release of the Bilbies and Burrowing Bettongs in April and September this year.
- 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.
- At least one ATCV and Greencorp team are expected to work at the reserve this year.
- The University of Adelaide camp for 30 third year students is planned for mid-April.
- A large media contingent is visiting the site in mid-March and is expected to generate more publicity for the project.
- At least two research students from the University of Adelaide will conduct research at the reserve this year.
- Two volunteer botanists will conduct a two week project at the site setting up a database and recording seedling density of perennial plant species inside and outside the enclosure.
- Exposure will be increased through organised tours by Olympic Dam Tours, Trek-about and Diamantina tours.

Research

The following research projects will be initiated in 2000:

- Home range and diet of the Burrowing Bettong
- Perennial seedling densities inside and outside the enclosure
- Impact of stick-nest rats on *Gunniopsis quadrifida* regeneration
- Home range and habitat preference of the Greater Bilby

Appendix A

Estimate of the number of rats thought to be alive at the beginning of summer in the Arid Recovery Reserve

No. rats released April= 49

No. rats died from radio collaring= 2

No. female rats remaining = 24

No. rats collared=26

No. collared rats died from stress/natural causes=6 out of 26 (23%)

Using collared deaths to extrapolate to released population

Total number of female deaths in released population (23% of total 24 female rats) = 5

Total number of male deaths in released population (23% of total 23 male rats)= 5

Total females left to breed= 18

Total males left to breed= 17

If each female breeds once producing on average 1.5 young, total young produced= 27

If half females breed once and half breed twice on average 1.5 young, total young produced= 40.5

If each female breeds twice producing on average 1.5 young, total young produced=54

Total animals from April release = 35 adults and 27-54 young

No. rats released June= 40

No. rats collared=10

No collared rats died from stress/natural causes=1 (10%)

Using collared deaths to extrapolate to released population

Total number of female deaths in released population (10% of 20)=2

Total number of male deaths in released population (10% of 20)=2

Total females left to breed=18

Total males left to breed=18

If each female breeds once, producing on average 1.5 young, total young produced= 27

If half females breed once and half twice, producing on average 1.5 young, total young produced= 40.5

If each female breeds twice, producing on average 1.5 young, total young produced=54

Total animals from June release = 36 adults and 27-54 young.

Results assume that 1.5 young production includes the mortality of some young. Total rats in enclosure at the beginning of summer is estimated to be 71 adults and between 54 and 108 young (total between 125 and 179 rats). Considering that 25 young rats were tagged opportunistically whilst recollaring adults, all radio collared female rats produced young and most rats were known to produce 2 offspring per litter, it is likely that the number of young produced is towards the higher estimate of young produced. Thus a conservative estimate for rat numbers at the beginning of summer would be approximately **150 rats**.