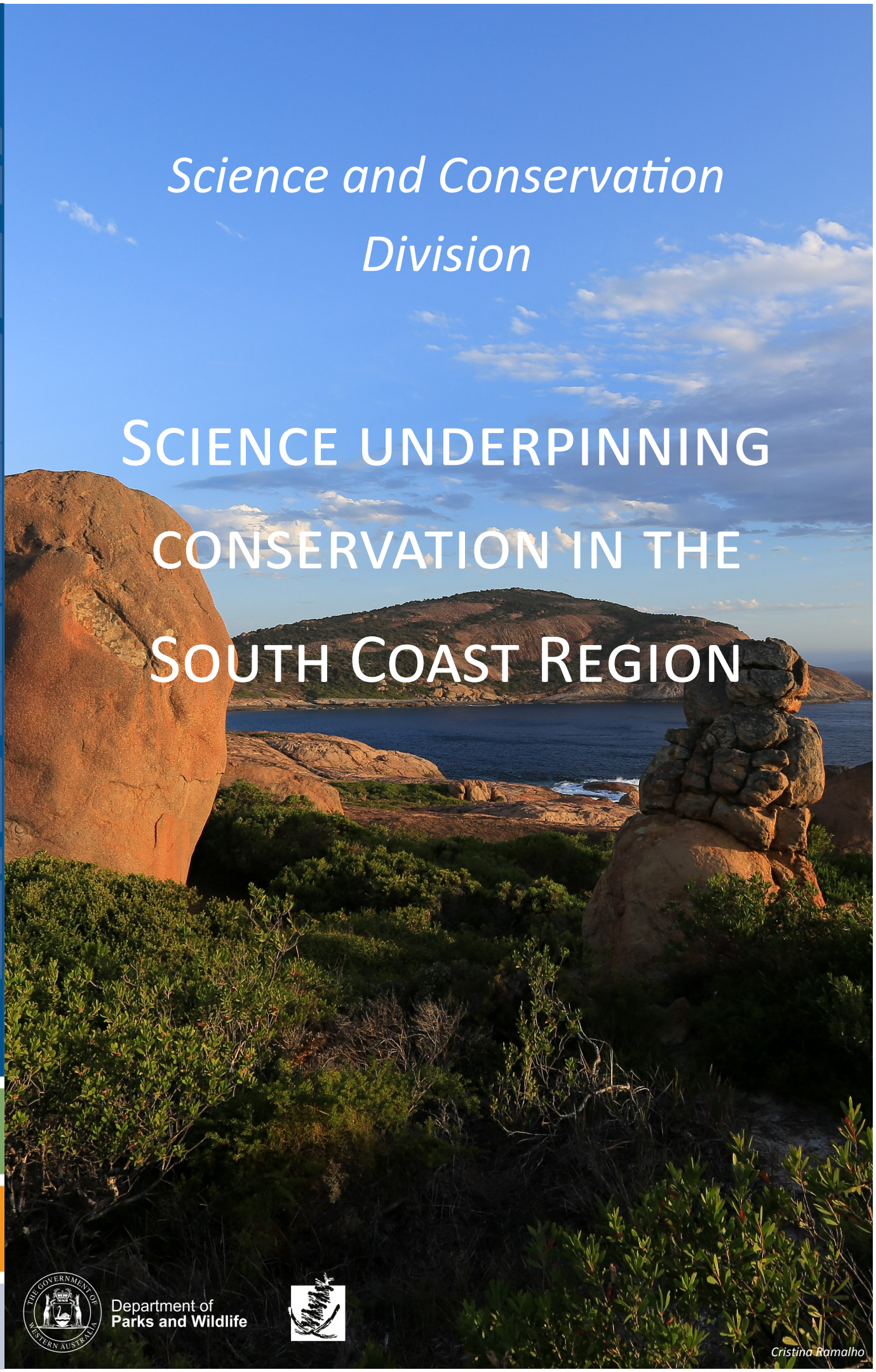
Science and Conservation Division

Science underpinning conservation in the South Coast Region



Department of Parks and Wildlife

Cristina Ramalho

FOREWARD

Effective communication of the outcomes of science is particularly important for ensuring the results inform conservation policy and wildlife, forest and parks management practice. Science undertaken in the Science and Conservation Division is carried out in collaboration with staff in the regions and our research partners, which include CSIRO, universities and industry. We highly value these partnerships, which deliver immense benefits in providing a scientific, evidence-based approach to conservation.

To facilitate communication with all regional staff we have produced a series of non-technical publications that describe the science we are undertaking in each of the regions of the Department. These 'Science in the Regions' publications capture a snapshot of current science activities that support wildlife, forest and parks management in each region, and are available on the website. Please contact any of our scientists if you would like more information on any of the topics described here.

Dr Margaret Byrne, Director, Science and Conservation Division

Sarah Barrett

On-site and off-site conservation actions for critically endangered communities

Understanding how fire regimes, weed invasion, grazing and disease interact to affect the population dynamics of the flora of threatened vegetation communities is critical for predicting the magnitude of current threats to these communities and for prioritizing management actions when resources are limited. Scientists and regional staff have been studying the recovery from fire of the critically endangered Eastern Stirling Range Montane Heath and Thicket community. This community is restricted to higher altitudes (over 750 m) within the eastern Stirling Range, and is contained within an area of less than 500 ha. Many of species endemic to this community are susceptible to *P. cinnamomi*.

A comparison of the data from long-term monitoring with historical sources has shown that dramatic changes have occurred in this community, due to the interactions between recent fire regimes and infestation with *Phytophthora cinnamomi*. The thicket community has become less diverse, yet still retains important conservation values. Maintaining these values into the future will require the treatment of *P. cinnamomi* with phosphite application and managing the intervals between fires. For the most threatened species, however, conservation off-site is necessary.

Seed collected from three extinct populations of the critically endangered *Banksia brownii* from the Stirling Ranges are currently being used in off-site translocation programs. The presence of dieback and rabbit grazing currently prevent translocation back into the Stirling Ranges. Scientists are investigating the genetic differences between the populations of *B. brownii* found in three distinct ecoregions—the Stirling Ranges, Millbrook/Cheyne Beach and the Vancouver Peninsula—to ensure that future translocation programs maintain optimum genetic diversity and population health in this species.

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Greg Freebury

Anne Cochrane

Improving the success of rare flora translocations

Translocating the seedlings of rare or threatened flora, either to increase the size of current populations or to establish new populations, is an important component in the recovery of such species. Scientists have been monitoring the translocation sites of over 60 plant species and have examined how on-site watering treatments and different seedling microhabitats influence seedling survival and growth.

For critically endangered *Banksia ionthocarpa* ssp. *ionthocarpa*, weekly automatic watering over summer led to increased survival and growth compared with seedlings watered manually once a month. Survival and growth were best in plots where all other vegetation had been removed. For *Acacia awestonia*, also critically endangered, watering treatments did not affect survival, but watered seedlings (either weekly or monthly) showed better growth than seedlings that were not watered. The potting medium that seedlings were grown in prior to translocation also influenced seedling health after translocation, with better growth of those seedlings established in potting mix rather than sand.

Such information on 'best-practice' watering protocols and choices of potting medium will ensure that translocations undertaken by both departmental staff and the broader community have the maximum chance of success.

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Beating cats to bolster birds

Scientists are collaborating with regional staff and the South Coast Threatened Birds Recovery Team to understand the conservation requirements of the critically endangered western ground parrot (*Pezoporus flaviventris*) and the vulnerable western bristlebird (*Dasyornis longirostris*). Habitat loss from too-frequent fire, in combination with predation from feral cats, are major threats to these ground-dwelling birds in the reserves in which their remaining populations persist. The team are investigating their nesting site requirements, response to fire and vulnerability to predation. A particular focus has been understanding the importance of careful assessment of habitat quality on likely translocation success.

Another essential component in securing the recovery of ground parrots and bristlebirds is reducing predation by feral cats. Any widespread control of cats requires an effective aerial baiting technique and the development of a toxin and bait medium that is suitable for feral cats. A state-wide project focussing on a range of climate zones is assessing how the timing of baiting, baiting intensity and baiting frequency influence the effectiveness of a baiting program. In Cape Arid National Park, western ground parrots and western bristlebirds have been monitored before and after cat baiting, and scientists are working to improve the effectiveness of the monitoring program by using audio recordings to identify birds. Significantly reducing cat numbers may allow both bird species to successfully reproduce in the wild.

This integrated and evidence-based approach to managing habitat and predators is essential if the western-ground parrot and western bristlebird are to be saved from extinction.

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Sarah Comer

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Minimizing the effects of plant pathogens

The continued spread of plant pathogens poses a significant threat to many rare and threatened plant species and restricted vegetation communities. Effective control of the spread of disease requires knowledge of which species are most susceptible and the efficacy of treatment and containment strategies. Researchers tested the susceptibility of rare and endangered flora to *Phytophthora cinnamomi* so that the management of those taxa at risk could be prioritised. Of the 501 taxa tested, the species that are sprouters are more likely to be resistant than those that are seeders. A range of responses was found within families: most taxa in the Fabaceae, Malvaceae and Poaceae were resistant; taxa in the Casuarinaceae were mainly resistant, but some taxa were susceptible to infection; and a few taxa in the Myrtaceae were susceptible. Taxa in the Proteaceae showed a range of responses from resistant to susceptible, and most of the taxa in the Ericaceae were susceptible. Mortality was lower in those taxa with higher concentrations of leaf phenolics, which suggested that pre-existing traits in some species may improve their resistance to the disease.

Scientists trialling the effectiveness of high-intensity phosphite application in *P. cinnamomi* disease centres in Fitzgerald River, Gull Rock and Stirling Range national parks have found that differences in plant community composition, soil properties, hydrology, topography and climate between sites leads to significant variation in *P. cinnamomi* epidemiology. Such information greatly improves our ability to predict the spread of *P. cinnamomi* and allows for the development of site-specific management of the disease. *P. cinnamomi* has been successfully eradicated from an infected site in Cape Arid National Park using *in situ* fumigation and vegetation destruction, while containment strategies used at Bell Track and Pabelup Drive in Fitzgerald River National Park have been effective in preventing further spread of the disease.

Scientists have also been investigating how future climate change is likely to affect the activity of canker fungi and how this will impact on members of the Proteaceae. An increase in the incidence and severity of canker was recorded in all of the 48 sites surveyed over a four-year period. Significant correlations between canker incidence in *Banksia baxteri* and temperature were found. Seven fungicides have been rated for effectiveness, and the two most promising are currently being trialled in the field with varying effectiveness. In an infected population of *B. verticilliata*, spraying with fungicide has reduced the impact of canker, yet in an infected population of *B. coccinea*, spraying has had no effect.

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High conservation values in the Ravensthorpe Range

Until recently, the plant diversity and conservation importance of the Ravensthorpe Range was poorly known, despite increasing pressure from mineral exploration. Floristic surveys have shown that—far from simply being a northern buffer—the conservation values of the range are similar to those of Fitzgerald River National Park. The Ravensthorpe Range supports a high number of both threatened and/or local endemic plant species, including a high concentration of short-range endemic taxa (taxa with a total range of less than 10,000 km^2). As with the vegetation on other banded iron formation and greenstone ranges of the Yilgarn Craton, floristic communities are closely associated with landform, geology and soil type.

The information from the floristic survey will improve conservation planning and the environmental review process for developments in the region.

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Christina Ramalho

Weed risk assessment

In areas affected by dryland salinity, farmers are often advised that perennial -based production systems, rather than traditional annual-cropping systems, may provide better environmental and economic benefits. The introduction of new perennial species is not without environmental risk—new species may become environmental weeds, they may hybridize with native species, or there may be gene flow from cultivated into natural populations.

In collaboration with the former Future Farm Industries CRC, scientists from the department have been conducting weed risk assessments and genetic risk assessments for all species developed for potential agricultural use, whether that species is native to Australia (but proposed to be used outside its natural range) or is introduced. Scientists determine the weed risk a species poses by assessing the area over which it could potentially grow, its ability to invade natural ecosystems, and its ability to alter ecosystem processes once it has established.

Assessment of genetic risk begins with a consideration of taxonomy, that is, is a potential agricultural species taxonomically related to native species in the area? If there is a relationship, and therefore the potential for hybridization, the likely biological management of the agricultural species is then assessed. For example, mallee species grown as biofuels can be harvested before reaching maturity and flowering. Finally, a geographic assessment is made, in terms of the size of the planting site, its location in relation to natural stands of related species, and the vulnerability of those populations to potential genetic contamination. Once these assessments have been made, information is distributed to as wide an audience as possible to help reduce environmental and genetic risks.

Preventing the establishment of new ecological and agricultural weeds through the weed risk assessment process is more efficient and cost-effective than undertaking the difficult 'cure' of eradicating weed populations in the future.

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Viki Cramer

Photo courtesy of Gilbert's Potoroo Action Group/Dick Walker

Gilbert's potoroo recovery

Ongoing monitoring of Gilbert's potoroo (*Potorous gilbertii*) translocated to Bald Island and an enclosure at Norman's Beach in Waychinicup National Park has revealed the successful establishment of self-sustaining populations in both locations. The Bald Island population, which was founded on 10 animals, now has around 70 members.

Since 2008, about 35 animals from Bald Island have been translocated to the mainland, with 25 of these relocated to the enclosure at Norman's Beach. In 2012, a significant number of potoroos in the enclosure were taken by carpet pythons, and by late 2013 only 16 potoroos were known to be alive inside the enclosure (of which eight had been born on-site). Scientists will now trial winter translocations to the enclosure, so that the potoroos can gain knowledge of their new habitat before carpet pythons become active in the warmer months.

By using a combination of trapping, radio-tracking and motion-activated cameras, scientists have shown that the potoroos in the Norman's Beach enclosure use different vegetation types than those in the wild population at Two People's Bay. The use of different habitat types is a promising sign that potoroos can survive and breed in habitats other than the dense low heath in which they are found on Mt Gardner. Careful management of fire, feral predators and dieback will allow Gilbert's potoroo to colonise new areas as numbers increase, and improve the likelihood of long-term population recovery in a range of vegetation types.

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Fire management in woodland, mallee and mallee-heath reserves

Managing fire for ecological outcomes, such as maximising plant diversity and maintaining community structure, is a major operational challenge, particularly in areas where fire history is poorly known and our knowledge of how species respond to fire is limited. Too frequent fire can lead to a loss of species that rely on seed to re-establish after fire but, when the time between fires is too long, those species reliant on fire senesce and community diversity and structure is decreased. In recent decades, large areas of the Great Western Woodlands (GWW) have been burnt more frequently than what appears to have occurred in the past, while in contrast, the time since fire in many small wheatbelt reserves has been greater than 100 years.

To understand how fire intervals affect vegetation composition and structure in plant communities in the eastern wheatbelt and adjoining GWW, scientists from the division and CSIRO used a combination of satellite imagery and aerial photography to determine the time since fire in remnants of mallee and mallee-heath around Lake Magenta, and analysed growth rings in long-unburnt stands of gimlet (*Eucalyptus salubris*) in the GWW. They aimed to predict and generalise changes in plant communities with time since fire by grouping species into plant functional types (PFT) based on the combinations of traits that plants show in response to fire. In fire-prone environments, for example, critical traits to long-term survival include plant longevity (long- or short-lived), whether plants are able to resprout after being scorched by fire, how long their seeds persist and where they are stored (in the soil or in the canopy), and plant height (with taller plants considered at a competitive advantage between fires).

The researchers found that the time between fires was strongly affected by the broader landscape context, with the shortest time between fires found in the GWW and the longest in small wheatbelt remnants, with large wheatbelt remnants intermediate between the two. They found that mallee-heath communities would benefit most from direct fire management: these communities are most likely to lose diversity and vegetation structure with large variations in intervals between fires because they are dominated by species that store seed in the canopy and are unable to resprout after fire. Mallee communities were found to be more resilient to longer periods without fire, but both communities contained species that had traits that would make them vulnerable if fires occurred less than 25–30 years apart. In gimlet woodlands in the GWW, diversity was highest in mature stands, indicating that recurrent fire is not necessary to maintain plant diversity in this vegetation type. In these communities, intense, stand-replacing fires less than 200 years apart are likely to have significant impacts on plant diversity and the conservation values of the woodlands.

This knowledge of the fire-response traits of vegetation communities is used to determine the appropriate time between planned burns, ensuring that species diversity and vegetation structure, particularly in mallee-heath, is maintained in the long term.

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