
Perup

The woylie is in trouble, but a 423-hectare fenced enclosure at Perup is helping safeguard the native marsupial, which has experienced a staggering population decline in the wild. Woylies are now successfully breeding in Perup Sanctuary, providing new hope.

by Adrian Wayne

Sanctuary

INSURING WOYLIES AGAINST EXTINCTION

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Main Perup forest.
Photo – Marie Lochman
Inset left A juvenile woylie.
Inset right Department staff and volunteers line up to herd out kangaroos, wallabies and emus.
Photos – Adrian Wayne/DPaW

Above left A pair of woylies foraging for food.

Top A woylie carrying nest material.

Above A woylie nest.
Photos – Jiri Lochman

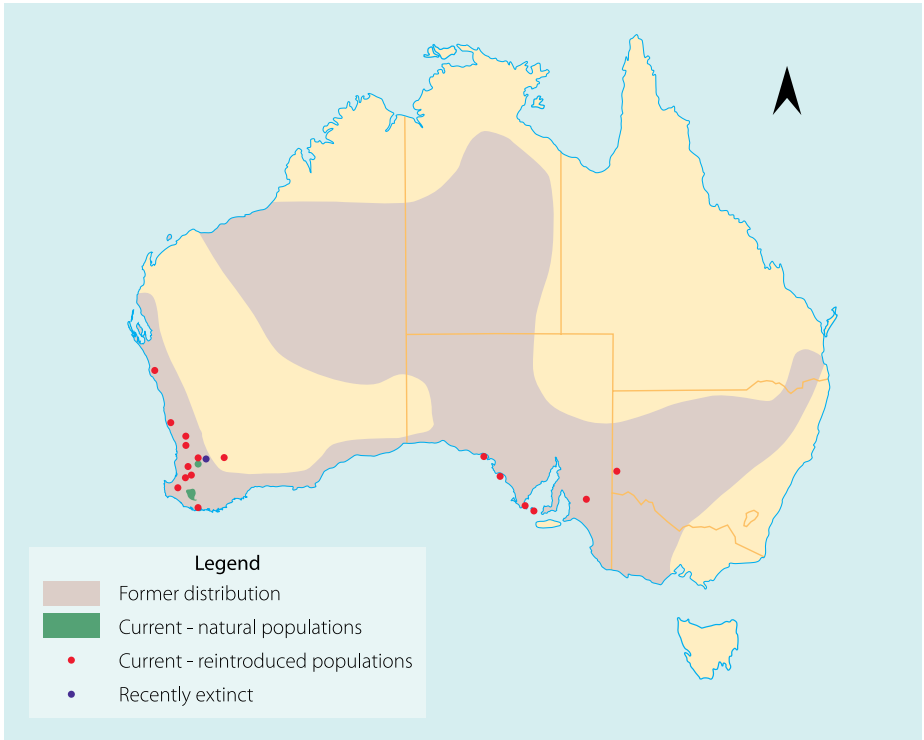
In 2010 the situation was dire: woylie (*Bettongia penicillata*), or brush-tailed bettong, populations had crashed by about 90 per cent in just seven years. In one of just three areas where natural woylie populations had persisted, Tutanning, the population was disappearing altogether. By 2011 it was gone. While scientists worked hard to determine the cause for the decline, something had to be done to protect the remaining populations. And it had to be done fast. Enter Perup Sanctuary. The then Department of Environment and Conservation (DEC) opened this 423-hectare predator-free enclosure in December 2010 to provide an 'insurance population' of woylies should the worst-case scenario happen: the total extinction of woylies in the wild. In just three years, Perup Sanctuary has experienced a 1,000 per cent return on investment as the insurance population grows from strength to strength. While buying valuable time to work out what had gone wrong in the woylie world, this population is now being used to help kick start the recovery of populations in the wild.

A POPULATION IN FLUX

Woylies once covered more than half of Australia but, due to land clearing and introduced predators, by the 1960s they were numbered in the hundreds, restricted to just three areas in south-west Western Australia—Dryandra, Tutanning and Upper Warren. By the 1970s some populations had started to increase in response to fox control and woylie translocations—a trend that escalated with the launch of the department's *Western Shield* fauna recovery campaign in 1996, which targeted foxes and resulted in more woylie translocations. Such was the success of this work that the woylie was de-listed from state and commonwealth threatened species lists in 1996—the first Australian species to be de-listed due to the success of conservation efforts. By 2000 there were about 200,000 woylies in the wild but the largest and most important woylie populations were starting to rapidly decline. Such was the extent of the decline that in 2008 the woylie was re-listed as critically endangered (see 'Down but not out: solving the mystery of the woylie population crash', *LANDSCOPE*, Winter 2008).

WHAT WENT WRONG?

Efforts are still underway to work out what caused the more recent population decline, which appears to be different to past decreases. By understanding the causes, conservation managers can directly target the problem to help conserve the species now and in the long term. So far it is clear that predation, particularly by feral cats (*Felis catus*) but also the European red fox (*Vulpes vulpes*), has had a major role in the recent decline of the woylie. But woylies also appear to have become more vulnerable to predation due to other critical factors, probably some form of disease yet to be verified. Evidence of this includes a strong pattern for the woylie decline in the Upper Warren over space and time, in which something, possibly a disease, is initiating the population crash at one point and then spreading out like a wave to impact neighbouring areas at a rate of about four kilometres a year. Characteristic changes in the demographics of the woylie population associated with the decline include a deterioration in skin and fur condition, elevated immune system responses and more woylies



"While scientists worked hard to determine the cause for the decline, something had to be done to protect the remaining populations. And it had to be done fast. Enter Perup Sanctuary."

were being infected with parasites and the parasitic infection levels were also higher.

BUILDING A SAFE-HAVEN

The 423-hectare Perup Sanctuary is located within Tone-Perup Nature Reserve, 40 kilometres from and between Manjimup and Boyup Brook. Work to build the enclosure began in 2009 with the construction of an 8.5-kilometre fully enclosed electric fence using 1,700 2.4-metre galvanised star pickets with 33 kilometres of netting and 52 kilometres of standard tensile wire.

In September 2010, before the four corners of the fence were closed, 180 volunteers and department staff mustered out the kangaroos, wallabies and emus by walking from one end of the sanctuary to the other (2.5 kilometres) and back again, in a coordinated line of people spaced 10 metres apart and spanning the full width (1.5 kilometres) of the sanctuary. This was necessary to prevent entrapping these wide-ranging species and avoid any potential future management problems, including a build-up of their numbers inside the sanctuary.

DPaW staff then had to ensure the enclosure was free from cats and foxes using a combination of targeted baiting, trapping, sand track surveys, remote sensor camera surveillance and active searches. The only two chuditch (*Dasyurus geoffroii*) trapped were also liberated from inside the sanctuary to immediately outside, because their home ranges are much bigger than the size of the sanctuary.

In early November 2010 the enclosure was complete and declared free from cats and foxes. Next began the task of translocating woylies to the safe-haven. In November and December 2010, 210 kilometres of transects across the Upper Warren region involving 1,050 trap points, each surveyed for four nights, resulted in 41 woylies (21 males and 20 females) being carefully selected to represent the genetic diversity across the Perup and Kingston populations. Thirteen additional woylies were also sourced from the Upper Warren to establish smaller captive colonies at Perth Zoo and Native Animal Rescue facility in Malaga.

The woylies in Perup Sanctuary survived in greater numbers in the first year after the translocation compared to woylies in the wild populations of the Upper Warren. Foxes and cats were responsible for most of the deaths outside Perup Sanctuary, whereas no predation was observed inside the sanctuary.

Monitoring in Perup Sanctuary by trapping has shown that at least 34 of the 41 original founders released by December 2010 were still alive in 2013. All adult female woylies captured have been breeding and one female has been repeatedly observed with twin pouch young, which is extremely rare. While woylie numbers have grown strongly in Perup Sanctuary, the capture rates of wild woylies in the Upper Warren have remained very low.

Recent research, led by Carlo Pacioni at Murdoch University, has shown that the genetic diversity of the remaining natural wild populations of woylies was still high at the time of the decline, and that the differences observed between these populations was the result of recent fragmentation due to modern human-induced land-clearing and habitat change. Historically, woylies throughout the southern half of Western Australia belonged to one large interconnected population. This genetic research has helped guide plans to help conserve the woylie population as a whole, rather than as separate populations in isolation. To increase the genetic diversity of the insurance population in Perup Sanctuary and thus better reflect the genetic diversity of the species as a whole, another 36 woylies (23 males, 13 females) from Dryandra were introduced to Perup Sanctuary in July 2013. The independent offspring from the last remaining six woylies from Tutanning, being bred in captivity at Kanyana Wildlife Rehabilitation Centre, also have been released into Perup Sanctuary; two in August and three in October 2013. More young woylies from Tutanning parents will be released as they become available. Remote sensor cameras and cage trapping will continue to monitor their progress in Perup Sanctuary.

WHAT HAVE WE GAINED?

The number of woylies in Perup Sanctuary has grown from an initial 41 to more than 400 woylies in the first three years. In the next couple of years the numbers could double again until the woylies reach their natural carrying capacity, at

Above A woylie in Perup Sanctuary.
Photo – Sallyanne Cousans

Right Perup woodlands.
Photo – Bron Anderson/DPaW

which time their numbers are expected to stabilise as they have done elsewhere such as at Karakamia Sanctuary (see 'Karakamia Sanctuary', *LANDSCOPE*, Summer 1997–98). The Perup colony will not only help conserve the woylies' genetic diversity to maximise its long-term prospects but it also provides a source for genetic augmentation of existing woylie populations and a source for translocations of woylies elsewhere, some of which have already occurred (see 'Kick starting wild population recovery, below).

In addition, the long-term and extensive monitoring involved in the program has provided an unrivalled resource for conservation managers and researchers. It indicates that, having declined by 95 per cent, woylie numbers in the Upper Warren have remained low but relatively stable since 2006. Subregional patterns are also evident. There are no signs yet of a population recovery in central Perup (including no woylies found in Yackelup since 2005), but potentially the beginnings of a modest recovery in southern Perup. There appears to be some recovery in northern Perup and, in Greater Kingston where the declines first began, the first and only substantial recovery was recorded. However, this recovery did not last, with the population later declining to new record lows.

The monitoring currently provides some of the strongest evidence available for and against the possible causes of the woylie decline and the barriers to a recovery. It represents an excellent resource to provide wildlife conservation managers with up-to-date information on population changes and potential issues. For instance, the monitoring has revealed that a drop in the breeding rates of female woylies coincides with the start of declines. Also, samples collected from woylies during the monitoring and examined by expert and student collaborators at universities and other institutions have helped to narrow the possible suspects at play in the declines. They have resulted in many discoveries new to science including new parasites, viruses, bacteria, a tick and several new native truffle (fungi) species.

KICK STARTING WILD POPULATION RECOVERY

Eighty-seven woylies (51 males and 36 females) were translocated from Perup Sanctuary to nearby Yendicup in July 2013. The translocation area was subject to weekly ground-based fox baiting for three months, beginning just before the release

Where to see woylies

You may see woylies in the Perup region by staying at Perup-Nature's Guesthouse in the heart of Tone-Perup Nature Reserve. Choose from a range of accommodation types and set out on one of the many walk trails at night with a spotlight in hand for a chance to observe woylies and other native animals in their natural habitat. For more information contact the Department of Parks and Wildlife's Donnelly District office on (08) 9776 1207 or email donnelly.district@dpaw.wa.gov.au.

You can also see woylies at Barna Mia animal sanctuary at Dryandra Woodland and Karakamia Sanctuary in Chidlow.

Top The 2013 monitoring team at Perup Sanctuary.

Above Releasing a woylie.
Photos – Adrian Wayne/DPaW

A collaborative effort

Many collaborations and partnerships have been involved with the woylie conservation actions in Perup Sanctuary and the Upper Warren region, most involving student projects and experts at Murdoch University, Perth Zoo and The University of Western Australia. Much of this work is focused on better understanding the nature of the woylie declines, the possible causes of these declines and the ecology and biology of the woylie relevant to its conservation and, in some cases, native wildlife more broadly.

Warren Catchments Council (WCC) has been a key partner, particularly in helping with invasive species control, woylie and predator monitoring and involving the community. Volunteers have also been a substantial and critical component to the successes of this project. The Caring for our Country federal government-funded components of this project alone, led by WCC, involved 159 individuals contributing an average 6.2 days each—a total of 984 days and 9,889 volunteer hours, worth at least $250,000 of labour. These calculations do not include the involvement of Bush Ranger cadets, primary, secondary and university student experiences, landholder involvement in vertebrate pest animal control, volunteers assisting at public information display booths at public events or the work of wildlife rehabilitators looking after orphaned young such as Leslie Harrison and Maroo Wildlife Refuge.

The Department of Parks and Wildlife and its predecessors, WA State NRM, the Caring for our Country federal government program and the Perth Zoo funded the establishment of the Perup Sanctuary. Other aspects of woylie conservation and research efforts have been funded by the Australian Research Council, South West Catchments Council, Wildlife Conservation Action, Australian Academy of Science, South Coast NRM, World Wildlife Fund, and the Environment Division of the United Nations Association of Australia (WA) Incorporated. Other collaborators include Kanyana Wildlife Rehabilitation Centre, Whiteman Park, Australian Wildlife Conservancy, South Australian Government Department of Environment, Water and Natural Resources, and the University of Adelaide.

of woylies into the area. Monitoring using 50 remote sensor cameras within a three-kilometre radius of the centre of the release site occurred for four months and follow-up monitoring by trapping continues. Early results indicate that many of the translocated woylies are doing well and the capture of many new individuals indicates that their numbers are growing significantly.

Provided the key threats to woylie populations can be reliably identified and managed, from now on Perup Sanctuary can provide a source of up to hundreds of woylies a year to help enrich the genetics and kick start the recovery of other existing woylie populations, establish new woylie populations and perhaps create other insurance populations across Australia if needed.

BIGGER PICTURE

As well as providing unrivalled data on woylie populations, the work at Perup Sanctuary has revealed much information about other species that occur there. Surveys indicate that at least 13 mammal, 19 reptile and 10 frog species are found in and immediately adjacent to Perup Sanctuary. The sanctuary provides refuge for many of these species that are also vulnerable to introduced predators. Ongoing monitoring inside Perup Sanctuary, in conjunction with monitoring at comparative sites on the outside, will help to understand what other effects a predator-free enclosure may have on the plants, animals and ecosystems within.

The strong increase in woylie numbers in Perup Sanctuary provides an opportunity to measure their actual breeding potential and survival in the absence of introduced predators, which helps population modelling—an important tool for managing the conservation and recovery of populations. It also demonstrates that, given a chance, woylies have an enormous capacity to recover strongly and that foxes and cats are likely to play a critical role in limiting the recovery of populations in the wild. Close monitoring of the numbers and health of the woylies will also help efforts to understand the possible roles of disease.

The monitoring and associated research across the Upper Warren region also provides insights into the biology and ecology of several other native mammal species. For example, we now have a clearer understanding of broader and recent patterns of population changes in other animals including similar rates and magnitudes of decline that occurred before the woylie, including the wambenger, or brush-tailed phascogale (*Phascogale tapoatafa* ssp. WAM M434); dunnarts (*Sminthopsis* spp.); quenda, or southern brown bandicoot (*Isoodon obesulus fusciventer*); and ngwayir or western ringtail possum (*Pseudocheirus occidentalis*); and the subsequent substantial increases in koomal, or common brushtail possum (*Trichosurus vulpecula hypoleucus*) and chuditch.

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