A safe haven for threatened plants

Over the past few years, several of the south-west's most endangered plant species that normally inhabit the mountain tops of the Stirling Range National Park have found a new home just north of the Porongurup Range, near the southern coastal town of Albany.

by Anne Cochrane and Sarah Barrett

Southern Western Australia has a rich endemic flora that is highly threatened by habitat fragmentation, salinity and waterlogging, invasion by exotic pests and diseases, and climate change. The threats facing this floral diversity are increasing in type, severity and scale, demonstrated by the rising numbers of species threatened with extinction. In particular, dieback, which is caused by the pathogen *Phytophthora cinnamomi*, is a biological disaster that is wiping out many of the region's unique plants. Some species have suffered such dramatic declines in recent years and are so threatened in their natural habitat that they have been selected as candidates for a special recovery program. This recovery program includes the collection of seed for *ex situ* conservation, the use of vegetative propagation to create new living plants and the establishment of a seed orchard. Although *in situ* conservation of wild plants is considered the most essential component of a conservation program, it is sometimes not possible to adequately conserve natural communities jeopardised by high

impact threats such as encroaching disease. Many populations of threatened species require management intervention to prevent further declines. This is the story of one such intervention.

Mountain dryandra (*Dryandra montana*) and small-flowered snottygobble (*Persoonia micranthera*), both members of the banksia family, and Stirling Range beard-heath (*Leucopogon gnaphalioides*) from the heath family are found only in the Stirling Range National Park, on some of the highest peaks of the range. This region is one of the biodiversity hotspots of the world, and the national park supports some 1500 plant species, many of which are known from nowhere else in the world. All three species have been listed as critically endangered since the mid to late 1990s. Mountain dryandra, small-flowered snottygobble and Stirling Range beard-heath are highly susceptible to the effects of dieback. The three species are also vulnerable to short fire intervals due to long juvenile periods, and fires in both 1991 and 2000 contributed to their decline. Grazing by introduced rabbits and native quokkas has also adversely affected seedlings that regenerated after the 2000 fire. By late 2005, less than 50 mature plants of the mountain dryandra and only a few hundred plants of each of the small-flowered snottygobble and Stirling Range beard-heath remained in their natural habitat. Given their current status, the long-term prognosis for these plants in the wild is poor. Application of the fungicide Phosphite® is an effective short- to mid-term strategy for halting the advance of the killer disease, but establishment of new plants in a *Phytophthora*-free site is considered crucial to the long-term viability and recovery of all species.

Searching for land

'Critical habitat' for species is often as limiting as the biology of the species itself, and no sites suitable for translocation within the historical distribution of the species were found, due to the extent of disease infestation on the peaks of the Stirling Range. The site selected was therefore a

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Main Stirling Range National Park viewed from Toolbrunup Peak.
Photo – Marie Lochman

Top Mountain dryandra.
Photo – Sarah Barrett

Left Grazing by rabbits and some native animals, including quokkas, may threaten some plant species in Stirling Range National Park.
Photo – Jiri Lochman

Above Mountain dryandra growing in Stirling Range National Park.
Photo – Greg Freebury

Above right Small-flowered snottygobble ready for planting.

Right Planting the first mountain dryandra seedlings in the seed orchard in 2003.
Photos – Anne Cochrane

considerable distance from the natural populations, in an area considered 'safe' from disease. Several choices were available but, eventually, a remnant patch of revegetated bushland was selected on private property just north of Porongurup National Park. The site had well-drained gravelly loam soils, on a gentle north-facing slope, that were considered ideal for the seed orchard. Healthy adjacent vegetation should provide habitat for a range of pollinators as well as wind protection and some shade. In addition, the owner of the property has had extensive experience in restoration ecology and has been involved in seed collection and seed orcharding for many years. The landowner's presence on site would also allow for early detection and action if a wildfire was to threaten the new plants. The kind donation of the use of a portion of land for the threatened species seed orchard was gratefully accepted, with all parties recognising the benefits of such a partnership acting as an interim measure to prevent extinction of these three species.

Ex situ conservation of the mountain dryandra is currently limited to a small collection of less than 800 seeds in the Department of Conservation and Land Management's (CALM's) Threatened Flora Seed Centre, collected over the past decade. The aim of seed collection is to preserve the wild populations and, at the same time, represent them genetically. As the frequency and intensity of harvest can impact on wild population survival, a limited amount of seeds were taken on each visit. Low seed numbers, no success with tissue culture and very limited success with propagation of cuttings meant that only a few mountain dryandra plants could be placed in the seed orchard in the first year. The initial planting in 2003 therefore consisted of only 14 seedlings. More seeds were collected and germinated the following year and, in 2004, a further 90 mountain dryandra plants were added to the seed orchard. Unfortunately, no seeds had been collected from either the small-flowered snottygobble or the Stirling Range beard-heath, despite a number of attempts. Challenges in collecting seeds from these species included few reproductively mature plants, low seed production, grazing by vertebrates and invertebrates, abortion of flowers and fruit, and difficulty in accessing populations. The solution was to create plants using vegetative propagation techniques. Cuttings were collected from a range of different plants in 2003 and 2004 and given to the Botanic Garden and Parks Authority nursery staff for propagation. By 2005, approximately 100 plants from each of the small-flowered snottygobble and the Stirling Range beard-heath were available for planting.

Top left Stirling Range beard-heath.
Photo – Sarah Barrett

Above left Small-flowered snottygobble.
Photo – Ellen Hickman

Above Assistant conservation officer Renee Hartley plants a mountain dryandra seedling.
Photo – Sarah Barrett

Community involvement in planting

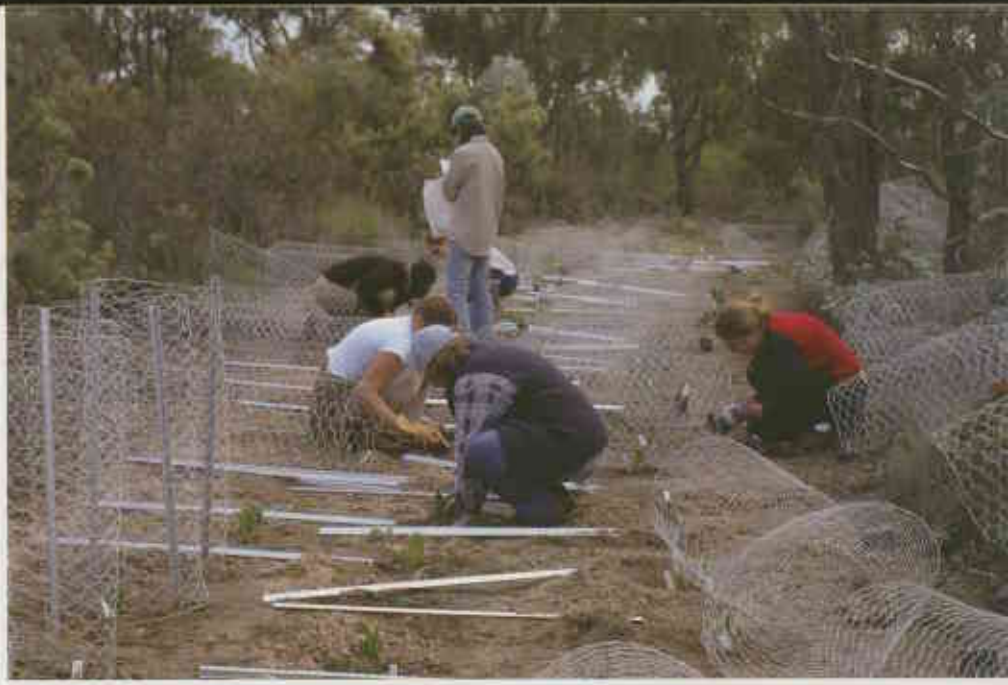
At the seed orchard site, the owner prepared the ground by deep-ripping the soil and preparing firebreaks. On the planting days, community volunteers and CALM staff, including translocation expert Leonie Monks, planted the seedlings and placed small cages of rabbit netting around each plant to prevent possible grazing by large herbivores. Each new plant was identified by a metal tag and some vital measurements were taken so that the progress of the plant's growth could be monitored in the future. Those involved in the planting days included members of the Albany Rare Flora Recovery Team (RFRT), which is coordinated by CALM Conservation Officer Sarah Barrett. The team meets twice yearly to ensure that recovery actions for threatened flora are in place that aim to conserve the region's unique floral diversity.

The initial plantings survived well over the summer of 2003–2004 with a small amount of hand watering proving the merits of good site selection. The landowner regularly monitors the progress of the plants and keeps CALM staff advised about their condition.

After a hot dry start to the 2004–2005 summer, it was decided to install irrigation at the site to facilitate watering on a fortnightly basis while avoiding watering in the heat of the day. Heavy invertebrate grazing by weevils, locusts and various caterpillar larvae also occurred in January 2005, and prompted the removal of invertebrates by hand. While the use of pesticides was considered, the plants weathered the insect infestation and, following record rains in April, produced healthy new growth to compensate for any defoliation. Fortunately, there have been no weed problems at the site due to the healthy nature of the remnant.

Despite drought, grazing and floods, there was a continued high survival rate after the second summer, and it appears that mountain dryandra can cope well under warmer and drier lowland conditions. The number of mountain dryandra plants in the seed orchard now represents a doubling of the known wild population. It remains to be seen how the other two species fare over the next year.

Ex situ cultivation of mountain dryandra, small-flowered snottygobble and Stirling Range beard-heath in a seed orchard should give us opportunities to maximise seed production and provide material for research into vegetative propagation, relieving pressure from the wild populations. Material from the seed orchard will be used in the future for research aimed at better understanding the unique and diverse flora of WA. With more material available, it is possible that research may be able to detect some resistance to dieback within populations of these species and develop this for future restocking of existing populations or reintroductions to the wild.



Right 'Caging' seedlings protects them from possible grazing.

Below right A caged mountain dryandra at the seed orchard.
Photos – Anne Cochrane

The site will be intensively managed, allowing for necessary research into reproductive biology, and may even involve pollination experiments to maximise seed production. Translocated populations will be monitored in conjunction with of the original populations to provide essential baseline data for assessing the performance of the new populations. This will include data on survival and growth, reproductive information, as well as general health of the plants. Strict dieback hygiene protocols are in place to ensure that the soil-borne pathogen *Phytophthora* is not introduced to the site. Access is restricted to dry soil conditions and foot baths containing methylated spirits are used on the property boundary to ensure that infected soil containing the pathogen spores is not inadvertently carried in on footwear. Fortunately, vehicle access is not required and this also decreases the risk of soil transfer. Monitoring visits will be kept to a minimum to further reduce the risk of spreading the disease.

A number of other Stirling Range plants are in a similar predicament to those discussed here, and it is likely that more critically endangered species will be introduced to the seed orchard site. An additional *ex situ* site will also be considered for the future and would provide even more security for these species.

Only time will tell

The growing significance of *ex situ* conservation to the recovery of plant species in southern WA is evident. Thinking laterally and considering a range of options for recovery should ensure species survival. The collection and conservation of seed supplies over time has allowed us to begin to understand our species, site and resource limitations and make alternative interim decisions (such as the need for vegetative propagation to create new plants) that give us a positive outcome. In essence, we have bought time. Only time will tell whether these mountain species will reproduce successfully in their new lowland home and provide the valuable sought-after seed. We anticipate that these young plants will flower much sooner than on the mountain tops. In their mountain homes, first flowering only begins some 10 years after fire for the mountain dryandra and the small-flowered snottygobble, due to the harsh environmental conditions they experience.

In May this year, the Albany RFRT met on site to assess the progress of the seed orchard plantings and to plan for future actions that can ensure the survival of these and other plant species in the wild. Community involvement in these types of conservation activities is vital, with dedicated volunteers helping to drive important conservation actions. Our *ex situ* efforts and our growing awareness of the issues faced should make a critical difference between extinction and survival for these three unique WA species.

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