

SEGments

A photograph of a desert landscape. In the foreground, a tree with a trunk that has peeling, light-colored bark stands on rocky ground. The background shows a large, reddish-brown mountain under a cloudy sky. The overall scene is arid and rugged.

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SEGments



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SEG and the Arkaroola Wilderness Sanctuary (AWS) in the Flinders Ranges are long term friends. This was consolidated in the recent large scale bio-diversity survey undertaken in the area by SEG volunteers. As friends we need to work together in the forthcoming discussion about Proposed Management Zones in the Northern Flinders. The associated document is entitled “Seeking a Balance”.

With mining currently suspended in the AWS it is appropriate time to examine whether we want this area to continue to be mined or not? Ask these questions...Has mining already significantly impacted in this area? Will the impact continue if the mining recommences? Well yes the impact has occurred and will continue so in combination with a harsh environment make it impossible so see how mining could continue at the Marathon site.

The Yellow Footed Rock Wallaby and the Spidery Wattle add to the rich diversity that inhabit this spectacular region. SEGs continued keen interest in this region continues to add data which assists in management in the wonderful diversity of fauna and flora in the region.

In “Seeking a Balance” the observation of land rights to the broadest range of people is essential so that all rights are examined and acknowledged. Can’t we learn something about the need to treat our world gently so that it is around to be seen by those in the future? Other mining options are nearby and the value of AWS deserves our protection.

The proposed zone for Arkaroola contains very little area that is excluded from mining in the future. This means that possibly large areas of Arkaroola would remain potential future mining targets.

The landscape and natural environment in and around the AWS are too precious to be allowed exposure to mining in any extended form. A sanctuary must be built that is strong enough to hold off incursions into its natural environment. So SEG needs to rally behind the AWS so that they are able to maintain the wonderful sanctuary they have built.

Travelling on a scientific expedition is a wonderful way for students to gain a scientific education and understanding of the fauna, flora geography, geology and weather of areas of South Australia.

SEG has had a proud history of supporting science education. From its beginnings 25 years ago to the recent Arkaroola trip the group has actively supported students in the pursuit of relevant and exciting scientific experiences. With the significant expedition experience and scientific knowledge of SEG members the role of education of volunteers and students remains an important task for SEG.

On the recent expedition to Arkaroola a number of university students joined SEG for their first survey and last year students from Urrbrae Agricultural High School joined the trip to Marqualpie Well. In forthcoming editions of SEGments we will be featuring reports written by the students who attended the Arkaroola trip this year.

This edition highlights a report by Duncan Mackenzie on the trip to Arkaroola. Duncan has also supplied some outstanding photographs from this trip. One is featured as the front cover of this edition of SEGments. Russ Sinclair has written an excellent poem resulting from his exploits at Arkaroola.

Chris Wright and Paul Harvey have detailed the 21 year history of the Gammon Ranges project from the presentation they gave at the SEG AGM. SEG’s involvement has been extensive and Chris and Paul have highlighted the importance throughout this project of volunteer work and specifically the role played by training “young people in science activities”. The importance of the educational role of SEG members in all the projects undertaken is commendable and is directly linked to the bright future SEG has in front of it.

Graham Blair has detailed the work done recently on the Vulkathunha - Gammon Ranges Data Recovery trip 2009. The report details the field work done on this important project in early October 2009.

This episode of SEGments concludes with 2 book reviews covering history and ecology of South Australia.

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Figure 1: The Arkaroola environment 2009

Arkaroola Sanctuary is one of the ‘geological wonders’ of the world. Located in the north-eastern tip of the Flinders Ranges the 570 sq km property was purchased in 1968 by Reg Sprigg who removed all sheep and converted the property to a wildlife sanctuary.

The general topography of Arkaroola is mountainous with deep gorges – Yudnamutana Gorge is almost 609 meters deep and other prominent gorges are Arkaroola, East Painter and Wywhyana.

The Freeling Heights attains a height of 975m (plateau-like) and Mt Painter is a resistant central peak, 868m in height. A prominent escarpment marks the eastern boundary with the Lake Frome Plains.

The core of the country is red and white granite. Great faults along the east and south separate the latter from black schist country. The Sanctuary is encircled by more typical Flinders Range slate, limestone and quartzite country.

Park-like river beds (Arkaroola, Ydnamutana and Wywhyana) cut through the rough mountain country, almost without geological reason.

The Arkaroola River nurtures a number of larger permanent rock holes in the slate. Mostly these are enclosed by precipitous cliffs and spectacular mountain scenery. A number of unique granite plutons (circular, pipe-like masses) push up spectacular spines of white rock out through red granite and a basement of red schist. These include the Needles, the pinnacles and Sitting Bull.

North of Mt Painter, the smooth granite mass of ‘The Armchair’ rises precipitously almost 30m from the floor of a granite amphitheatre, and takes its name from its peculiar form. (*R.C. Sprigg*).

The 2009 Arkaroola expedition certainly presented some great challenges. SEG has never before worked in such awe-inspiring and difficult terrain and this presented a number of challenges, including those of timing, organization, logistics and the movement of expeditioners around the landscape.

The reconnaissance trips: Usually we undertake one reconnaissance trip (with a small party) prior to the main expedition, to determine survey site locations, campsite, logistical requirements etc. The Arkaroola preparation required three prior visits. Firstly to select our survey sites and two more trips were needed to dig the 108 holes necessary for the pitline traps. The rocky terrain was so difficult we needed two jack hammers and generators to dig most of the holes. In some cases hole digging was impossible, so we reverted to using a new type of collapsible Funnel Trap.



Figure 2: John Morley jack-hammering pitline holes

Local logistical support was generously provided by Marg and Doug Sprigg, the owners of Arkaroola. During the three reconnaissance trips, they provided us with a vehicle, accommodation and meals at the main Village for the duration of our stay.

They also allowed us to use the old Homestead buildings as our campsite for the main expedition. The “Euros” had entered many of the buildings and their droppings were in most rooms. A SEG ‘clean-up’ team brought the buildings back to habitable condition that included hot showers and toilets and a kitchen. Most expeditioners were housed in rooms with a few preferring tents. The scientists were provided with the best working conditions possible, utilizing a long enclosed weather-proof veranda that had excellent lighting, power etc. Arkaroola installed a large generator at the Homestead and this provided our total power requirements.



Figure 3: Max Barr setting up Funnel Traps

On the first trip, Doug Sprigg flew us over Arkaroola to study the terrain and in particular, to look at the Mawson Plateau, an area that might be the target of a future SEG expedition.

The reconnaissance trips enabled us to experience driving on the ridge top road—a particularly steep and in places, narrow track. As eight of our sites were located along the length of this track, Arkaroola gave us permission to use five SEG vehicles with selected drivers to travel the road during the period of the expedition. These vehicles had to be thoroughly cleaned underneath (prior to driving on the Ridge Road) to help prevent the introduction of weeds to the area.

It is important to note that the SEG Expedition was the first biodiversity survey undertaken at Arkaroola and we will probably undertake further surveys in the not too distant future.

Planning, science leaders and expeditioners:

One of the great strengths of SEG is the very efficient and organised planning that goes into an expedition, well before it leaves Adelaide. This is usually undertaken by a committee composed of the expedition leader, quartermaster, science leader and a number of specialists.

The expedition leader for Arkaroola was Richard Willing assisted by Bruce Gotch and Quartermaster Trent Porter. The Science Leader was Duncan MacKenzie with Michelle Trethewey (Communications and Data Capture), Brian Blaylock (birds), Loraine Jansen (mammals), Margie Barnett (botany and assisted by Russell Sinclair and Garry Trethewey), Brian Swann (reptiles), Annette Vincent (ants and other invertebrates) and Nick Birks (spiders).

There were 40 expeditioners (including six students) and we were all very efficiently organized into daily teams. Because of the necessity to limit the number of vehicles that could access the Ridgetop road each day, teams changed 'jobs' on a daily basis, thus giving each expeditioner the opportunity to work across all the sciences and to visit each and every site. Each day a new team was scheduled to remain in camp, and

undertake the days cooking and cleaning chores. Expeditioners were also given a day off during the rotation process, and Graham Hill organized four walks around the Arkaroola Sanctuary that were available to these expeditioners. Maps of each route were provided and the walks comprised two 6.8 km and 8.0 km loop walks, and two 5.8 km and 15.2 km linear walks.

The Camp:

We camped in the old Arkaroola family homestead (situated 4 km from the main Arkaroola Village) which is no longer in use. A great deal of cleaning was required to make it habitable and this then provided a very comfortable 'home' for two weeks. A marquee was erected to provide a meeting place to discuss the days activities, plans for the following days work and to look at PowerPoint presentations and listen to talks given by some of the expeditioners. The weather was not unduly hot, however there were a number of days when strong wind gusts developed during the afternoon. On one day, gale force winds were experienced and brought with them dust storms. These storms raged across western NSW to eventually reach Sydney, pass on to Brisbane and then on to New Zealand. Arkaroola management stated that they had never experienced such weather in the past.



Figure 4: The SEG 2009 Arkaroola Expeditioners



Figure 5: During the dust storm, the colour of the sky turned from a ruby red through to yellow and then brown.

Field Work:

Sixteen survey sites (known as quadrats) were selected that ranged across a wide number of vegetation and geological habitats. Eight sites were located off the Ridgetop track and another eight south of the village.

Utilising the standard DEH methodology for collecting data to be input to the SA Biological Database each site had six macro-pits installed for catching reptiles and small mammals (these were made from heavy duty PVC bore casing as they were left in place at the end of the expedition, for future survey work (after being filled with rocks and securely capped); a line of 15 Elliot traps, (for catching small mammals and some reptiles); and a cage trap (for larger mammals) at each end of the trap-line. Additionally, micro-pits were installed in the quadrat to catch invertebrates.

Each site was surveyed over four days and nights for birds, mammals and reptiles (traps were checked twice daily) and invertebrates. In addition, a 'special' team undertook collections of invertebrates from trees and bushes; collected leaf litter to take back to camp for the later extraction of insects and undertook 'opportunistic' searches of quadrats for insects and in particular, ants and spiders. Mammals and reptiles trapped were identified, weighed, measured and released, apart from some voucher specimens.



Figure 6: Setting up for an invertebrate survey.

A separate 'botanical' team surveyed each site collecting a representative sample of all plants. These are pressed and labeled on site and at the conclusion of the expedition lodged with the State Herbarium for formal identifications and entry to the SA Biological Database. In addition physical data of each site was gathered (landform description) that includes a vegetation description, map of the site and data on slope, angle, relative proportions of rock etc. A 'standardized' photo is also taken of the quadrat—this then provides a visual comparison of the vegetation, for comparison when sites are re-surveyed. Voucher specimens of all biota were collected and lodged with the SA Museum. During the evenings, the scientists worked on completing their paperwork and identifying and sorting specimens taken during the day. Forms and collecting materials for the next days work were also prepared.



Figure 7: Michelle Trethewey scans data sheets while Deputy Expedition Leader Bruce Gotch, watches.

An important aspect of the Arkaroola Expedition was the computerized data retrieval system developed by Garry Trethewey. This system enabled Garry to download photos taken by each expeditioner to a central system which will later be used by the scientists to identify specimens (particularly opportunistic sightings) and for Trent Porter to produce an expedition DVD. The data retrieval system also enabled Michelle Trethewey to daily scan to hard disk, all data collection forms manually completed in the field, thus providing a much needed back-up and security retrieval system.

The data collected during the expedition is presently being entered into the SA Biological Database. We do know, however, that due to continuing drought conditions in the Northern Flinders Ranges, the number of birds and animals trapped and sighted during our survey is well down on previous expeditions to other areas.

Arkaroola Sanctuary is very keen for SEG to undertake a repeat survey following good rain events, which should promote breeding activity and result in us finding greater numbers of animals and birds and probably additional species. The 2009 SEG survey has established a 'benchmark' that we can work with in future surveys and indicates just how fragile the balance is between biodiversity and environmental conditions. The SEG 2009 Arkaroola Expeditions was a great success, even if we didn't trap large numbers of animals. We received marvelous support from Arkaroola management and staff and the Nature Foundation SA helped with financial support for our students to attend the expedition—we thank them most sincerely for their efforts.

A trip was made by a number of expeditioners to Paralana Hot Springs which gave us an opportunity to see a different part of Arkaroola.



Figure 8: Inspecting the Paralana Hot Springs

Other activities:

A number of expeditioners attended some of the tours run by Arkaroola, including the Ridgetop and Astronomy tours and also undertook scenic flights from the Arkaroola airstrip.

To celebrate SEG's 25th birthday, all expeditioners attended a barbecue at the village which was followed by an excellent illustrated lecture on the geology of the Arkaroola region delivered by Professor Ian Plimer. The interesting part of his talk came when he presented his personal views on climate change and its causes.

At the conclusion of the evening a large 25th Birthday cake was cut by SEG President, Richard Willing.



Figure 9: Richard Willing cutting the 25 year birthday cake at Arkaroola.

Editors Note:

All photographs in the article by Duncan MacKenzie

*There was movement from the city, for the word had passed around
That another trip by SEG was underway.
They were off to Arkaroola, way up past Wilpena Pound,
So all the cranks had gathered for the fray.*

*All the tried and noted Seggites from the stations near and far
Had gathered at the homestead overnight,
For biologists love hunting where the wildest bushlands are
And the birdos snuff the challenge with delight.*

*There was Richard (he's the President), who thought the whole thing up,
The old man with his hair as white as snow;
But few could drive behind him when his blood was fairly up –
He would go wherever four-wheel drive could go.*

*And Trentaurus, the Adjutant, came down to lend a hand.
A better bushman never pitched a tent.
No whirlwind could deter him, while the guy-ropes still would stand
Til the last remaining tent-pegs all were bent.*

*And Bruce, the master strategist, pinned lists upon the board
To tell the eager Seggites what to do.
Using random number tables he could allocate the tasks
And ensure, in spite of all, they'd muddle through.*

*For the avid Reptile hunters, the prospects looked quite bright.
They had Gollie there to follow up their scents,
But their first big acquisition, and it gave Rick quite a fright
Was a little snake caught lurking in the Gents.*

*They had cages, pits and Elliotts, and micro-pitfalls too
To catch any creature smaller than a cow,
And the old man gave his orders: "Boys, go at them from the jump-
No time for fancy Botanising now!"*

*"And Duncan, you must lead them out along the Ridgetop Track
With the radios reporting your position
To the other Ridgetop drivers; and there'll be no turning back
And no room for faint heart, fear or indecision."*

*When they reached the mountain summit, even Duncan took a pull-
It well might make the boldest hold their breath!
For the jagged rocks spread thickly, and the track-side banks were full
Of washaways, and any slip was death!*

*But little Margie Barnett let her vehicle have its head
And she swung the steering wheel and gave a cheer!
And she raced it down the Switchback like a torrent down its bed
While the others stood and watched in very fear.*

*Over boulders, past the washouts, on the rough and broken ground
Down the hillside at a racing pace she went,
Touching neither brake nor clutch until she landed safe and sound
At the bottom of that terrible descent.*

*But the bush was parched and shrivelled, and the animals were few
Though they searched the traps each morning and each night.
Until the final evening, when the final Mammal crew
Caught a Phascogale, to everyone's delight.*

*And still, round Arkaroola, where the mulga branches sway
And the rocks at sunset blaze in all their glory
The great SEG expedition is a household word today
And the Spriggs regale the tourists with their story.*

With apologies to Banjo Patterson and Clancy.



When preparing this report I reviewed my last years report and it brought home to me how many changes and activities there have been in the Scientific Expedition Group since last year. Our 25th year has been another busy year for SEG. GRaSP has continued its work, the Minnowarra Biodiversity Project has continued and we have just completed a successful major expedition to Arkaroola. The next monitoring in the mallee fowl survey project will occur next week. The committee has been strengthened by the addition of a new member.

GRaSP

Chris and his team have continued to develop the Gammon Ranges rainfall project. He has been ably assisted by Michelle Trethewey and many others. There will be a full report on 21 years of GRaSP presented by Chris Wright.

Minnowarra Biodiversity Project

The autumn and spring surveys have been carried out in adverse weather conditions but have been completed.

Major Expedition

The major expedition this year has been Expedition Arkaroola. This is a region which is well known to many as an outback tourist destination but no complete biodiversity survey had been carried out there. To complete this survey pitfalls had to be made with jackhammers in the rockiest regions. It was an enormous challenge. As a result of this expedition we have been able to supply some baseline data, albeit in a drought year, for the management of Arkaroola. Already they have asked us back when rains occur to see what changes there may be. As we have installed 16 pitfall lines with great difficulty later surveys and long term monitoring are going to be a lot easier in the future.

Mallee Fowl Monitoring

A first malleefowl monitoring was undertaken in November last year as part of a national Malleefowl Monitoring Program. Malleefowl mounds are located and mapped within permanently marked grids, which are surveyed regularly to determine changes in breeding activity over time. Surveys have been carried out in the Murray Mallee and South East of South Australia since 1985. We monitored two sites, Bakara Conservation Park and the property of one of our members, Henry Short. Bakara is located 32 km East of Swan Reach on the Swan Reach to Loxton Road and was established to conserve the malleefowl habitat. A further monitoring will be done next weekend. If you have not yet indicated your interest in this survey and you would like to be involved please register with Bruce Gotch.

Presentations

John Love organised and attended the display for this year's Science Week at the South Australian Museum with the assistance of a number of members. We had a much more prominent position in the entrance to the Museum this year.

SEGments

Andrew Barr and Michelle Trethewey have produced this year's editions of SEGments and more recently have been assisted by Conrad Denyer. Conrad will take over more of the Editorship after this meeting. SEGments has now been produced for 25 years and to celebrate this fact and to make accessible to members old editions of SEGments I have produced a CD with every edition on it. Copies will be on sale at \$5 immediately after this meeting. If there is a demand for more copies than I have made I will produce further copies.

Website

Michelle Trethewey has taken over management of the website and has done a magnificent job. Community Webs, who host our website, are now providing online editing so Michelle can easily keep the site up to date. I encourage members to visit the site regularly to keep an eye on what is going on.

Committee

In my sixth year as Chairman there have been a number of changes to the committee. During this year Graham Hill has been seconded to the committee and John Hayes, Kevin Burrett and Phil Cole have resigned for various reasons. Chris Wright has indicated that he will not be seeking re-election. Each of these have made a valuable contribution to the committee and the activities of SEG over the years and we are very sorry to see them go. This has meant that we have been looking for new members and as you will see when we come to the election of office bearers there is a new face and we have the potential to co-opt committee members as the need arises. I should in particular mention Gina Breen who has taken on the enormous work of Secretary and done a very good job. She has fortunately re-nominated.

Summary

The future for SEG looks very bright with a number of new avenues opening up for further exciting activities. We are close to deciding the site for next year's major expedition. Unfortunately it is too early to start talking about this and other opportunities but the committee will keep members informed of developments.

The Gammon Ranges Project - 21 years

Chris Wright and Paul Harvey

This is a long-term ecological monitoring project in the Arcoona Creek catchment area of the Vulkathunha-Gammon Ranges National Park. Begun in 1987 with the installation of an automatic rain gauge on the Gammon Plateau, the program has been gradually expanded to include:

- Continuous rainfall records at high and low altitudes from 5 sites
- Streamflow recording in Arcoona Creek
- Photographic botanical monitoring
- Aquatic biology and water quality
- Human impact monitoring
- Stream flow recording
- Feral animal counts
- Yellow Footed Rock Wallaby monitoring

Location:

The project is located to the west of the Gammon plateau in the Northern Flinders Ranges.



Figure 1: Location of the Vgrasp project

Access to the project is normally via Leigh Creek, about 600 km north of Adelaide. then the road from Copley, east towards Balcanoon, and the Mt Serle turnoff to the north. After passing Owiendana station there is an access road into the National Park and camping area beside Arcoona Creek. It is worth noting that there are 3 additional rainfall sites that were added to the project in 2004, these are in station country at North Moolooloo, Pfitzners Well and Maynards Well

From leaving the vehicle, there is a walk along Arcoona Creek to Vandenberg Camp, taking 4 to 6 hours, and then a day to walk up onto the Gammon Plateau to the most remote rainfall site. There are five pluviometer sites in the National Park, the first established was on the Gammon Plateau, followed by the Exclosure, (close to where the vehicles are parked), then Sambot, and finally Arcoona South. At a later stage it was decided to set up a site that could be accessed daily by Mobile Phone/Modem. An approach was made to the Board for permission to install an instrument on the side of Arcoona Bluff. The Board arranged for two Aboriginal representatives to inspect the site and gave approval to go ahead. A Pluviometer was successfully installed at this location. Rainfall data is recovered each day and appears on the Bureau of Meteorology website.



Figure 2: Location of the Vgrasp project

The Beginning History

This project arose out of curiosity how did the Gammon Plateau support such a dense growth of vegetation in a low rainfall area? This curiosity was heightened by an experience in which extremely heavy rain in the ranges was observed to be confined almost entirely to the ranges.

It became clear that the only way to get an answer to the question of exactly how much rain actually falls in the ranges would be to establish a long term rainfall monitoring project. It was also recognised that this could provide a different and valuable opportunity for SEG to assist in the training of young people in field science activities. From this rather humble start and with the help of many people and organisations this project has now grown into a significant, broad environmental monitoring exercise which will provide

valuable information to organisations such as National Parks and Wildlife Service, and other relevant agencies in government and private enterprise, as well as providing training and wilderness experience for expeditioners.

On 11 September 1988 the project was officially commenced with the turning on of a pluviometer which had just been installed on the Plateau. The project was dedicated to the memory of Louise Grandfield, a SEG member and leader on Expedition Freeling Plateau in 1986, who devoted much of her short career to caring for the Flinders Ranges. Tragically Louise was killed in a car accident on a field trip to the Flinders just one month after the Expedition.

The Gammon Ranges in the far northern Flinders Ranges consist of a deeply dissected quartzite plateau with steep gorges and spectacular cliffs. The sites for the SEG project are all located towards the western end of the Gammon Ranges and are reached from an access track off the Mt Serle to Yankaninna road. This area was selected because it is less popular than the eastern part of the park which means that the scientific equipment is less likely to be disturbed and the data collection trip is in an area of near wilderness which adds to the experience for participants. It is intended that the project will continue for at least 30 years (ie until 2018). Four or more data recovery trips are made to the area each year.

The program has gradually expanded to include seven activities:

- Pluviometers (recording rain gauges) at eight sites
- Botanical monitoring at six sites
- Aquatic biology monitoring at two sites
- Human impact monitoring at three sites
- Stream-flow monitoring at one site
- Yellow footed rock wallaby colony monitoring
- Feral animal counts, numbers and locations.

A native vegetation monitoring program has been run by Robert Henzell, of the Feral Animal and Plant Control unit since the early 1970s. He has set up fenced exclosures to investigate the regeneration of native grasses, shrubs and trees when all grazing pressure is removed. During the 1996 Expedition Gammon Ranges SEG helped construct a series of exclosures at key sites on Arcoona Creek. They can be seen during trips to and from the Plateau.

There were four South Australians Paul Harvey, John Grounds, Bob Read and John Waterhouse who were walking in the Gammon Ranges in 1987 and while camped on the Plateau were drenched by a heavy storm. However when they reached their vehicles on the edge of the National Park, found the place was dry and dusty. As they descended and walked down a wet and slippery Arcoona Creek, the question was “How much does it rain up there?” From there on, the project developed, and many people have participated, over the years. Prominent in the early days were David West, Jenny Beer, Janet Furler, Andy and Sarah Telfer.

Expeditions

The original intention of the project was to measure rainfall continuously on the top of the Gammon Plateau. Instrumentation available at that time was a tipping bucket raingauge, no different from the ones we use 20 year later, and the data was recorded using a Hydro-mace recorder, a black, shoe-box sized, aluminium body, containing the electronic card and battery. This instrument had a 90-day recording life, which meant that after 90 days had elapsed, the instrument would over-write its original record. Therefore visits to the site had to take place at a maximum of 90 days. In practice 5 visits were planned each year. As technology improved, newer generations of data logger had much greater memory capacity, and could survive for much longer. Over the years a pattern has emerged and is now more or less:

- January (the hot weather trip). Despite the mid-summer these trips have often been very pleasant, with day temperatures around 30C. Even the hot trips are bearable, but we generally try to start early and find a cave or shady patch to while away the midday heat until around 5pm, and then continue with work or walking;
- Easter/ANZAC weekend has been a popular time for visits, when the summer heat has (hopefully) diminished;
- July mid-year break the cold weather trip, with short days and freezing nights. SEG often organises a Cross-over trip, with groups starting at opposite ends of the ranges and swapping vehicles, hopefully meeting up at the end of the walk;
- September or November springtime, with wildflowers out after some winter rain.

Rainfall measurement

Initially the group selected a spot on the relatively flat Gammon Plateau. Getting the materials to site, including a concrete slab, took a bit of organising, but was done successfully with a lot of help from John Vandenberg, then hydrographer at Crystal Brook. Data was recorded using a Hydromace Electronic Logger, with a 90-day memory. These were replaced subsequently with SDS Cherryville loggers. The last of these was phased out in 2007. Hydrological Services loggers are being used at all sites. New technology using Campbell loggers, will be introduced over the next few years.

It was found at an early stage that at a remote site, anything that can go wrong will go wrong. With experience we learned to provide two data loggers at each site, and to avoid using laptop computers. Power requirements are much less for the new equipment, meaning smaller batteries, and less heavy equipment to carry. In the effort to understand rainfall distribution with ground surface elevation, and across the Arcoona Creek catchment, additional sites were added, and there are now 5 located at:



Figure 3: Gammon Plateau 11 September 1988



Figure 4: Exclosure 20 April 1990



Figure 5: Sambot 17 September 1991



Figure 6: Arcoona South 13 July 1997



Figure 7: Arcoona Bluff April 2003.

There is a scarcity of long-term record about the variability of rainfall with height in this semiarid climate. In particular the orographic (topography/mountain ranges) effects can cause an increase in the rainfall at favourable locations.

The initial rainfall monitoring site, on the Gammon Plateau, is at an elevation of approximately 930m. This makes it the highest automatic recording rain gauge in South Australia. The others are at various elevations, down to 320m. These instruments are ideally located to investigate the orographic effect of the ranges on

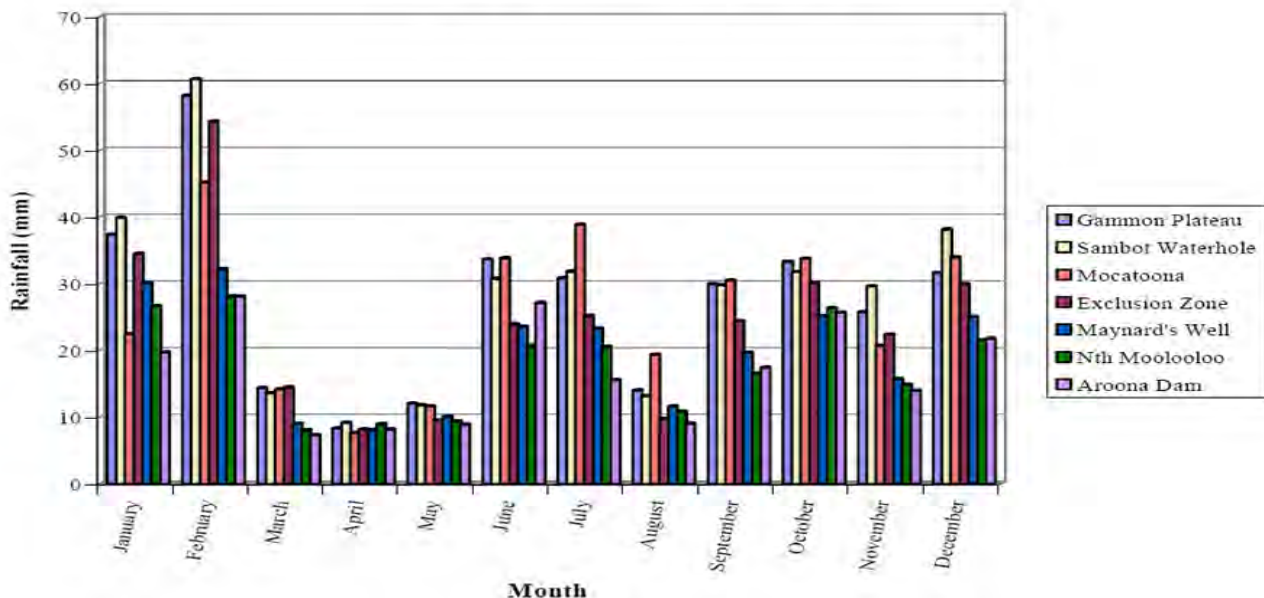


Figure 7: Comparison of average monthly rainfall In the Gammon Ranges and nearby locations

the rainfall. They can also be compared with recordings from Balcanoona, Arkaroola, Leigh Creek and other daily read stations on pastoral properties. Because of the random and infrequent nature of the rainfall, it will take many years before sufficient data have been collected to enable an accurate comparison with adjacent stations, however a general understanding of the differences and similarities is already starting to develop.

The five sites within the catchment of Arcoona Creek will also provide a good estimate of the total rainfall in the catchment for comparison with stream-flow measurements.

Since the beginning of the project in September 1988, the quality and capability of the monitoring of rainfall, using tipping bucket rain gauges, has improved considerably. In the early days, there were frequent occasions when the data loggers failed to record, or data was overwritten. The pluviometers are now performing consistently within the 3% error bounds used by the Bureau of Meteorology. Currently the data is recorded using dual data loggers at each site.

The instrument on Arcoona Bluff has a modem and NextG mobile phone facility. It is interrogated by the Bureau of Meteorology each day to find out whether rain has fallen, and the data is displayed on the Bureau of Meteorology public web-site. This is vital information for Robert Henzell who manages the Feral Animal Research Project (Exclosures), as he needs to know when there has been sufficient rainfall to cause

germination of mulga (*Acacia aneura*) seedlings. It is also a useful indicator of whether there is likely to be water in the creeks, which will reduce the amount that must be carried in by expeditioners.

Stream flow Monitoring

Since 1991 SEG has operated a stream flow monitoring program on Arcoona Creek. The instrument consists of the data logging equipment, a solar panel to charge the batteries, two tubes that lead down to the creek with the control cables and the sensors, mounted against a rock. The recording instruments are housed well above the height of any flood. The measuring instruments and cables are tucked in against the rocks, protected from the main surge of the current.



Figure 8: Arcoona Creek

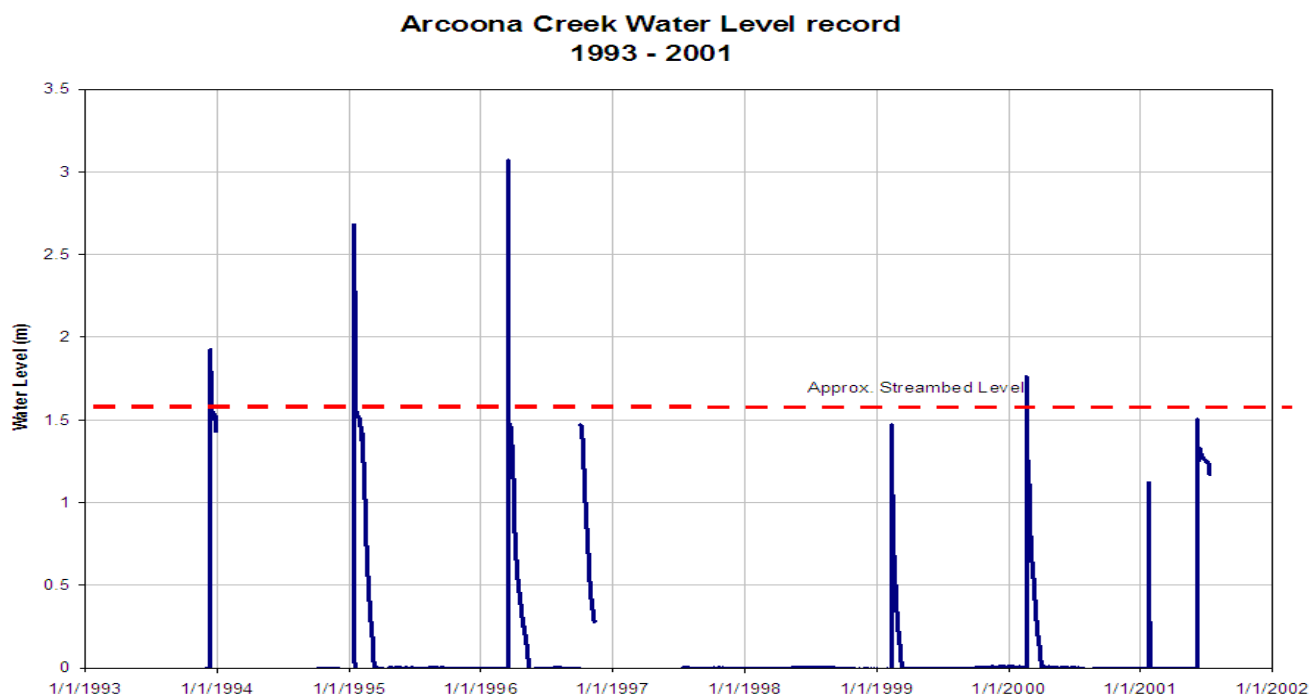


Figure 9: Arcoona Creek water levels

The gauging station measures the level of the water in the creek at 5-minute intervals. Most of the time there is no flow in the creek in this semi-arid climate. However when heavy rains have fallen, the instrument records the rise of the water level as it fills the creek, and then records the falling water level as the flood passes down the creek. Engineering calculations used to convert the level of the water surface to a rate of flow in cubic metres per second (tonnes per second) from which the total volume of water and the peak rate of flow of the flood is calculated. It is then possible, for instance, to compare the volume of water that fell as rain, with the amount of water that flowed down the creek as runoff. This can give an indication of how much water recharges the groundwater supply, how much goes to support the trees and other vegetation and how much is lost to evaporation. In order to minimise the risk that data is lost during the occasions have on several occasions failed to record floods due to equipment malfunction), there are actually two data loggers, each keeping a separate record of the flow. On each three-monthly trip we recover the data from the Hydrological Services logger.

Botanical Monitoring

The vegetation found in the western part of the Gammon Ranges National Park varies depending on its location. Arcoona Creek is predominantly lined with *Eucalyptus camaldulensis* (river red gum) and *Melaleuca glomerata*, while on the slopes of North Tusk Hill *Triodia irritans* (spinifex) is interspersed with low shrubs. On the Plateau three distinct plant

communities exist: a dense heath consisting mostly of *Calytrix tetragona*, *Callitris columellaris* (native pine), *Allocasuarina muelleriana* and *Acacia aneura* (mulga); an open mallee consisting of *Eucalyptus flindersii* and the low shrub *Goodenia vernicosa* with relatively large clear areas of stony soil; and a very dense impenetrable vegetation composed mainly of *Melaleuca uncinata*. The vegetation on the western slope of North Tusk Hill was burnt at some time between 1985 and 1988 and is slowly regenerating. This has provided an opportunity to monitor the succession of plants that colonise this area.



Figure 10: Vegetation and Animals in Arcoona Creek

Vegetation photopoints with associated quadrats were installed in each of the identified plant communities on the Plateau and on the slopes of North Tusk Hill in 1988 and 1989. Their purpose is to assess long term changes in vegetation such as density, species



Figure 11: Vegetation monitoring

composition, condition or growth. These changes are assessed in two ways – by regular photographs from fixed points and by less frequent scoring of the individual plants at each site. Between 1988 and 1999, the photopoints were photographed on most of the quarterly trips, whereas the quadrats were scored 5 times. Photographic monitoring is now limited to the autumn and spring trips.

This method of monitoring has shown that overall there has been little change in all of the photopoints over twenty years, demonstrating the slow growth/change in vegetation in this environment. Some of the changes that have been observed are as follows:

- development of a bush track (footpath) in photopoint 70B;
- *Melaleuca uncinata* becoming less dense;
- burnt area regenerating, overstorey height increasing
- some response in relation to rainfall

Land Condition Monitoring

In 1999, Department for Environment and Heritage set up a monitoring program for the Gammon Ranges National Park, to monitor land condition using the same methods that are used to assess land condition on pastoral lease properties. Two of the original V-GRASP photopoints (66B and 71B) have been adopted as part of the above program. Their structure has been modified so that they are consistent with the pastoral monitoring methods, and SEG will continue to monitor them as part of the V-GRASP program.

Aquatic Biology

It is known that ephemeral streams with pools and running water left after rainfall are rapidly colonised by macro-invertebrates (small invertebrate animals living in streams and sediments, including insect larvae such as mosquitoes and midges). Presumably these animals either live deep in the sediments during dry periods or recolonise from outside the immediate area.

Macro-invertebrates are a major food source of many animals. They also process large amounts of organic matter and are an important component of nutrient cycling within aquatic ecosystems. Many have adapted to living in running waters (e.g. flattened bodies). Others may live in a stream environment but escape high flows by sheltering in low flow areas (e.g. behind rocks or vegetation).



Figure 12: Aquatic biology in Arcoona Creek

The study of macro-invertebrates is important for a number of reasons. The most important in the context of the Gammon Ranges Scientific Project is because of their potential as biological monitors of changes in their habitat (ie changes in water quality). Some species are very sensitive to changes such as increases in salinity, turbidity or nutrients. The presence or absence of a particular species or the abundance of one species can give an indication of changes have occurred since the last samples were collected. A study has been initiated to identify the species involved. Water salinity has also been monitored periodically by measuring electrical conductivity at selected locations on Arcoona Creek.

Human Impact Studies

Despite the intention of SEG, our presence will always have some impact on the environment. This is the case for any human activity anywhere on the planet. Unfortunately, very little quantitative work has been done on investigating the impact bushwalkers have on the environment. Although it has been assumed that there is little or no impact, regular visitors to popular locations will testify to the changes wrought by increasing visitor loads.

As this project involves regular expeditions in the same locality, an ideal opportunity exists to gather quantitative data on the impact caused by bushwalking groups in an arid environment. Photopoints have been set up on the top of North Tusk Hill, at the Plateau pluviometer site and at Vandenberg Camp site (near the foot of North Tusk Hill) to record photographically the impact at these three locations. Data collected will be stored until a suitable research project can be initiated to carry out analysis. At Vandenberg Camp which has been regularly used, there has been some dieback of trees. However in the current drought the cause of dieback is not clear. Understorey vegetation has also been depleted.

Camp Fires

As part of the effort to reduce human impact, SEG decided not to light camp fires during the regular field trips. Dead timber, twigs, and leaf litter are vital to the survival of small animals and insects at the low end of the food chain. It was noted in other parts of the Flinders Ranges, such as Arkaroola, which are regularly visited by campers, that all dead timber within several kilometres radius is carried off and burnt. The lack of

a camp fire to sit beside and talk after dinner comes as a shock to many people. However, SEG feels that the extra effort to minimise the effect on the environment is worth while.

Yellow-footed Rock Wallaby

The yellow-footed rock wallaby (*Petrogale xanthopus*) is restricted to small scattered colonies in arid rocky ranges of northern South Australia and adjacent areas of New South Wales and Queensland. This beautiful species has declined considerably since European settlement and many isolated populations have become extinct. Predation by foxes is known to be a major contributing factor in this decline. Wallaby populations protected by fox baiting programs elsewhere in South Australia are recovering strongly.

A small colony survives in the Arcoona Creek area of the Park. Sightings of only two or three animals at a time have been made in recent years. All have been made in steep gorges associated with two small tributaries of Arcoona Creek. In dry conditions the wallabies descend from the cliffs to drink at soaks in the creek, where they exposed to increased risk of fox predation.

In September 1997 SEG, with the help of the Animal and Plant Control Commission and (then) Department of Environment, Heritage and Aboriginal Affairs, embarked on a program to control foxes and monitor wallaby populations in the Arcoona Creek area. Fox baiting by SEG ceased in 2002 when aerial baiting was begun by the Department for Environment and Heritage

The aim of monitoring rock wallaby numbers and distribution is to measure population changes which might occur as a result of the fox baiting program. The populations of other large herbivores, with which rock wallabies may compete, is similarly monitored.

Feral Animal Counts

Goats, rabbits, donkeys and foxes are known to inhabit the project area. Sightings of these animals, or recent scats, are recorded in all phases of the project.

Conclusions

The Vulkathunha-Gammon Ranges project is now in its 22nd year and has seen many changes during its course. The feasibility of running a volunteer program long term has been established. The project has involved several hundred people as expeditioners, scientists, leaders and managers, and several SA State Government Departments.

The project has achieved its primary objective of recording rainfall, long term, in a remote environment. Many valuable lessons have been learnt in keeping scientific equipment operating in a hostile and remote environment.

A great deal of scientific information has been collected and an understanding of the Hydrology is developing.

- The vegetation monitoring program has shown how slow are the changes to vegetation, and how fragile the ecology of the area.
- Studies of the hydrology have shown how different the flow regime in the Semi-Arid area, is from the less-dry climate further south. Flow episodes in Arcoona Creek commonly occur over small parts, but rarely along the whole length of the creek.

- The effects of even small amounts of rain are amazing, evidenced by the efficient way in which local flora and fauna make use of it.
- Even after protracted drought, the frog population rebounds prolifically when any water accumulates in the waterholes.
- The death of Yellow Footed Rock Wallabies during 2008 may be attributable to the drought, of to attacks by foxes. It is not clear whether the Fox Baiting program initially undertaken by SEG and which ceased when aerial baiting began, was worthwhile.
- In comparison with the Mt Lofty Ranges, the population of small creatures per unit area is very low.
- The goat-culling program, effective since the mid-1990s, has led to a marked reduction in damage to vegetation and deterioration of the river basin. (fewer tracks and dust bowls.)

The next objective for the Project will be September 2018, when 30 years of operation will be complete.

Editors note:

This paper was presented by Chris Wright and Paul Harvey at the SEG's Annual General meeting on October 23, 2009.



Figure 13: Arcoona Creek

The Vulkathunha- Gammon Ranges Data Recovery trip 2009

Graham Blair

Itinerary and description of the expedition

On Friday 2-Oct-09, Garry and Michelle travelled to the Vulkathunha-Gammon Ranges National Park from the Arkaroola Expedition, arriving around 4pm. The remainder of the expeditioners departed Adelaide around 6:15 am in two separate vehicles meeting at Clare at 8:00 am. Continuing on, a fuel stop was made at Hawker and a bakery stop at Copley before reaching Pfitzners pluvio around 2:30 pm. Conditions were cold and windy. After logger replacement and calibration check the group left for Arcoona Creek. Approaching from the southern side via the turn off at the Owiendana Yards arrival was around 17:30 pm. Camping was at Bob Henzel's campsite.



Figure 1: Rainbow at Bob Henzel's Campsite

Sat 3-Oct-09

Graham, Tricia and Andrew did the Yellow Footed Rock Wallaby walk and visit to the Saddle pluvio followed by a visit to the stream gauge recorder site and then the Exclusion pluvio. These tasks took till 2:30 pm. A macropod of some sort was sighted descending Evasive Creek, however the distance made it too difficult to positively confirm whether it was a YFR Wallaby. All rainfall and water level recording equipment had worked well since the April visit. Calibration checks indicated both gauges were operating within an accuracy of 1%.

Garry, Michelle, Michael and Alan carried out the water drop to Vandenberg Camp carrying in 65 litres. They went to SAMBOT waterhole to see if there was any need to bring the macro-invertebrate gear the next day. There was no need as it was dry. There was water in Wild Ass water hole so they spent time investigating macro-invertebrates, with back swimmers and water boatmen being the most prolific variety identified. On the walk from Vandenberg they used the opportunity to carry out the remaining objects left from the pitfall project that was run in the 1990's.

Sun 4-Oct-09

Departing by 08:15 am, the group walked to Arcoona South Branch junction where upon Graham, Trish and Andrew split off to do the South Branch pluvio visit while Garry, Michelle, Michael and Alan continued to Vandenberg. The pluvio visit involved the usual logger replacement and calibration check, with no problems encountered. Rejoining the others around 2:30pm and after a rest, the Sambot pluvio was visited. The batteries of the rain gauge logger had run flat however data had been successfully recorded by the Davill backup logger. The calibration check indicated the gauge accuracy was within 2%.

Mon 5-Oct-09

The plateau walk comprised photography, the pluvio visit and mobile phone signal strength testing. Angling up the western flank of North Tusk Hill all expeditioners visited the first two photo points. From there the group split with some going directly to the Plateau pluvio while the others carried out the remaining photography. Just like at the Sambot pluvio, the batteries of the Plateau rain gauge data logger had gone flat, leaving the Davill backup logger to prevent data loss. Ironically the voltage of the Davill logger batteries were the lowest of any of the Gammon Ranges backup loggers, and should be replaced on the next expedition. Signal strength testing was hampered by a broken connector on the Yagi antenna. A collinear 6dB antenna had also been brought along so was tested at a height of 4 metres above ground and adjacent the nearest Callitris north of the gauge. Signal was present and although low was sufficient to carry out a successful test call to 1194 Time service.

The return walk from the plateau was via a steep descent into the creek on the western side of the plateau exit and then along Western Tributary Creek, also called Grandfield creek, after it's waterhole.

Tue 6-Oct-09

An early start was made for the walk back to the vehicles. The group left behind 15 litres of excess water left in cache. Photos were taken at Wild Ass Creek. Using the traditional rock point at the upstream end of the waterhole for the photo point, it was observed that the photo excludes showing much of the water present in the water hole so an additional photo was taken pointing more specifically towards the water surface. The good walking weather enabled an easy arrival back at the cars by 10:30 am. All vehicles were driven to Copley at which point Garry and Michelle departed for Adelaide while the remaining 2 vehicles and expeditioners made a circuit of the remaining station pluvio's. The route between North Moolooloo and Maynard's Well was via the old hut along the Windy Creek. Both pluvio visits indicated the recording equipment is operating well. Calibration checks of both gauges indicated accuracy was within 1%. Home responsibilities of some members influenced a decision to commence the return journey back to Adelaide instead of staying overnight at the shearers quarters as originally planned. Leaving Maynard's at 4:30 pm, Hawker was reached by 7pm. Hawker motors had been closed for an hour but they kindly re-opened to enable refuelling. The remainder of the trip was uneventful with Adelaide reached around midnight.

General Observations

There had been around 20 mm of rainfall during the fortnight before the expedition. The recent rain and a number of generally good falls through winter resulted in surface water being present in Wild Ass and Grandfield water holes and pools at the bases of waterfalls along Wallaby Creek and the upper tributary of Western branch often traversed as an exit from the plateau. Water was also observed in the seeps along Arcoona Creek located 50 – 100 hundred metres before entering the "short-cut". All observed surface water was clear though often coloured.

There were no sightings of feral animals occurred during the expedition. It is worth noting that a combination of both human impact and the low rainfall over the past 7 years are the probable contributing factors leading to the deterioration in the condition of the vegetation along the terraced section of the



Figure 2: Wild Ass water hole.

Vandenberg Camp area. Although SEG would not be the sole users of this area they would have contributed to an estimated 25 uses during the past 7 year period and in the vicinity of 80 during the life of GRASP. Given that the values of SEG are in the pursuit of understanding and preserving the environment the following suggestions are made:

■ The location of the future tent sites of future GRASP expeditions in the Vandenberg area should be varied to firstly allow Vandenberg to regenerate and secondly to prevent possible similar impact in another location. There are numerous good tent areas in the flat area beyond the Western Tributary junction or between Wild Ass Cache & Eastern exclosures. (The counter argument to this is that park managements realised around 20 years ago that people = damage, and it's best to concentrate that damage in fewer areas than spread it out).

■ Continue with human impact photography in this area to monitor and hopefully gain an insight into the revegetation and recovery process of an arid area assuming that the above suggestion to vary campsites is adopted). Perhaps adding more photos, looking upward, of the sick looking trees, with diams 200 - 400mm, at VDB on the cleared area, & comparisons with similar trees along the creek.

■ It was suggested by one of the expeditioners that by simply sorting the garbage resulting from the October expedition it was found that a majority of it could be recycled. The effort to achieve this on future expeditions is minimal requiring two garbage bags while camping so that recyclables are separated from disposable garbage at the time of placing it in the garbage bag.

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Book Reviews

Mr Stuart's Track

John Bailey
Pan Macmillan Australia Pty
Ltd
1 Market Street
Sydney 2000

John McDouall Stuart was clearly mad. He attempted to cross Australia from south to north no less than six times during the 1850s and 1860s before he succeeded in his quest to reach the north coast. John Bailey's biography entitled *Mr Stuart's Track* provides some wonderful insight into what Bailey describes as "The forgotten life of Australia's greatest explorer".

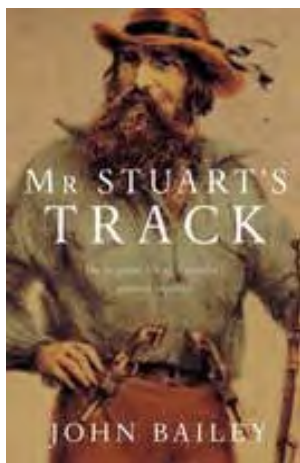
This is quite an accolade when one considers the exploits of Captain Sturt, Edward Eyre, Matthew Flinders and Burke and Wills. But in terms of endurance and persistence against the odds Bailey may just be right.

Stuart was an exceptional character who battled alcoholism and serious ill health through large parts of his life to cross some of the harshest terrain on the planet and eventually succeed where no other European explorer had been previously successful.

Bailey has created a well documented and extremely readable recount of the life of this diminutive but in many ways larger than life character. The book contains fascinating pictures and photographs and some detailed maps that make following the extraordinary journeys of Mr Stuart a pleasurable read. Bailey builds up the tension of the "race" between Mr Stuart and Burke and Wills and retells the depths of depravity that surround Mr Stuart on his return to Adelaide after each successive journey.

In the end a biography may be judged by the pictures created in ones head as the story unfolds and the pictures created by John Bailey of Mr Stuart are vivid, colourful and long lasting. This book is highly recommended for anyone interested in the Early European exploration of Australia and the obstacles overcome on these journeys.

Conrad Denyer
University of South Australia



Red Sand, Green Heart

John Read (2003)
Thomas C. Lothian Pty
Ltd, 132 Albert Road,
South Melbourne, 3205

This book is about our South Australian desert, its mammals, birds, reptiles, amphibians, vegetation and climate. Having spent more than 20 years visiting the Northern Flinders and bushwalking in the company of a wide range of ecologists, geologists, scientists and enthusiasts, I am left with the realisation that I know very little about this fragile and fascinating world..

John's book covers a huge range of ecological topics, and includes many thoughts, ideas and stories – amazing and sometimes downright terrifying – like his account of crash landing in a light aircraft on a bush strip on Lake Eyre – the engine caught fire and was doused with handfuls of sand, leaves and dirt (because the plane didn't carry a fire extinguisher!!) – after which the pilot pushes the battered plane out of the scrub and takes off again!

This is the first of a 6-stage review, and covers the first part of the book entitled "The Desert Lottery". Rain over the arid areas is unpredictable, rain is "equally unlikely any month of the year." "Rain is everything out here. It is never convenient, always needed and perennially topical" It is a subject of great interest to everyone who lives out there, much discussed and intermingled with folk lore. "Long range forecasts are no more likely to be correct than predicting the shape of a gum tree". This gives rise to a major issue, that through believing (or hoping) for long-forecast rain, pastoralists can seriously denude the country, rather than destocking and waiting for rain which mimics natural animal movements/population dynamics which help protect the vegetation and soils etc (John Read, pers com) The huge rains of March 1989, when 273 mm of rain fell in 24 hours, followed by a lot more the next day, transformed the landscape and created lakes that had not filled for many (perhaps hundreds) of years, and unprecedented breeding conditions for huge





numbers of water birds. The pelicans arrived from all parts of Australia, how did they know? However John believes that it is actually droughts that may have greater value in maintaining the desert ecology, because the creatures of the desert are adapted to drought,

The lack of regeneration of tree species has been a matter of concern to ecologists and scientists. Sir Douglas Mawson commented on the lack of regeneration of Mulga in the 1940's, and Robert Henzell has been studying this problem for some 30 years. John Read writes about similar observations of western myall and native pine trees – some of which do not appear to have regenerated for hundreds of years, and are represented by grand old men (and women),

battered survivors. The erratic rainfall, droughts, bushfires, plagues of locusts and floods make the chances of survival for large trees very slim indeed. When I next travel in that area I will look at the weather-beaten survivors of so many seasons of hardship. John says that for seedlings to survive they need rain just at the right time for at least 2 successive seasons, plus being deposited in ideal soil conditions and locations.

After 21 years working in Weather Forecasting, I have followed the efforts and debates about rainfall prediction. While we can forecast rain a couple of days ahead, seasonal rain prediction is a different story. In the context of Roxby Downs and Lake Eyre, John points out that even in a major drought, some rain falls, and that conversely in very wet seasons, some areas miss out. In the outback, seasonal predictions will only be of value if they can predict rain at a specific location (who wants to know it has rained 50km away!). From the perspective of a human, animal or a plant, it doesn't help to know that there is lots of water somewhere else if I am dying of thirst. Therefore for humans and other living things in the outback, all they can do is wait until it happens and cope as best they can. I commend John Read for his thoughts and experiences and have enjoyed and learnt from his book.

Chris Wright

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- * The furthering of knowledge, understanding and appreciation of the natural environment.
- * Promotion of the values and philosophy of wilderness.
- * Enabling people to learn the skills required for planning and running expeditions, and to develop sound field techniques.

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