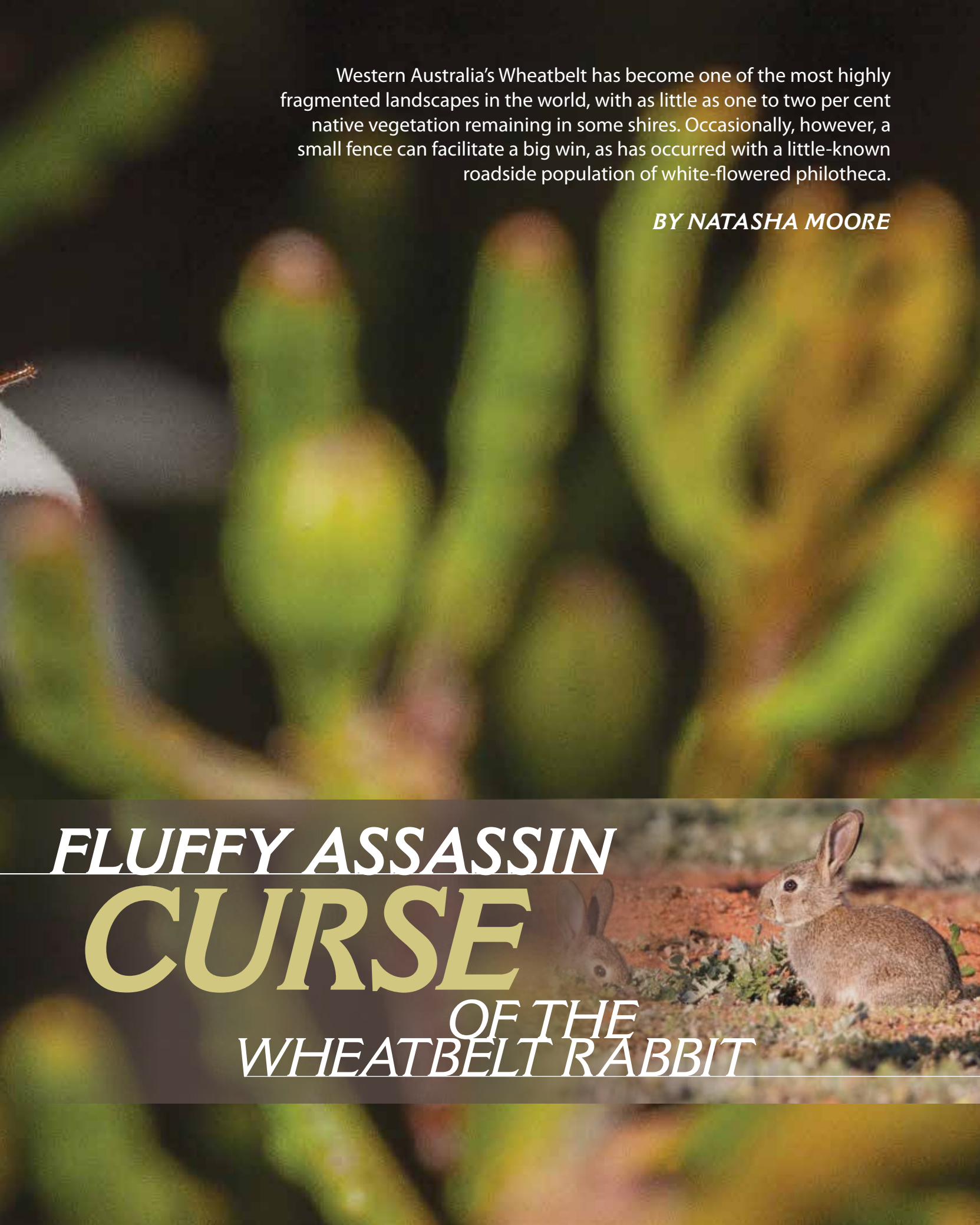
Western Australia's Wheatbelt has become one of the most highly fragmented landscapes in the world, with as little as one to two per cent native vegetation remaining in some shires. Occasionally, however, a small fence can facilitate a big win, as has occurred with a little-known roadside population of white-flowered philotheca.

BY NATASHA MOORE

FLUFFY ASSASSIN CURSE OF THE WHEATBELT RABBIT



Introduced rabbits have committed untold environmental damage to our country. Their impact is highly conspicuous, especially in sandy areas, but their effects can be subtle too – often it's the small things missing from the landscape that can indicate something insidious is happening.

A patch of bush in the central Wheatbelt with large established trees and a beautiful array of shrubs with a carpet of spring annuals may look healthy. However, without seedlings or young plants, it could indicate rabbits are feasting on the new growth and encouraging weeds – derailing the efforts of plants to repopulate. Either way, few people pay any attention when they see a rabbit in the wild, and it's not uncommon to see them bounding through paddocks or along roadsides. Perhaps this would be different if people realised the damage being inflicted on our unique Australian landscape. Thankfully, many plants of the central Wheatbelt, even those in isolated bush fragments living in an unpredictable climate, have regenerative powers to restore areas to their natural state if given time and protection from this furred assassin.

AN INNOCENT VICTIM

The white-flowered philotheca (*Philotheca basistyla*) is restricted to two small roadside populations between Kellerberrin and Trayning, in the central Wheatbelt. These plants can be found growing underneath or below other taller shrubs and trees in dense scrub heath vegetation on deep yellow sand. These areas were largely cleared for agriculture during the 1960s and are a favoured area for the burrowing rabbits. The philotheca has been slowly declining in number every year since its discovery in 1990. The total population in 2009 was thought to be just 20 mature plants from one roadside community, with many showing signs of senescence, and plants at another site presumed to have become extinct. Conservation officers estimated that at that rate of decline, and with no intervention, the species would be extinct in five to eight years.

In the five years earlier, conservation officers scoured nearly 40km of roadsides and more than 500ha of remnant vegetation in search of white-flowered philotheca plants. During the survey several sites were identified as potential habitat and, where possible, searches are still carried out in these areas – just in case a plant germinates.

While there is still a small amount of habitat left for this species on private remnants and a few roadsides, the plants seem to be unable to recruit seedlings under current conditions. In an effort to determine why this might be, conservation officers carried out small patch burns in autumn 2009 in an area adjacent to one of the populations. Slightly lower-than-average winter and spring rainfall led to a late germination of other seedlings in the plots but philothecas were not seen. Then in 2011 a burn was carried out in a location where they were known to have grown previously in the hope that seeds stored in the soil would still be viable and would germinate successfully and continue to maturity. Although there was good germination of other plant species, only one philotheca seedling eventually germinated in 2013. It struggled to thrive in the following unseasonal conditions but looks as though it might flower later this year.

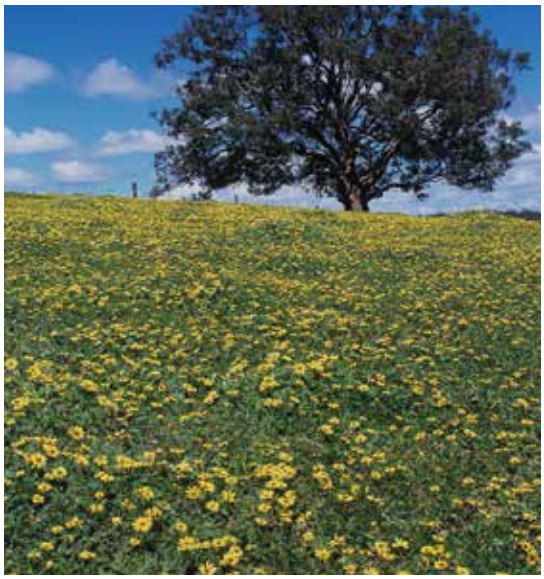
A TWIST IN THE TALE

The defining moment in this story occurred in November 2010 when Commonwealth *Caring for Our Country* funds were used to construct a rabbit-proof fence around the largest known remaining population of white-flowered philothecas. While the fenced conservation area is only 2ha, the fence has proven extremely worthwhile and has highlighted the amount of vegetation that rabbits can consume in our landscape.

Excluding rabbits from the site also enables the effective control of weeds in the area, mostly ice plant (*Mesembryanthemum crystallinum*) and

Previous page
Main An ant on a white-flowered philotheca.
Photo – Hayden Cannon/Parks and Wildlife
Inset Rabbits are commonly seen throughout Australia.
Photo – Sallyanne Cousans

Above The impact of rabbits can be seen across the landscape.
Photo – Jiri Lochman



"Rabbit diggings and dung heaps contribute to new weed infestations in the bush as they create nutrient-rich sites that encourage germination of weeds."

cape weed (*Arctotheca calendula*). Rabbit diggings and dung heaps contribute to new weed infestations in the bush as they create nutrient-rich sites that encourage germination of weeds. It is especially important to control ice plant in these sensitive sites since it accumulates salt throughout its short life, in a gradient from the roots to the shoots, with the highest concentration stored in epidermal bladder cells on its leaves – giving the plant its glistening appearance. The plant then releases salt into the soil when it dies at the end of summer, creating an increasingly hostile environment that stunts or halts the growth of other, non-salt-tolerant species while enabling ice plant seeds to germinate.

A HAPPY ENDING?

In the four years since the fence was erected and weed control undertaken, many species have germinated from seed and grown steadily into mature plants. It wasn't until the fence had been up for two years that philotheca seedlings were

Top left Cape weed is one of the weed species that impacts most patches of remnant vegetation in the Wheatbelt.
Photo – Len Stewart/Lochman Transparencies

Top Clearing for agriculture has presented challenges for native species.
Photo – Marie Lochman

Above left Fencing against rabbits also prevented ice plant growing in the area.
Photo – Jiri Lochman

Above Rabbit burrows decimate areas of natural vegetation.
Photo – Ann Storrie

Above The tiny flower of the white-flowered philotheca.
Photo – Hayden Cannon/Parks and Wildlife

Above right Plants are being grown in a glasshouse in the hope they can transplanted into the wild.
Photo – Eric Bunn

Right Recruitment burn trial.
Photo – Ben Lullfitz/Parks and Wildlife

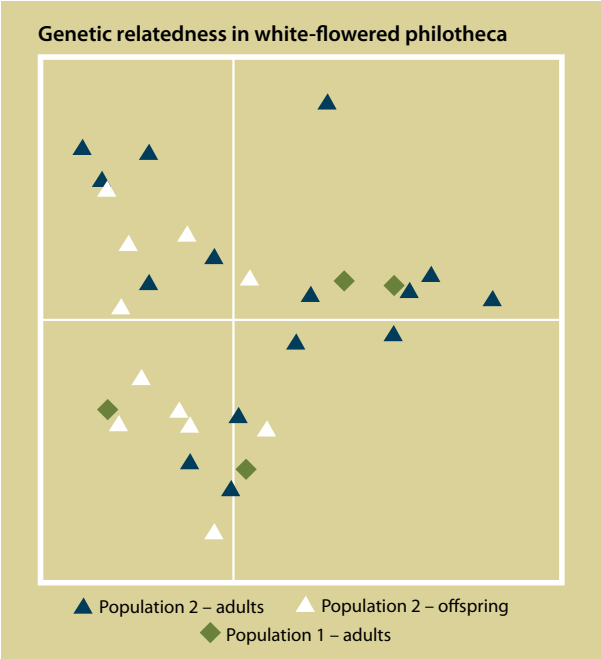
Opposite page
Right The fence has provided protection from rabbits and reduced weed spread.
Photo – Sallyanne Cousans

observed and in an unexpected high density. So far, more than 90 seedlings have been counted and more are found with each visit. The population is now thought to number about 120 plants. Now, thanks to little more than the installation of a small fence and the removal of rabbits, this species is moving towards recovery and a sustainable population. This result suggests that philotheca plants were always recruiting new seedlings but the rabbits were eating them as fast as they appeared.

The other nearby population, thought to be extinct, has also experienced some good fortune. Although this area could not be fenced, routine rabbit control has been carried out in the adjoining private properties since 2009. It seems that this has been enough to enable the recruitment of five new philotheca plants in some of the thickest vegetation.

JOINING FORCES – A NEW PARTNERSHIP

In another development, in December 2010, the newly fenced population of philothecas appeared to be dying. The greenness had vanished from the leaves and they began to look parched and yellow. Concerned about losing the species, Dr Eric Bunn from the Botanic Gardens and Parks Authority was invited to collect small amounts of shoot material from all the remaining live plants. This material has formed the basis of a cryogenic-stored population that will be used for future restoration and translocation projects. Given the sharp decline in the health of the remaining live plants, very low seed set and poor season, this step was a critical safeguard for the species.



Above figure This graph shows the pattern of genetic variability within and between populations of white-flowered philotheca. Each point on the graph represents an individual plant; plants plotted close together are genetically similar, while plants further apart on the graph are less closely related.
Produced by Janet Anthony

Current status

Understanding the genetics of rare plants is often an important part of their conservation. In the case of white-flowered philotheca, genetic fingerprinting studies have been conducted to assess the amount of genetic diversity in the adult plants and seedlings. These studies show that there is a high amount of genetic diversity among adults within each population, and little difference between the two populations, at least with the plants tested so far. Seedlings appear to be more closely related to each other than the adults are, probably because the populations have declined since the current adults were seedlings. One of the new seedlings germinated showed new genetic patterns not associated with the current adults, indicating that it is descended from parents that have since died. Seedlings like this one are particularly important to propagate via tissue culture, as they represent important genetic diversity for the species.

The relative lack of genetic diversity in the seedlings examined so far highlights a common problem with rare plants that have declined to small populations. As numbers of plants decline, inbreeding increases, potentially resulting in progressive reduction of genetic variability, fitness and vigour in each succeeding generation. To counter this, it is important that as many adult plants as possible play a part in seed production. In addition, it is important to capture as much of the existing genetic variation of adult and seedling plants as possible via tissue culture and cryopreservation while plants are still alive. Once the genetic fingerprinting of white-flowered philotheca is completed, the most diverse genotypes can be focused on for plant production and translocation to create new populations or seed orchards.

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Several collections have been made since this event and, to date, Eric has managed to grow eight plants from *in vitro* propagation through to the glasshouse. The *in vitro* rooting trials have continued to improve with up to half establishing roots in one experiment (up from 23 per cent in previous trials). But conserving philothecas in the glasshouse is proving difficult and only a few plants have made it to soil as they have not thrived in the available soil mixes or conditions. Root induction (the process of the micro propagules or cuttings forming their own root systems while in tissue culture, allowing them to be potted out to grow into mature plants) is still variable and takes a long time. It usually takes about eight weeks or longer to occur, but further trials are underway to try to reduce the time taken to initiate roots and to improve rooting percentages. Currently micropropagated plantlets are being established in pots designed specifically for getting long-rooted plants to maximise survival under harsh conditions.

Even though these substantial steps have been taken to assist with the long-term survival of white-flowered philotheca, without continued research and investigations we may never fully understand its role in the ecosystem nor be able to effectively and efficiently recover this species in the wild. Well-managed targeted pest control programs are essential in protecting our native wildlife and for agricultural production.

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To find out more about rabbit control and the conservation methods used to protect threatened species contact your nearest Parks and Wildlife office or visit www.pestsmart.org.au.

To find out more about Dr Bunn and the flora conservation work conducted at the Botanic Gardens and Parks Authority visit www.bgpa.wa.gov.au.