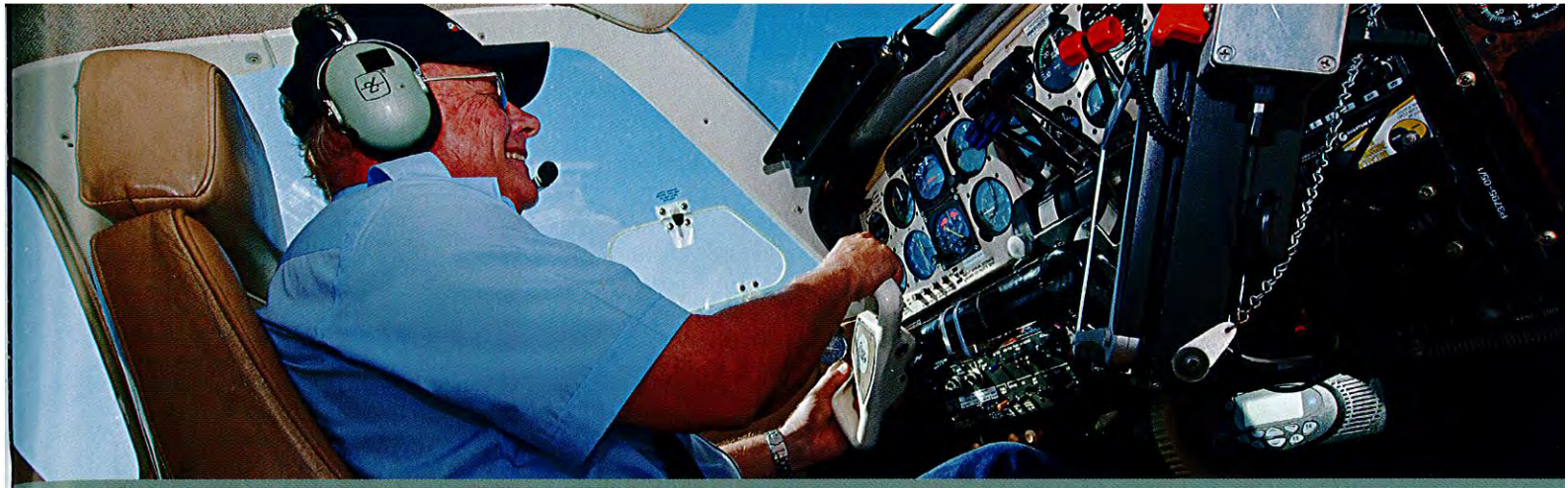


Western Shield: protecting our native fauna

Fifteen years on and the Department of Environment and Conservation's *Western Shield* fauna recovery program continues to defend Western Australia's most threatened native fauna on millions of hectares across the state.

by Ashley Millar, Keith Morris and John Asher

Western Shield, the Department of Environment and Conservation's (DEC's) flagship fauna conservation program, is one of the largest wildlife recovery programs undertaken in Australia. The program, which was started in 1996, has largely been built around the effective control of introduced predators such as the European red fox (*Vulpes vulpes*) and the feral cat (*Felis catus*) using 1080 poison meat baits across millions of hectares of Western Australia. This is conservation on a grand scale, significant for species at a state and national level.

Why the need for *Western Shield*?

During the past 100 years, native mammals have suffered severe decline in Australia. Our country accounts for one-third of all mammal extinctions on a global level since the seventeenth century. This represents the greatest extinction and decline of mammals in modern times anywhere in the world. At a state level, of the mammal species occurring in WA at the time of European settlement, 11 species are now extinct, six have disappeared from the mainland but remain on a few offshore islands, and more than 30 remain on the mainland but have declined significantly or are threatened with extinction.

In addition to habitat loss through activities such as land clearing, introduced predators such as the fox and feral cat have been identified as a main threatening process driving these extinctions and declining trends. Since their arrival, the fox and feral cat have played a significant role in the decimation of many native wildlife species. In Australia, the situation has been most noticeable among the medium-sized mammals fitting into what is described as the 'critical weight range'—35 to 5,500 grams—as these are the ones most at threat of predation. The impact of predation by foxes and feral cats has also been felt hard by other species groups including ground-nesting birds—such as malleefowl (*Leipoa ocellata*), western ground parrot (*Pezoporus wallicus flaviventris*) and noisy scrub-bird (*Atrichornis clamosus*)—and in some reptiles—such as the western swamp tortoise (*Pseudemydura umbrina*).

Something drastic needed to be done on a broad scale to defend our native animal species from this threat of predation and to arrest these declines.

The 1080 story

Much of the success of *Western Shield* stems from our ability to use the toxin sodium fluoroacetate, more commonly known as 1080 (pronounced 'ten-eighty'). 1080 is one of the most toxic substances known and was first synthesised in Belgium in 1896. During the 1940s, testing showed that it was extremely toxic to rabbits and rodents and, in 1953, 1080 was first used in WA for rabbit control. In the 1960s, it was discovered that many of the plants in the *Gastrolobium* genus occurring in the south-west of WA contained very high concentrations of fluoroacetic acid, the toxic component of the synthesised poison.

Previous page
Top Pilot Robin Wilcockson flying a light aircraft to drop baits.
Photo – Peter Nicholas/DEC
Bottom A numbat in the Dryandra Woodlands.
Photo – Carl Danzi

Above European red foxes are a major cause of the decline of critical weight range mammals, ground-nesting birds and some reptile species.
Photo – Dennis Sarson/Lochman Transparencies

Left Malleefowl populations in the greater southern region have been greatly affected by introduced predators.
Photo – Gary Bell/Oceanwide Images

Right DEC officer Ashley Millar with aerial baiting contractors Neville Garvey and Robin Wilcockson.
Photo – Peter Nicholas/DEC

Below right DEC officer Kim Bastian carrying out ground baiting of 1080 baits.
Photo – Rebecca Hayes/DEC

In the 1970s and 1980s, testing was undertaken on the tolerance of native fauna and it was found that many of the native fauna species in the south-west that co-evolved with the *Gastrolobium* plants exhibited a high tolerance to 1080. For example, the brushtail possum (*Trichosurus vulpecula*) from WA has a tolerance more than 150 times that of the same species of possum from eastern and central Australia. Even more impressive is the tolerance of many of our native fauna to 1080 in comparison with introduced species such as the fox and feral cat. This natural advantage has provided biodiversity conservation managers in WA with a unique weapon.

In the 1980s, following the discovery of 1080 tolerance in native species, fox control research trials were conducted in small wheatbelt reserves to protect the threatened black-flanked rock wallaby (*Petrogale lateralis lateralis*) (see 'A new threat posed by foxes', *LANDSCOPE*, Autumn 2012). These trials showed that the introduction of 1080 fox baiting increased the number of rock wallabies at these reserves. Then, in 1993, 1080 fox baits were trialled in a broadscale aerial baiting program as part of *Operation Foxglove* in the northern jarrah forest. Following the success of this program and the demonstration that the native carnivore, the chuditch (*Dasyurus geoffroii*), was not adversely affected, baiting was expanded to other parts of the state under the *Western Shield* program.

Species recovery and landscape-scale reconstruction

The vision for *Western Shield* has been to reconstruct, as far as possible, the original vertebrate fauna within selected areas of WA, with a focus on threatened species. To achieve this, aerial and ground baiting was started in 1996 on a large scale across some 2.6 million hectares of conservation estate in the south-west of WA.

Sites for baiting were selected to maximise the recovery of threatened fauna. These included fauna recovery sites where a single key species was targeted, and fauna reconstruction sites where a suite of fauna could be re-built over time, providing multiple-species conservation benefits. These sites are primarily focused in the south-west forests but also extend east to recovery sites in the wheatbelt, to Cape Arid on the south coast and as far north as the Burrup Peninsula in the Pilbara. As the program progressed, sites in the arid zone have also been added—including the Lorna Glen former pastoral station—further extending the baiting program.

Baiting now occurs across more than 3.9 million hectares of DEC-managed lands, an area equivalent to more than half the size of Tasmania. The majority of the baiting across this vast area is undertaken using aircraft with baits laid at a rate of five per square kilometre or one every 20 hectares. Additionally, DEC staff hand bait along tracks and the perimeters of reconstruction sites to maximise the control of foxes and feral cats.

Monitoring to gauge success

Monitoring to assess fauna recovery is a key component of the program.

Top left Quendas were removed from the threatened species list in 2008.
Photo – Sallyanne Cousans

Centre left DEC staff carrying out health and disease monitoring of woylies.
Photo – Keith Morris/DEC

Below left Using a Sheffield trap to catch the critical weight range mammal species.
Photo – Sallyanne Cousans

Across the area baited under *Western Shield*, 36 monitoring sites are used to measure the presence and abundance of native species. Each year, DEC district staff set and check hundreds of Sheffield cage and Elliott traps across these sites, and in some cases pit traps are also used. Trap success rates—the simplest form of a population index using trapping data—have been the main measure for assessing relative abundance of fauna. More robust abundance sampling techniques are being developed for use in the future. Techniques to monitor the abundance and distribution of foxes and feral cats have also been developed out of a recent research program into the interactions between the introduced and native predators of our native fauna (see 'Fauna recovery in the wheatbelt', *LANDSCOPE*, Spring 2010).

In the early years of the program there was a demonstrable increase in the numbers of several native fauna species as a result of fox baiting. The declines of many species—including the quenda (*Isoodon obesulus fusciventer*), woylie (*Bettongia penicillata ogilbyi*) and tammar wallaby (*Macropus eugenii derbianus*)—were arrested leading to these species being removed from state and federal threatened fauna lists. These were impressive results. Through fox baiting, our native fauna were being protected from the threat of alien predators and were starting to recover (see 'Bouncing back', *LANDSCOPE*, Spring 1998).

However, by 2001, the monitoring indicated that some species were once again experiencing declines, most notably the woylie, which resulted in its re-listing on both state and federal threatened fauna lists (see 'Down but not out: solving the mystery of the woylie population crash', *LANDSCOPE*, Winter 2008). It was apparent there were other factors at play in the decline in many of our native species.

While these more recent declines have occurred, it has been encouraging that no further extinctions are known to have occurred among our unique mammal fauna. Furthermore, three of the four target species associated with *Western Shield* monitoring (brushtail possum, chuditch and quenda) persist at many of the fauna reconstruction sites.

The program operates within an adaptive management framework, and management practices have been reviewed and refined. This has included a revision of the monitoring techniques being used and the areas to be baited, and further research

Above Chuditch monitoring at Bindoon.
Photo – Christine Groom/DEC

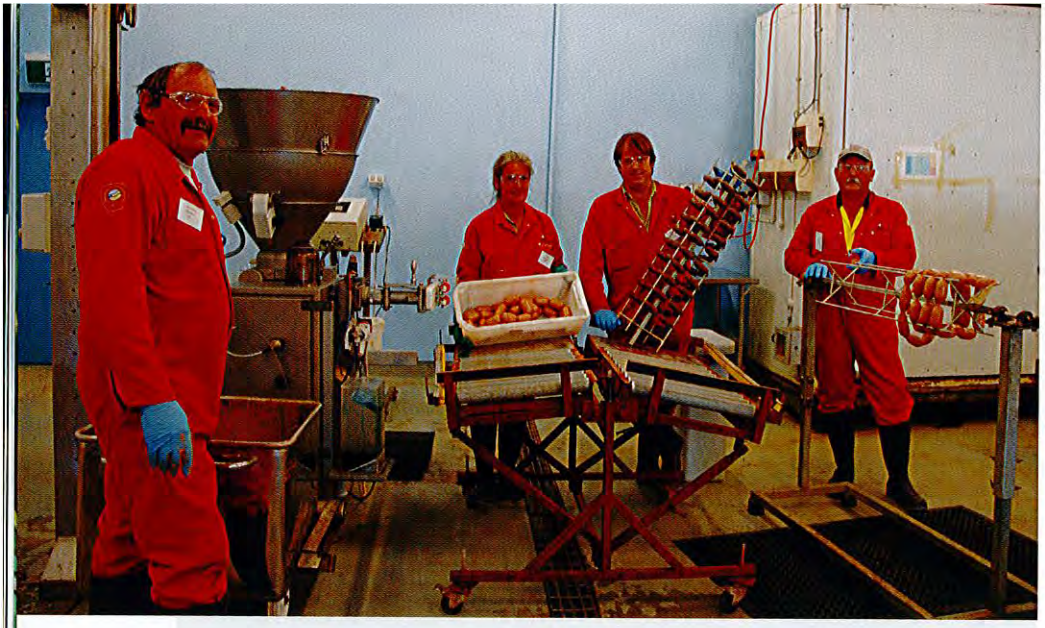
Left Golden bandicoot being monitored following a translocation to Lorna Glen in 2010.
Photo – DEC

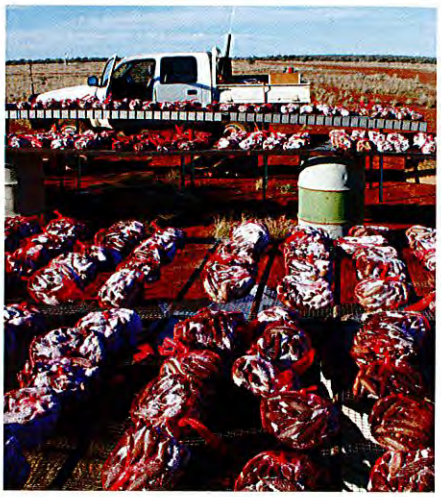
into the effectiveness of current fox baiting practices. Recent research undertaken by DEC in collaboration with the Invasive Animals Cooperative Research Centre has indicated that the feral cat is a significant predator of medium-sized mammals such as the woylie. This research also found that cat numbers may have increased following the reduction in fox numbers—a phenomenon known as mesopredator release—where a second order predator (the feral cat) becomes dominant once the top order predator (the fox) is reduced or removed. DEC has been developing a specific bait for feral cats during the past 10 years and has used it to eradicate feral cats from islands. However, issues surrounding the effect on non-target species and efficacy in cat control still need to be resolved before the cat bait can be used extensively in mainland situations, particularly in the south-west.

In some semi-arid and arid areas of WA where risks to non-target species are not an issue, cat control using baiting has been undertaken to assist in DEC's fauna reconstruction efforts. One of these areas is Lorna Glen, about 160 kilometres north-east of Wiluna. This former pastoral property was acquired by the government in 2000 for conservation purposes, and is now managed jointly with the traditional owners. The 244,000-hectare area, together with the adjacent Earaheedy former pastoral lease, has been destocked, and artificial water sources have been turned off.

At Lorna Glen, feral cat control through annual aerial baiting has been carried out since 2005 and feral cat numbers have been reduced by about 70 per cent. This has enabled DEC to trial reintroductions of some of the 11 species of medium-sized native mammals that once occurred in this area. In 2007, bilbies and brushtail possums were successfully reintroduced to Lorna Glen (see 'The great bilby muster' on page 6). In 2010, golden bandicoots (*Isoodon auratus*) and boodies from Barrow Island were reintroduced into an 1,100-hectare feral cat-proof fenced enclosure as part of the Gorgon Gas Development offset fauna translocation program (see 'Giant steps: industry and conservation make history through Gorgon', *LANDSCOPE*, Winter 2010). In 2011, rufous hare-wallabies, also known as mala (*Lagorchestes hirsutus hirsutus*), and Shark Bay mice (*Pseudomys fieldi*) were reintroduced into the enclosure from the Montebello Islands.

In 2012, there are plans to release golden bandicoots to areas outside the fenced enclosure. The aim of these reintroductions is not only to improve the conservation status of these threatened species, but to reinstate the ecological processes that digging mammals provided to the rangelands—such as improved water penetration of the soil, the facilitation of soil carbon and nitrogen recycling and the promotion of seed germination.





Above left Greg Johnston, Erin Davis, Dave Hawke and Mick Chambers at the Harvey Bait Manufacture Facility.
Photo – Joanna Moore/DEC

Above right Packaged Eradicat 1080 bait® ready for distribution via aircraft.

Below left Dan Biddulph releasing a numbat at Cocanarup Nature Reserve.
Photos – DEC

Bait development and research

The Department of Environment and Conservation developed its own baits and manufactures these products at the Harvey Bait Manufacture Facility. The two main products used as part of the baiting program are the Probait 1080 Foxbait® and Eradicat 1080 cat bait®. More than 800,000 fox and 300,000 cat baits are manufactured and distributed each year as part of the *Western Shield* program.

Over the life of *Western Shield* there have been significant advances in the research and development of bait products. Advances in bait type and delivery of bait into the field are continuing to be explored to ensure baiting can be as effective and efficient as possible, both in targeting the pests and in minimising the risks to pets and native species.

Captive breeding and translocations

In order to give native fauna populations a helping hand, some species have been bred in captivity and then translocated to fauna reconstruction sites. This has been to either re-establish new populations or to provide more individuals at a site to promote recovery of existing populations.

DEC established two captive breeding centres—the Peron Captive Breeding Centre in Shark Bay and the *Return to Dryandra* facility near Narrogin. More than 2,000 individuals of 14 threatened fauna species have been bred at these and other captive breeding centres such as Perth Zoo and Kanyana Wildlife Rehabilitation Centre. Species bred include the chuditch, banded hare-wallaby (*Lagostrophus fasciatus*), rufous hare-wallaby (*Lagorchestes hirsutus*), bilby (*Macrotis lagotis*), boodie (*Bettongia lesuer lesuer*), numbat (*Myrmecobius fasciatus*), dibbler (*Parantechinus apicalis*) and western swamp tortoise.

Translocations also occur in wild-to-wild situations, where animals are taken directly from their natural environment and released at another site. As with releasing animals from captive breeding centres, these translocations may be to re-establish native animal populations where species were previously found, or to supplement existing populations and aid in ecological reconstruction. DEC follows international guidelines for fauna translocations to ensure they are undertaken in a way that maximises success and ensures the welfare of the animals. Since 1996, more than 100 translocations of 28 different species have occurred through *Western Shield* and associated fauna recovery programs involving many DEC staff, volunteers and resources (see 'New island home', *LANDSCOPE*, Summer 2010–11).

Right Bilbies have been a focal species for captive breeding at Peron Captive Breeding Centre and the *Return to Dryandra* facility.
Photo – Jiri Lochman

Centre right DEC officer Chris Vellios radio tracking western ringtail and brushtail possums in jarrah forest in Perup Nature Reserve.

Below right DEC volunteer Anita Barnett releasing a brushtail possum.
Photos – DEC

While not all translocations have been successful, many valuable lessons have been learnt. We know that current fox baiting programs reduce fox abundance by about 80 per cent and feral cat baiting reduces populations by up to 70 per cent. This appears to be adequate for the recovery of some species such as the chuditch and brushtail possum. However, in some places it may be necessary to completely eradicate foxes and feral cats before any predator-naïve species—such as the rufous hare-wallaby or greater stick-nest rat (*Leporillus conditor*)—can be re-established. Current research is examining the desirable genetic composition and behavioural traits of founder animals, as well as whether disease is an important factor in translocation success. Captive breeding and translocations have played a key role in re-establishing and recovering some native species in areas where they have become locally extinct or threatened with extinction due to threatening processes such as predation by foxes and feral cats.

Community, education and partnerships

A key aim of the *Western Shield* program is to raise community awareness, of the plight of many of our native fauna species. With greater awareness people are more likely to take action and to support measures that promote species conservation. DEC's *EcoEducation* program—which provides opportunities for students to take part in nature-based learning on biodiversity conservation—plays a significant role in achieving this aim. Through *EcoEducation*, a number of fauna conservation-based activities and

Top DEC officer Matt Harding with an *EcoEducation* student preparing to measure a possum.
Photo - DEC

Below Ready for re-release—a western ringtail possum.
Photo - Adrian Wayne/DEC

teacher resources have been developed for primary and secondary school students. These have been used to convey the *Western Shield* message to an estimated 170,000 WA students, teachers and accompanying adults since the program started.

Western Shield has been greatly assisted through the support of corporate sponsors. Since its inception, more than $4 million has been provided to assist with the program's delivery. Sponsors include Cable Sands, Westralian Sands/Iluka, Alcoa World Alumina Australia, BHP Billiton Worsley Alumina Pty Ltd, Tiwest Joint Venture, BHP Billiton, Tectonic Resources NL, Western Areas NL and First Quantum Minerals (Ravensthorpe Nickel Operations). In addition, DEC has partnered with the Department of Defence to deliver fox baiting and native species monitoring across adjoining lands associated with the *Western Shield* program.

Future directions

Western Shield has been operating for more than 15 years. The program's initial successes have been tempered with some further declines; however, the reasons for these are being unravelled. Species such as the chuditch and quenda continue to recover at a number of reconstruction sites but others, such as the numbat, Gilbert's potoroo (*Potorous gilbertii*) and western ground parrot, are still precariously placed. The challenge now is to ensure that populations of our unique fauna most at risk from introduced predators are secured for the future, and that the additional potential threats—such as climate change in the south-west, or cane toad invasion in the Kimberley—are managed appropriately. A review of the program and its delivery is currently underway to determine what model can be employed to rise to this challenge in the best way possible with available resources.

Looking forward to the next 15 years, a number of future developments will maintain our efforts to conserve native fauna. These include registration of a feral cat bait and the expansion of cat baiting in the south-west, further arid and tropical zone fauna reconstructions, examination of the role of fenced enclosures in mainland fauna conservation, and active monitoring of introduced predator species across fauna reconstruction sites.

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