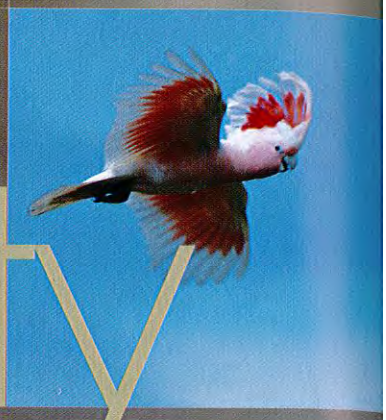
Desert diversity

by Karl Brennan, Stewart Ford, Patricia Woolley, Sarah Barrett, Julianne Waldock and Bobbie Hitchcock



A major biological survey of one of Western Australia's most isolated reserves, the Neale Junction Nature Reserve, reveals the rich flora and fauna of the Great Victoria Desert.

The deserts of Australia contain some of the country's largest terrestrial conservation reserves but it is sobering to reflect upon how little is known about the plants and animals inhabiting them. The dearth of survey data for desert regions is no doubt due to their vast size and remoteness. Surveys in deserts are a major logistical challenge and extremely expensive. A prime example is Neale Junction Nature Reserve (NJNR), which lies at the heart of the Western Australian side of the Great Victoria Desert, 500 kilometres north-east of Kalgoorlie. At 723,073 hectares, it is the fifth largest conservation reserve in Western Australia, but the area has not received significant survey effort for mammals and reptiles since before the reserve was gazetted in 1977 and it has never been subject to a systematic survey for plants.

Access roads for rocket testing

NJNR takes its names from Neale Junction which marks the intersection of the Anne Beadell and Connie Sue highways. The junction derives its name from the Neale Breakaway approximately 42 kilometres to the south, which was named in honour of Frank Neale, a World War I flying ace who flew aerial surveys for minerals in the area from 1930 to 1935. The highways were created by Len Beadell and his Gunbarrel Road construction party during the 1960s to provide access to the flight paths of rockets fired from Woomera in South Australia towards WA's north-west coast as part of the British nuclear testing program. The program required a network of roads throughout the western deserts. The roads also facilitated access to the Aboriginal people living in the deserts and aided their evacuation to avoid exposure to radiation from the nuclear testing at Emu and Maralinga in South Australia.

Previous surveys

Despite its remote location, the Neale Junction area has been visited by explorers and scientists for more than a century. In 1891 the Elder Scientific Expedition passed through the area. At the time it was the biggest scientific expedition ever undertaken in Australia with six officers, four Afghan cameleers and 44 camels. They amassed an impressive collection of plants and lichens as well as birds, reptiles, mammals, insects and land and freshwater snails. Their journey was particularly perilous and plagued by bitterness and quarrelling between expedition members. Taking 24 days to travel 632 kilometres and desperately short of water, their passage through the Neale Junction area was part of the longest, waterless marches in the

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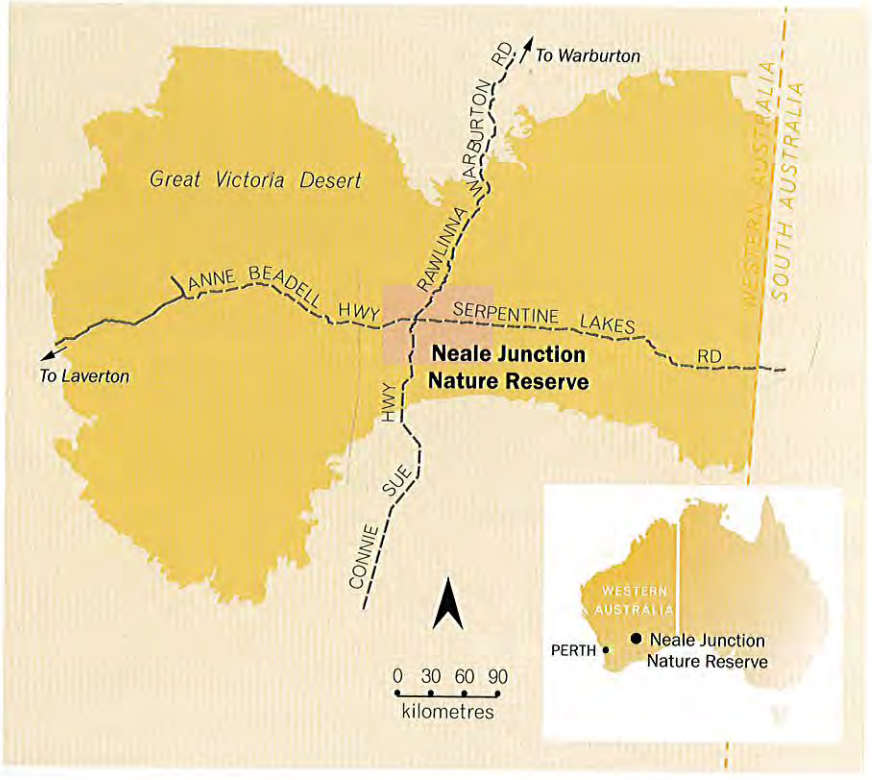
Main Storm front approaching Neale Junction.
Photo – Karl Brennan/DEC
Insets from left Desert scorpion. Major Mitchell's cockatoo.
Photos – Babs and Bert Wells/DEC
Ride's ningaui with a centipede.
Photo – Jiri Lochman
Warburton starflower.
Photo – Sarah Barrett/DEC

Left Neale Junction marker erected by Len Beadell and his Gunbarrel Road construction party in August 1962.
Photo – Wendy Minchin



history of Australian exploration. Lack of water remains a major logistical problem for present day expeditions into the region. The Elder party's woes were heightened on 10 September, when expedition leader, David Lindsay, asked the expedition doctor, Dr Elliott, to serve their supply of lime juice with the evening meal. Dr Elliott mixed the lime juice with whiskey and water in a galvanised canteen and the resulting concoction gave them all severe zinc poisoning. Thereafter Camp 41, north of the present day Neale Junction, became known as Limejuice Camp.

In the late 1960s, a survey by famed American herpetologist Eric Pianka drew attention to the area's rich reptilian fauna. A survey of the birds was also completed by his wife Helen. In the mid 1970s a survey of birds and mammals was conducted by Andrew Burbidge, Norm McKenzie and their colleagues. They recorded 10 species of mammals, including the then little-known Ride's ningaui (*Ningaui rideï*). As a result of this early work, the area was identified as warranting protection by gazettal as a nature reserve. This occurred in 1977.

The 2008 expeditions

In 2007, DEC's ecologist for the Goldfields Region Karl Brennan saw the need for more surveys of the NJNR and he recognised that any work in the remote and vast area would require significant resources. East-to-west the reserve spans approximately 98 kilometres and north-to-south 74 kilometres. Nearly two days' drive from Kalgoorlie, the reserve is very remote, with the only access being the Anne Beadell and Connie Sue highways. The category of 'highway' is clearly a misnomer—both are little more than very corrugated tracks with the Anne Beadell legendary among four-wheel driving enthusiasts as one of outback Australia's premier four-wheel drive routes. The Connie Sue Highway, although less corrugated, has vast tracts of axle-deep bull dust. Just getting to Neale Junction is a challenge!

Top A small portion of the Neale Breakaway.
Photo - Stewart Ford

Above Base camp at Neale Junction.
Photo - Karl Brennan/DEC

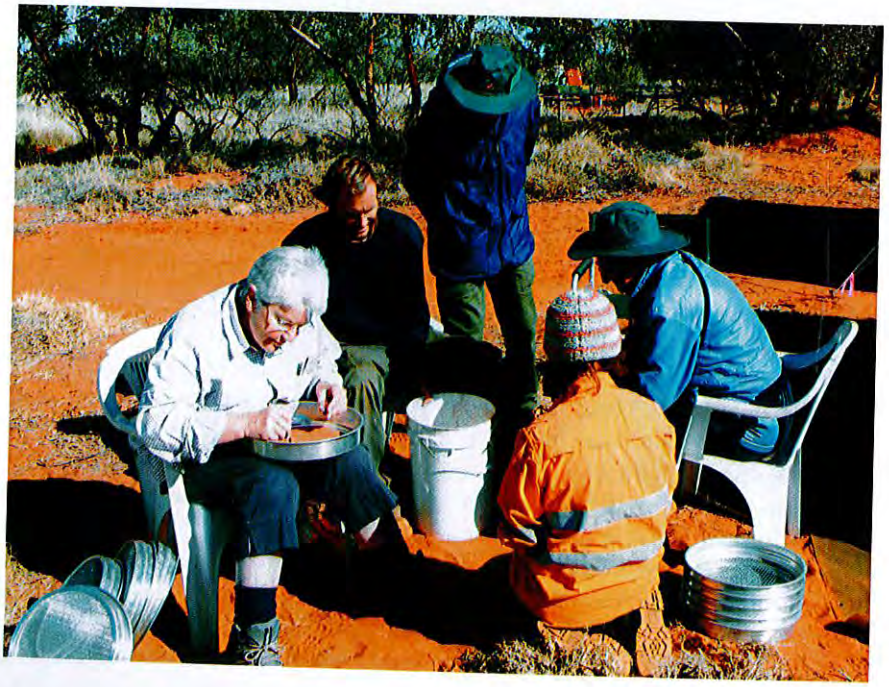
Logistics were no less daunting an obstacle to overcome. Survey sites spread across the reserve would require checking each morning, with the captured animals being brought back to base camp for identification and then returned to where they were

caught for release. To check all 27 sites within four hours after sunrise, six teams would need to drive up to 90 kilometres on rough roads allowing an average speed of only 40 kilometres an hour. Other specialists such as arachnologists, botanists, entomologists and ornithologists would also require vehicles and fuel. Who would be willing to undertake such a survey? The answer lay in developing partnerships, first with fee-paying volunteers on a *LANDSCOPE* Expeditions trip, and then with scientists from museums and universities, traditional owners and finally a mining company and its environmental consultants.

The two expeditions, one in April and one in October, involved six DEC staff, 13 *LANDSCOPE* expeditioners, one scientist from the Western Australian Museum, one from the Museum of Victoria, one from La Trobe University (Melbourne), two from the Australian National University (Canberra), one from CSIRO Entomology (Canberra), 14 exploration staff from the Tropicana Joint Venture (TJV: AngloGold Ashanti/Independence Group) and their environmental consultants (six Ecologia Environment zoologists and two Botanica botanists), and more than 25 traditional owners from the Spinifex People (Pila Nguru). The involvement of TJV was critical as its eight tonne, four-wheel drive truck was able to supply a 5,000-litre water tank, numerous 200-litre fuel drums and fresh food every four days from the Tropicana exploration camp, seven hours' drive to the south-west. The contrast between the Elder Scientific Expedition and the 2008 expedition could not have been starker. The former was so desperately short of water that they almost perished and the later had water in such abundance that they could shower every second day and even run a washing machine!

Setting up sites

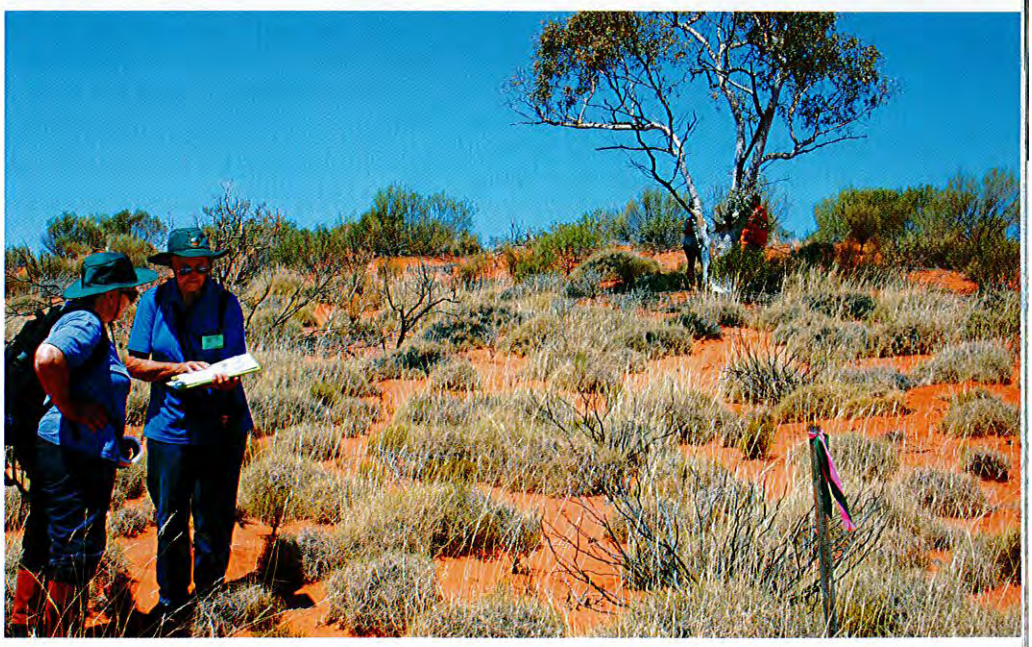
Potential survey sites were first inspected by senior traditional owners to ensure they were not areas of special cultural significance. The reserve is



Above left Traditional owners the Spinifex People (Pila Nguru) with staff from Tropicana Joint Venture and the environmental consultancy Ecologia Environment digging in pitfall traps.
Photo – Karl Brennan/DEC

Above Senior traditional owners from the Spinifex People (Pila Nguru) explain the special cultural significance of a heritage site located within the reserve.
Photo – Simon Tucker

Left Sieving insects, spiders and centipedes from pitfall traps.
Photo – Wendy Minchin



Right Undulate emu-bush.

Below right Expeditioners surveying a plant quadrat.
Photos – Sarah Barrett/DEC

criss-crossed by a number of song lines (paths that spirit beings took as they travelled across the landscape). After sites were agreed upon, traps were set up at each site. This involved digging 20-litre buckets into the soil as pitfall traps and connecting them with a fly wire fence. The fly wire fence directs animals wandering along the soil surface into the traps. When the soil was too hard to dig with a shovel, a machine fitted with a post-hole digger was used. This provided a unique opportunity for the younger traditional owners to receive training in the use of earth moving equipment from the experienced TJV staff.

Desert plants

Unlike many deserts around the world, Australia's deserts are well vegetated. The Great Victoria Desert contains a range of different vegetation types. Perhaps the most characteristic is a treed grassland with marble gum (*Eucalyptus gongylocarpa*) and scattered Yarldarlba mallees (*E. youngiana*) over a hummock grassland of hard spinifex (*Triodia basedowii*). This vegetation type occurs on sandy soils. Native pines (*Callitris*) occur in sandy areas where there has been infrequent fire. On colluvial substrates these species are replaced by mulga (*Acacia aneura*) with an understorey of emu bush (*Eremophila*) and sandalwood (*Santalum*). Near salt lakes and saline drainages, halophytes such as salt bush (*Atriplex*), bluebush (*Kochia*) and samphire (*Tecticornia*) occur.

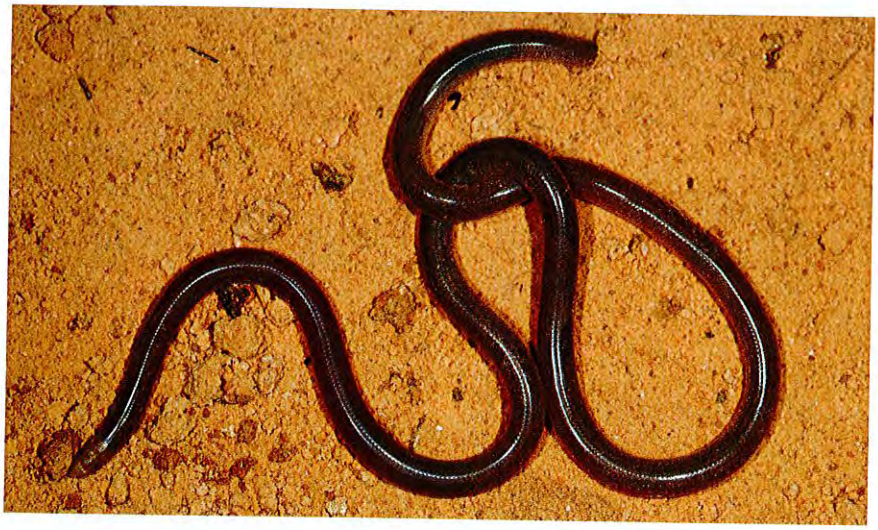
The survey greatly increased knowledge of the reserve's flora. More than 160 herbarium specimens were collected and the number of plant species known for the reserve almost doubled. The red sand dune vegetation showed the greatest species richness with *Grevillea*, *Hakea*, *Santalum*, *Daviesia*, *Jacksonia* and *Eremophila* species among the many recorded. Several new populations of priority two flora—Warburton starflower (*Calytrix warburtonensis*), undulate emu-bush (*Eremophila undulata*) and *Olearia arida*—were located (priority flora are species in need of further survey to evaluate their conservation status). *Microcorys macredieana*, which is listed as priority three, was also found and is a new record for the reserve. Seed from the undulate emu-bush, which has a very restricted distribution and is currently only known from a small area south of Neale Junction, was collected for DEC's Threatened Flora Seed Centre and the Millennium Seed Bank Project in the United Kingdom. The female members of the Spinifex People also shared their knowledge of bush-tucker and medicinal plants with the expedition's female participants on an exciting 'women's outing'.

Vertebrate animals

Bird surveys began at first light and lasted until a few hours after sunrise. A total of 100 minutes was spent at each survey site recording all the birds within, outside and flying over four two-hectare quadrats. Although bird abundances were sometimes low, the numerous incidental reports coming from enthusiastic *LANDSCOPE* expeditioners at morning and afternoon tea added significantly to the tally. Highlights were sightings of scarlet-chested parrots, striated grasswens on the dunes, regular fly-bys of Major

Mitchell's cockatoo at the camp and a stunning flock of 20 princess parrots.

Small terrestrial mammals, including four species of rodents and six species of small carnivorous (dasyurid) marsupials were trapped during the survey. Two of the dasyurids, the brush-tailed mulgara (*Dasycercus blythi*) and a species of false antechinus (*Pseudantechinus* sp.), had not been found previously in the reserve. Numerous sightings were made of other mammals such as kangaroos (three species), echidnas, camels, dingoes, foxes, cats and rabbits. Old nests of stick-nest rats were common in overhangs in the breakaways within the reserve, and one nest that was excavated yielded a jaw bone identified as that of the now-extinct lesser stick-nest rat (*Leporillus apicalis*). Bats were seen in caves in the breakaways. A trenching technique was used to investigate the likely presence of marsupial moles in the reserve. Moles spend much of their lives underground and, as they move through the sand, the tunnels they make are backfilled. By digging trenches (80 centimetres deep, 40 centimetres wide and 120 centimetres long) and allowing the sand to dry, the team discovered several tunnels considered to be made by these mysterious creatures. More tangible evidence for the presence of moles was obtained from the finding of hair and bone remains in the scats of mammalian predators such as dingoes, foxes and cats.



Surveying reptiles relied on a variety of methods including dry pitfall and funnel traps as well as foraging under logs and in leaf litter. When sighted, reptiles were captured by hand or sometimes with a noose on the end of a fishing rod. Spotlighting by driving along roads at night was also effective for sighting geckos and snakes. Finally, digging lizards out of their burrows was a popular activity undertaken by Aboriginal children despite being hard work. The rewards of an icy-pole or cool drink from the camp cook no doubt provided an incentive. A highlight of the survey included the discovery of the incredibly rare Margaret's blind snake (*Ramphotyphlops margaretae*). Before the survey, only a single individual was known to science—collected in the 1960s from Lake Throssell, 180 kilometres from Neale Junction. Other highlights included two new species of dragon lizards—a *Diporiphora* and a *Ctenophorus*—which survey participants Jane Melville (Museum Victoria) and Danielle Edwards (Australian National University and the CSIRO Australian National Wildlife Collection) will describe.

Amphibians were not forgotten. Australian deserts contain many species of burrowing frogs that can remain buried for years waiting for heavy rains before they emerge. Although heavy

Above Margaret's blind snake.
Photo – Stewart Ford

Below Identifying animals captured in pitfall traps.

Below right A false antechinus captured during the survey.
Photos – Karl Brennan/DEC

Right An entomologist pinning and setting the wings on butterflies and moths.
Photo – Wendy Minchin

Below background Yarldarlba (*Eucalyptus youngiana*).
Photo – Sarah Barrett/DEC

rain from thunderstorms fell during the April survey, it was not sufficient to entice frogs out of their burrows and they therefore remain under-sampled.

Invertebrate animals

Spiders, scorpions, pseudoscorpions and centipedes were collected from pitfall traps and by hand collecting, sifting leaf litter, peeling bark and tipping rocks. Fortuitously, a storm in April stimulated the dispersal of male trapdoor spiders, leading to the collection of about 20 specimens of an *Aganippe* species. Collecting a large number of live specimens of a single species ensured a good number for DNA sampling. Also of interest was a juvenile huntsman spider collected in April 2008 which was reared in captivity to an adult male in November. It was identified as *Heteropoda hermitis*, filling a gap in the distribution of this species, which extends from the Gascoyne and Pilbara coasts into the Northern Territory. Many more invertebrates collected during the surveys remain to be sorted and will no doubt lead to more interesting discoveries.

Moths and other nocturnal flying insects were attracted to a mercury vapour light suspended from a tree and collected as they alighted onto a white sheet hung below the light. During the October survey, more than 200 individual moths representing more than 90 species were collected during six nights. Many of the moth species were from the family Oecophoridae, whose larvae feed on leaf litter or dung and perform a vital role in recycling nutrients back into the soil. It is estimated that Australia has at least 20,000 moth species with fewer than half of these formally named and described.

Future management of NJNR

The biological survey at NJNR has given all parties a deeper understanding and appreciation of the fauna and flora of the reserve and, more generally, of the Great Victoria Desert. There is no doubt that the reserve's threatened fauna would benefit from feral cat and fox control. However, effective bait for cats is still experimental and the reserve's remoteness and vast size makes aerial distribution of cat baits extremely expensive. Reducing the number of feral camels is also needed to help protect species such as sandalwood and quandong from grazing. The control of feral camels is an active area of research within DEC. Flora and fauna will also benefit from an appropriate fire regime and DEC is implementing a carefully tailored burning program throughout the Great Victoria Desert.

Greater involvement of Aboriginal people from the Spinifex People in managing the reserve is anticipated. Finally, as the number of adventurous tourists visiting the reserve continues to increase, there will be a greater need to provide interpretative information and to manage local impacts such as cultural site disturbance, unrestricted vehicle access, firewood collection, and rubbish disposal in this special area.

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