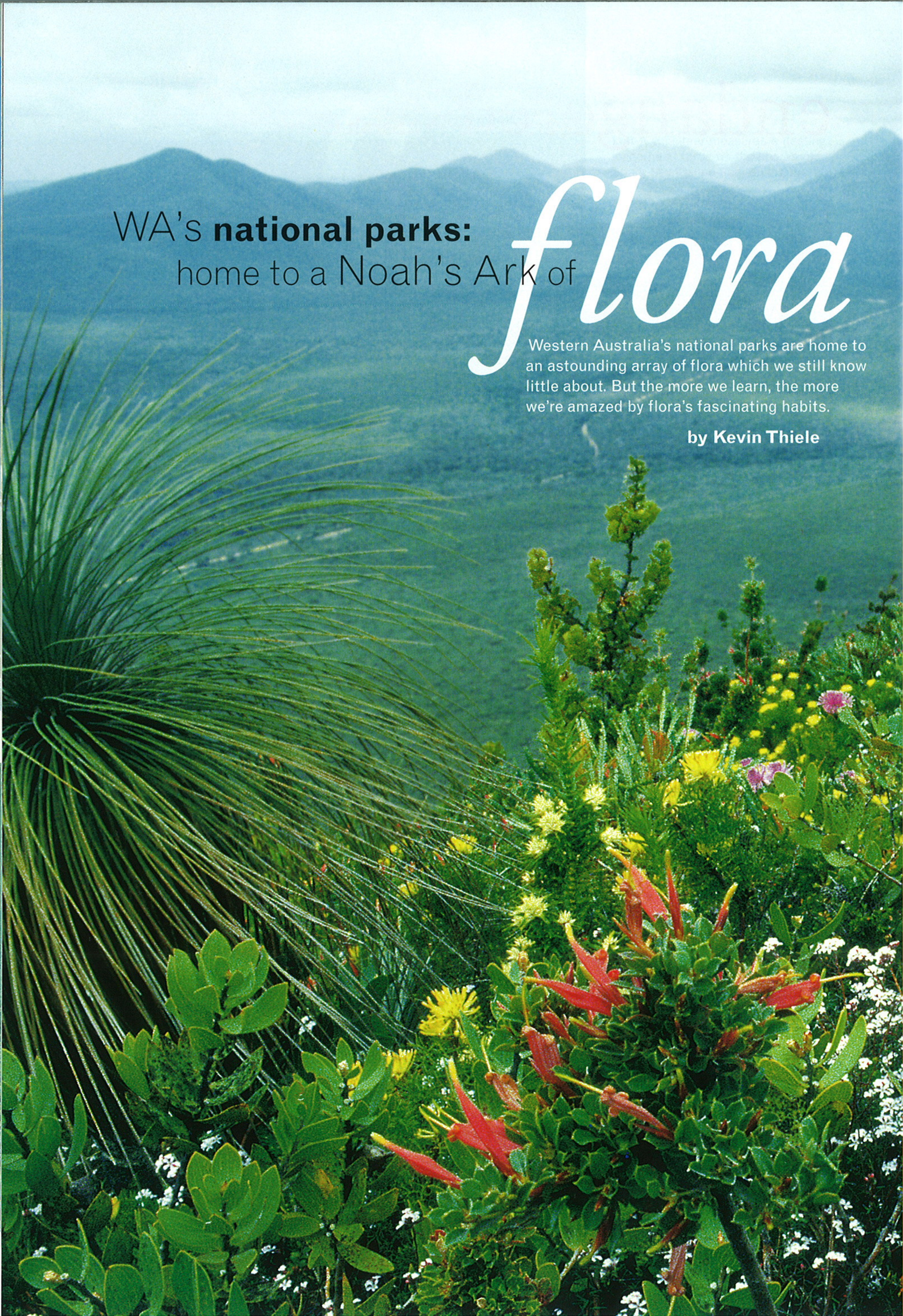


WA's **national parks:** home to a Noah's Ark of *flora*

Western Australia's national parks are home to an astounding array of flora which we still know little about. But the more we learn, the more we're amazed by flora's fascinating habits.

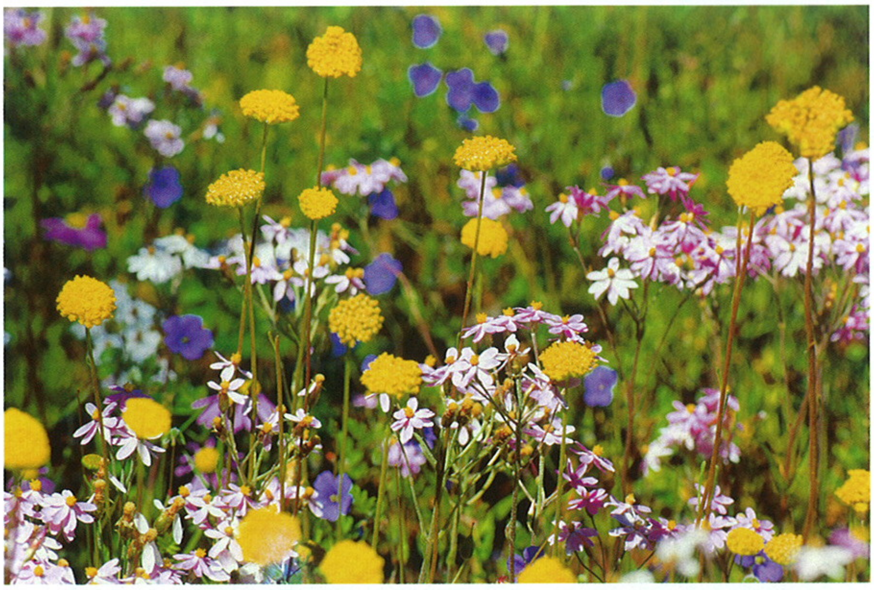
by Kevin Thiele

When ranger Allan Rose saw a beautiful, pink-flowered shrub off a bush track in the eastern part of the Stirling Range National Park in 1990, he thought he'd found a common species of featherflower (*Verticordia*). But as he didn't recognise it, he carefully collected and pressed a specimen to send to the Western Australian Herbarium for identification.

Several weeks later, staff at the Herbarium tentatively identified the specimen as the keeled featherflower (*Verticordia carinata*), and immediately called botanist Elizabeth George, an enthusiast on featherflowers, for confirmation. Elizabeth was called because *Verticordia carinata* hadn't been seen for more than 150 years and was thought to be extinct.

Elizabeth dropped what she was doing, raced into the Western Australian Herbarium to look at the specimen and confirmed its identity as the lost species. A week later she was in the Stirling Range with Allan Rose, hoping to be able to catch the plants in flower, as it was already late in the season.

Inspection of the site found several plants but also brought concern, as dieback disease, caused by the pathogen *Phytophtora cinnamomi*, was in the area and the newly rediscovered species looked threatened. The next year brought more worries when a wildfire burnt through the population, killing all but a few individuals. But autumn rains saw masses of seedlings and testing showed that the species was resistant to dieback. *Verticordia carinata* now looks secure, protected by the Stirling Range National Park around it and closely monitored by rangers and other Department of Environment and Conservation staff. At last count there were more than 10,000 plants in the original population, and a second population has been found some distance away.



National parks — protecting WA flora

The story of the keeled featherflower is a national park success story. When it was first collected, sometime in the 1840s by Scottish botanist James Drummond, most of the south-west of Western Australia was uncleared and many species were widespread and common. With clearing of the bush and changes to fire regimes, national parks like the Stirling Range and other conservation reserves have become like arks, protecting a priceless heritage of WA's plants and animals.

But unlike Noah's Ark, parks and reserves protect not only known but also unknown and undiscovered species. No-one knows how many species of flowering plants there are in WA, but a safe bet is around 12,000 species, of which about 80 per cent have been described and documented. For other groups, particularly fungi and invertebrate animals, the percentage known is much, much smaller, perhaps as low as 10 per cent. If we are so uncertain about the species occurring in our parks, we are even less certain

Previous page
Main Wildflowers on Mondurup, Stirling Range National Park.
Photo – Rob Olver

Above A carpet of daisies in the Midwest region.
Photo – Marie Lochman

Left Coastal heathland in Fitzgerald River National Park.
Photo – Jiri Lochman

Top and above Friends of the Stirling Range transplanting seedlings from a firebreak.
Photos – Rob Olver

Right Western pygmy-possum feeding on large-fruited mallee.
Photo – Jiri Lochman

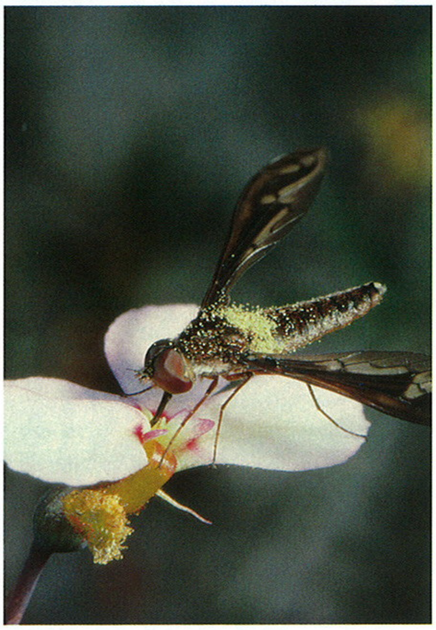
about species that are unprotected by parks and reserves. We may never even manage to collect and describe many of these plants before they are lost to extinction.

But protecting species, whether known or unknown, is only a small part of what conservation reserves are all about. Imagine, for a moment, a thought experiment. Imagine that we were able to take living samples of every species of plant, fungi and animal in WA, and to store these permanently and safely in some type of giant, high-tech Noah's Ark, cryogenically frozen perhaps or propagated through tissue culture and cloning. Every species would be safe from extinction forever. But we would still lose inestimably, because parks and reserves conserve much more than the species that live in them.They conserve stories—the stories of the myriad of complex interactions between organisms, and between organisms and their environment. Like enormous libraries, they are full of wonder and amazing tales. And we are like very, very inexperienced librarians. We're part way through the task of cataloguing the titles in the library—the species in our parks—but have scarcely begun to read their stories.

Floral tales of benefit and deceit

Consider pollination. This most fundamental aspect of a flowering plant's design and function often brings together the plant and its pollinator—an insect, mammal or bird, or maybe the wind—into an evolving relationship that results in astonishing specialisation. Some relationships are mutually beneficial, some involve trickery and deceit.

The best-known of the latter is the story of the thynnid wasps that pollinate many species of WA ground orchids. Winged male wasps emerge from pupae in the soil in spring while wingless females emerge a few days to weeks later. Climbing to the tip of twigs or grass stalks, the females lay a scent trail into the wind. Males catching the scent follow it to the female, pick her up and fly off, mating on the wing before dropping her to the ground where she seeks out burrowing beetle larvae in which to lay her eggs. But orchids have evolved that mimic the female wasps in shape, colour, orientation and, most astonishing of all, in precise details of scent. Males swooping to lift off and mate an apparent female, find themselves grappling instead with an orchid flower. In the ensuing confusion the orchid glues a pollen-sac to the head of the wasp, which then goes off and, often enough, repeats the mistake with a second orchid.



An unusual example of a mutually beneficial relationship is the pollination story of the brown boronia and its relatives. The heavily fragrant, yellow-and-brown flowers of scented boronia (*Boronia megastigma*) are familiar in gardens and as cut flowers. Equally striking relatives include the pink-flowered tall boronia (*B. molloyae*), named after the colonial botanical collector Georgiana Molloy, and the winter boronia (*B. purdieana*). All these species have odd flowers, with four infertile stamens or staminodes in addition to four fertile ones, and a curiously enlarged stigma.

These boronias appear to be pollinated by very small moths. But the flowers don't attract the moths by providing nectar. Instead, the male and female moths use the flowers to meet, greet and mate, after which the female moths lay eggs on the stigma and sterile staminodes. While laying their eggs in flower after flower, the female moths become liberally dusted with pollen and so effect pollination. On hatching, the caterpillars eat the staminodes, which are rich in oils and fats, and possibly

Top A native burrowing bee collecting pollen from a native iris flower.

Centre far left A wasp-mimicking mydid fly.

Centre left A bee fly feeding on a trigger plant.

Left A singing honeyeater feeding on a *Grevillea* flower.
Photos – Jiri Lochman

also the large stigma. But they leave the seeds intact, and so both moth and boronia persist. This close relationship between moth and boronia has proven troublesome for the cut flower industry, which finds itself unable to establish seed orchards of brown boronia outside the natural range of the moth.

These are two of the known pollination stories that can be found in parks and reserves throughout WA. There are a vast number of others that are still unknown. Why does the so-called golden rainbow (*Drosera microphylla*), have shining copper-red and green flowers while most of its relatives have plain-coloured white or pink flowers? What pollinates the smoke-bushes (*Conospermum*), many of which have tiny flowers that are almost black inside and white-woolly outside? And what do the strange little desert thread-petals (*Stenopetalum* species) do with their curiously elongated petals, so long that the flowers don't look like flowers at all at first sight? The stories of all these still need to be read.

Reproductive genius

Pollination, of course, is only one part of the story of plants. Protecting then shedding and dispersing seeds is another rich vein of stories, particularly in sandplain parks and other areas where fire plays a vital role in the landscape.

Burnt banksia cones with gaping follicles are a common sight after a wildfire. This is the final chapter in one of the most sophisticated seed dispersal stories in the world. It's a good story because banksias have a problem. Most species grow in sandplains and heaths where summer wildfires are common and hot. Their seeds are relatively large (to give the germinating seedlings the best chance of survival in dry conditions and infertile soils) and full of nutrients, making them very attractive to seed predators such as insects. So the plant needs to shed its seed at a very precise moment, onto moist soil after the onset of consistent autumn rains and after a summer wildfire, when conditions for germination are good but seed predator populations are low. Shedding the seed immediately after the fire, or in the interfire period, or even after a summer thunderstorm following the fire, would be disastrous, as the seedlings would probably not survive.

Above Banksia cone follicles open to release seeds after a fire.
Photo – Jiri Lochman

Above right Wattle and black-eyed susan in the Perth region.
Photo – Bill Belson/Lochman Transparencies

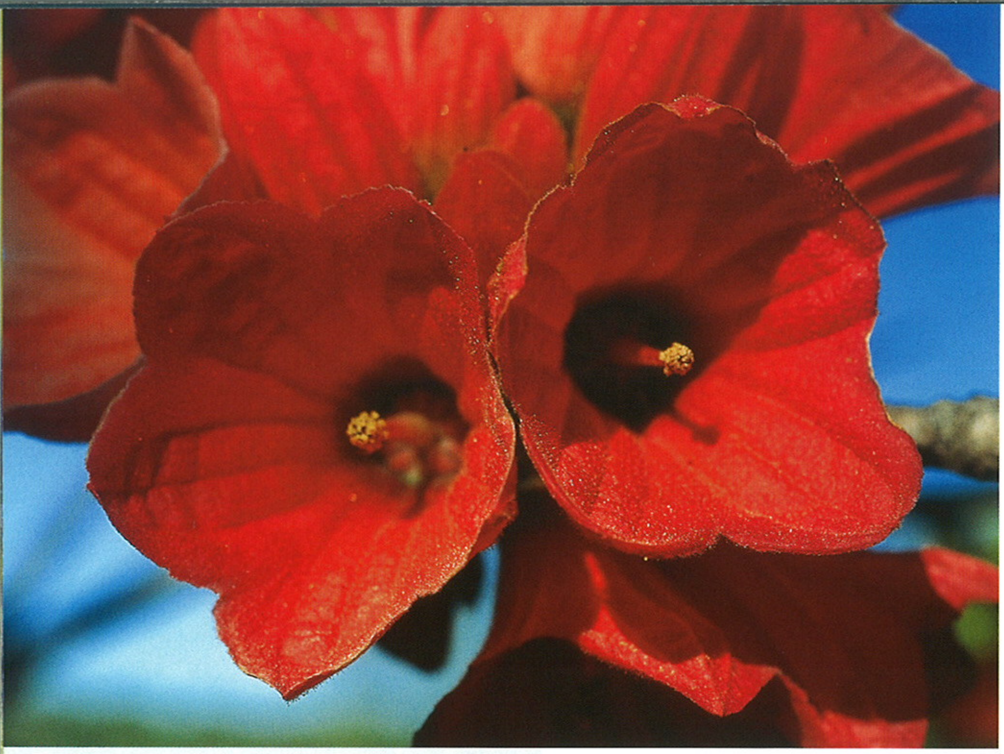
Right A community of Wheatbelt heath, featuring *Petrophile media*.
Photo – Jiri Lochman

Below right Coneflowers (*Isopogon latifolius*).
Photo – Alex Bond

Bottom right Brown boronia (*Boronia megastima*).
Photo – Andrew Davoll/Lochman Transparencies

Banksias solve this problem using a mechanism that's unique in the plant kingdom. After pollination the two ovules or eggs inside the flower develop into three structures—two seeds and a tough, woody, two-winged plate called a separator. The separator develops from the adjoining inner layers of the two seeds, which glue themselves together after fertilisation then split along a layer of crystals, forming a winged seed on either side and leaving behind the separator in the middle. Next time you see a banksia seed look carefully at the wing and you can just make out the tiny, glistening crystals that were used to break it from the separator.

The separator is used to get the timing of dispersal right. During the fire, resinous glues that hold the cone's follicles closed melt, and the follicles pop open. But the wings of the separator curve outwards as the follicle opens, forming a perfect lock that holds the seeds firmly in place. The separator wings are hygroscopic—every time the separator gets wet its wings straighten, when it dries they curve back again. This action, of straightening then



Above Sticky kurrajong (*Brachychiton viscidulus*).
Photo – Kevin Kenneally

Left Mottlecah (*Eucalyptus macrocarpa*).
Photo – Jiri Lochman

Below right Smoke bush (*Conospermum coerulescens* subsp. *adpressum*).
Photo – Alex Bond

curving back during several wetting and drying cycles, gradually levers the seeds out from the follicle. And here's where the marvelous precision comes in. The odd summer thunderstorm after the fire won't be enough to lever the seeds out. Only the onset of consistent autumn rains produces enough wetting and drying cycles to do it. So the seeds fall from the dead cones at precisely the right moment to maximise their chances of survival.

And yet here again, while there are some known stories in our parks and reserves there is still so much more that is unknown. The mechanism that banksias use to protect their seeds, and the reason why they do it, seems clear. Why then do hakeas and casuarinas, which also protect their large seeds in woody follicles that pop after a fire, have no such mechanism, instead shedding their seeds immediately? How do they get around the problem of insect predation before the onset of rains? We don't yet know.

Evolution produces a unique flora

Banksias, hakeas and casuarinas on the WA sandplains give tantalising clues of another great story, one that we can still only dimly perceive. If you compare the flora of a national park in the south-west of WA with an equivalent area in the south-east of eastern Australia, a striking pattern becomes immediately obvious. This is that the western park will be filled with bizarre and striking growth habits, leaves, flowers and fruits, while the eastern park will be filled with much more conventional plant forms, with more muted colours and less striking and varied shapes. The comparison holds over many (though, tantalisingly, not all) groups of plants. The wonderful triggerplants (*Stylidium*) provide a great example—there are not only more species but also a much wider diversity of forms in the south-west than the south-east of Australia. Eucalypts are another good example—there are no eastern equivalents of the wonderful mottlecah (*Eucalyptus macrocarpa*) or tallerack (*E. pleurocarpa*).

This pattern surely provides a hint of a big story, of the different paths of evolution in the two regions. Evolution seems to have gone a bit crazier in the south-west than in the south-east. Various factors or combinations of factors have been proposed to explain the high species diversity in the south-west. Some consider that the south-west's relatively stable climate over many millions of years has meant that extinction rates are lower here, so more species still survive, including the bizarre oddities. Others suggest the opposite—that sweeping cycles of aridity since the continent drifted north and dried out overlain on the fine-scale mosaic of rock and soil type in the south-west has driven speciation to high levels. Probably neither of these stories is wholly correct, and the real story will be stranger.

Either way, the plants and animals that tell this and other stories of the evolutionary and natural history of WA live and are protected in our national parks and other nature reserves. More than just refuges of species, parks teem with interactions, processes and patterns that hint at many more stories and many more secrets. If we and they survive the challenges ahead presented by climate change and the pressures of a full world, more of their stories will be read, and more of their lives will enrich ours.

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