bush*tracks*

Bush Heritage Magazine | Spring 2019

One million trees

Our 10-year plan to restore over 1350 hectares of Eurardy Reserve in Western Australia.

The future is female

The Karajarri Women's Ranger team has more than doubled in size over the past 12 months.

A climate-proof woodland

As climatic zones shift and native trees die, how do we decide what to replace them with?

BUSH HERITAGE
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Bush Heritage acknowledges the Traditional Owners of the places in which we live, work and play. We recognise the enduring relationships they have with their lands and waters, and we pay our respects to Elders, past and present.

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Left to right: Karajarri Ranger Marissa Munro, Karajarri Ranger Shannica Boddington, Women's Ranger Coordinator Jackie Wemyss, Senior Karajarri Cultural Ranger Jessica Bangu, Aunty Sylvi Shovellor (standing), Karajarri Ranger Jacqueline Shovellor, Karajarri Traditional Lands Association Executive Officer Comalie Manolis (standing) and Aunty Rosie Munro. Photo by William Marwick

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↑ Bush Heritage National Aboriginal Engagement Manager Cissy Gore-Birch, CEO Heather Campbell and Karajarri rangers. Photo by William Marwick

In late July, I was lucky enough to travel to Karajarri country in the south-west Kimberley region of Western Australia where our newest Aboriginal partnership is based. At over 3 million hectares, it's a stunningly vast and beautiful landscape encompassing white sand beaches and sandstone sea cliffs, inland wetlands and red desert dunes.

I found it deeply moving to consider the land from the perspective of the Elders and Karajarri Women Rangers who accompanied me on country. They taught me how to crush tea tree leaves in my hands as a sanitiser, showed me tiny native berries that were succulent and beautiful to eat, and told me stories about their totem, *Pijarta* the Emu, whose numbers have been locally declining.

'The future is female' (p. 6) looks at how Bush Heritage's partnership with the Karajarri Traditional Lands Association is supporting the women rangers to ensure knowledge and culture is kept alive. Their work, and that of their male counterparts, will ultimately benefit a suite of species, from Pijarta to Loggerhead and Green turtles, Dugong and Bilbies.

Another significant recent event for Bush Heritage has been the start of our largest ever revegetation project on Eurardy Reserve, Nanda country, north of Perth. When done well, revegetation can be a powerful restoration tool. This long-awaited project will transform an area equivalent in size to 762 Melbourne Cricket Grounds, providing vital habitat for native species and offsetting more than 90,000 tonnes of carbon emissions in the process.

On the other side of the country, in central Victoria, another of our revegetation projects is making headlines for different reasons. The experimental planting of 9000 seedlings on Nardoo Hills Reserve, Dja Dja Wurrung country, will help prepare the landscape for what is likely to be a much hotter and drier future.

Some of the words on the following pages are thought provoking and others deeply concerning. But there is also an overarching theme of intelligent, optimistic people doing their part to improve the health of this planet that we all call home. I hope that you find inspiration in their stories, as I have.

Heather Campbell
Chief Executive Officer

The one million tree project

Decades ago, parts of Eurardy Reserve were cleared for agriculture. Now, we're embarking on our largest revegetation project ever to restore what was lost.

STORY BY VIKI CRAMER

←
Rip lines ready for revegetation on Bush Heritage's Eurardy Reserve, WA. Photo by Katelyn Reynolds

Row upon row of parallel furrows snake their way towards the horizon, cutting deep red lines through the weedy wheat paddock that welcomes visitors to Bush Heritage's Eurardy Reserve in Western Australia.

It's perhaps not the entrance you'd expect to find to a conservation reserve, but then, these rip lines aren't awaiting your standard crop either.

As Bush Heritage ecologist Ben Parkhurst, his wife Tina Schroeder and their 10-month-old son Liam look on, the first of over 36,000 native seedlings are planted in the loamy, moist soil.

The planting is part of the first phase of an ambitious project that will eventually see over 1350 hectares of cleared land on Eurardy restored — Bush Heritage's largest revegetation project to-date.

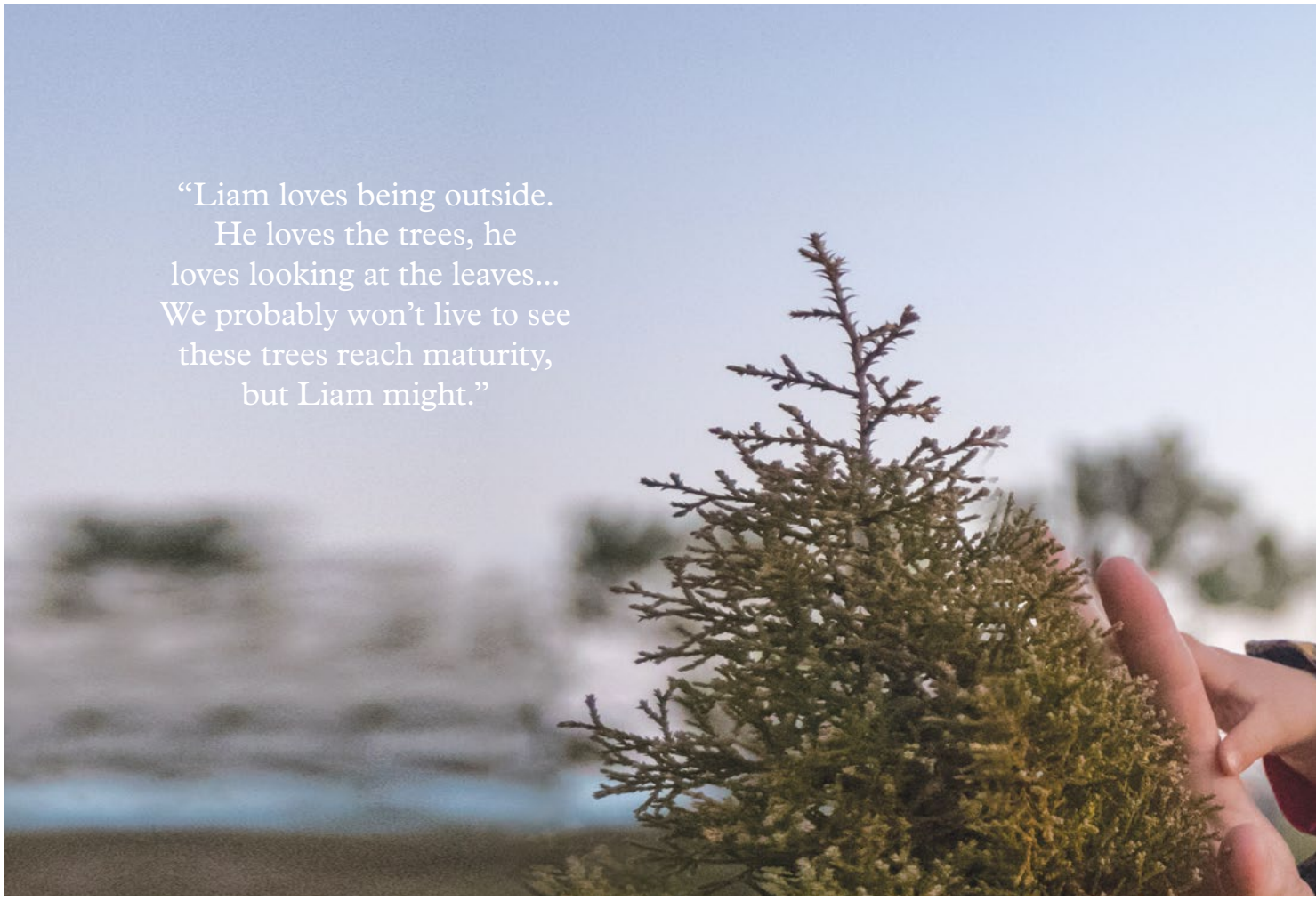
Located six hours drive north of Perth, the 30,050-hectare reserve on Nanda country has two major soil types: sandy, nutrient-poor yellow soils and denser red soils. In some places, the transition between the two is so abrupt that the ground takes on an ombre appearance.

Under previous owners, around 750 hectares of Eurardy's red soil country and 1550 hectares of its yellow soil country were cleared for cropping and grazing; the remaining 27,750 hectares were left relatively undisturbed.

The planting is part of the first phase of an ambitious project that will eventually see 1350 hectares of cleared land on Eurardy restored — Bush Heritage's largest revegetation project to-date.

Since Bush Heritage's purchase of the reserve in 2005, its uncleared land has flourished thanks in large part to the organisation's work controlling erosion, rabbits, foxes and feral goats. But the cleared areas have remained stubbornly barren.

"We've tried natural regeneration for almost 15 years, but it just hasn't happened," says Ben. "There's fertiliser residue in the soil that makes it unsuitable for native species, the seed bank is really low, and native



plants can't compete with introduced agricultural weeds. Active revegetation is our only option."

The first phase of revegetation is expected to take five years and will focus on restoring Eurardy's red soil country, which supports one of the northern-most stands of York Gum (*Eucalyptus loxophleba*) woodlands.

York Gums were amongst the earliest and most heavily cleared of the eucalypt woodlands in the West Australian wheatbelt because they grow on more agriculturally productive soils. Around 10 percent of their original cover remains.

"Eurardy is one of the last larger areas where there's lots of intact York Gum habitat," says Tina, who is investigating how to restore York Gum woodlands as part of her PhD.

The decision to start with the red soil and not the yellow is a calculated one. Eurardy's yellow soils support Kwongan Heathland, a globally significant and threatened ecosystem that features an enormous variety of plant species, making it difficult to restore well.

Restoration techniques for eucalypt woodlands are comparatively simple and much better researched; however, they're still not cheap. Ecological revegetation can cost up to $2500 per hectare, meaning the total cost of restoring Eurardy's cleared red soil could be upwards of $1.8 million.

To overcome this otherwise prohibitive cost, Bush Heritage has partnered with the Carbon Neutral Charitable Fund (CNCF), a not-for-profit that specialises in high-quality, biodiverse revegetation. In turn, CNCF provides its customers with carbon credits to help offset their environmental impact.

In July, a team of CNCF contractors donned buckets of seedlings and bright red tree planters to individually place 36,000 seedlings, comprising seven species of eucalypt and melaleuca, in the cleared paddocks at Eurardy's entrance.

CNCF estimates that more than one million trees will be planted on the reserve before phase one is complete, capturing more than 90,000 tonnes of carbon dioxide — equivalent to removing 20,700 passenger vehicles from the road for a year.

Forward thinking

It will be over a century before the revegetated areas are fully functioning ecosystems. As the trees mature and limbs drop off, hollows will form and provide nesting places for Red-tailed Black-cockatoos (*Calyptorhynchus banksii*) and other birds. The fallen logs, meanwhile, will offer shelter to ground-dwelling species such as the endangered Western Spiny-tailed Skink (*Egernia stokesii badia).*

At this stage in their lifecycle, Ben says the trees take on a "twisted, tortured gracefulness that's really quite beautiful."

Ben and Tina hope to complement CNCF's plantings with direct seeding of understorey species and experimental work to restore the ground layer of annual herbs — something that has never been attempted.

As part of her PhD research, Tina has also been investigating how adding logs and other woody debris to restored sites could assist with the recovery of soil health and invertebrate communities.

And then there is the challenge of phase two, restoring the cleared yellow soil country, which is due to start in 2021.

It's a massive project, but as Tina watches the first plants go into the ground with Liam on her hip, she muses that her son is a reminder as to why it's all worth it.

"Now, with our little one, it really feels like we're doing something for the next generation," she says. "Liam loves being outside. He loves the trees, he loves looking at the leaves, he loves listening to the birds. We probably won't live to see these trees reach maturity, but Liam might." ●

↑

Bush Heritage ecologist Ben Parkhurst and his son Liam on Eurardy Reserve, WA. Photo by Amelia Caddy

The future is female

The Karajarri Women's Ranger team has more than doubled in size over the past 12 months as women step up to care for their country and culture.

STORY BY KATE THORBURN

Carefully stitched onto the Karajarri Women Rangers' work shirts is a logo depicting two of the Kimberley's prized species– a *Pirrala* (Threadfin Salmon) and a *Pijarta* (Emu).

The logo paints a picture of the duality of the 3 million hectares of Karajarri country – on one side; *Jurarr* (coastal country), symbolised by a saltwater fish. On the other; *Pirra* (inland country), represented by a desert-dwelling bird.

Supporting more Karajarri women, particularly young women, to proudly wear this ranger badge is at the heart of a new partnership between Bush Heritage Australia and the Karajarri Traditional Lands Association, the governing body responsible for the management of Karajarri country.

> "The old people fought for this country for us, so we need to keep the legacy going. It's very important to keep our culture and language strong and alive, because if we lose it we lose our identity."

In the last 12 months, the Karajarri Women's Ranger team has grown from just two full-time rangers to five – the same number of positions in the long-standing Karajarri Men's Ranger team. With Bush Heritage's support, it is hoped this number can double yet again.

For 19-year-old Shannica 'Shanni' Boddington, a ranger role provides an opportunity to learn on country from senior women who hold important knowledge about practises like bush foods, bush medicines, fishing and hunting. Tech savvy younger rangers like Shanni are also playing a key role in pairing traditional Karajarri ecological knowledge with Western technology.

"I'm proud to be a Karajarri ranger," says Shanni, who joined the team last year. "Tagging along with [the senior rangers] is helping to build my confidence and we can help them learn to use tablets and iPhones."

"I'd like to see more young ones come on board," adds Senior Cultural Ranger Jessica Bangu. "The old people fought for this country for us, so we need to keep the legacy going. It's very important to keep our culture and language strong and alive, because if we lose it we lose our identity."

A trainee program run with the La Grange Community School in Bidyadanga, the community where the rangers are based two hours south of Broome, sees high school students working with the female ranger team two days a week. Head Karajarri Ranger Jacqueline 'Jacko' Shovellor's daughter is currently part of this program.

→
Senior Cultural Ranger Jessica Bangu guts a catfish with Karajarri Women's Ranger Coordinator Jackie Wemyss. Photo by William Marwick

→
Karajarri *Jurrar* (coastal country) in north-west WA.
Photo by William Marwick

"When we first started it was just me and Jessica, so it's good that we've got younger ones coming on board," she says. "We need to carry on our past from our Elders and it's important for [the younger generation] to learn the same things that I've learned from our old people."

Bush Heritage National Aboriginal Engagement Manager, Cissy Gore-Birch, herself a Kimberley woman, says the female ranger program offers Karajarri women a means to self-determination, particularly in communities like Bidyadanga where employment opportunities are limited.

"The Karajarri Women's Ranger program is giving women an opportunity to be part of the big picture, be part of the big decisions and be part of looking after country," says Cissy.

"People often associate the work of rangers as heavy duty but there is a lot of work on country that needs to be done and women are more than capable of doing it."

So far this year, the female rangers have led monitoring on the intertidal reef zone (a culturally significant activity for Karajarri women), worked alongside universities to record migratory shorebird species at Eighty Mile Beach and spent eight days in the desert surveying mammals and reptiles at the Edgar Ranges.

Shanni has completed her Incendiary Machine Operator training and assisted the Men's Ranger team on annual aerial burning. Jacko's bush medicine products are being sold at the Broome Saturday Market and she is developing a broader bush medicine business plan.

Underpinning these milestones is the rangers' deep spiritual, physical and emotional connection to country, known in Karajarri as *Palanapayana Tukjana Ngurra* (everybody looking after country properly).

"When we're on country we feel at ease — peaceful," says Jessica. "Sometimes we sit there and just imagine our ancestors walking this land."

"When I'm on country, I feel really good, because that's the place I want to be," adds Jacko. "When we go home we feel so stressed, but when we're out on country we feel everything is good."

"The Karajarri Women's Ranger program is giving women an opportunity to be part of the big picture, to be part of the big decisions and be part of looking after country."

An antidote to despair

Rather than lose hope when eucalypts started dying in central Victoria, Bush Heritage scientists came up with an innovative solution using future climate scenarios.

STORY BY AMELIA CADDY

In the middle of a cleared paddock on a cold and foggy winter morning, Dr Garry McDonald and several Bush Heritage staff huddle together to run through their game plan one last time. Then, tray by tray, they start unloading their precious cargo from the backs of their white utes.

The trays are filled with Grey Box and Yellow Box seedlings that have been germinated from seeds collected at different locations (known as *provenances*) across south eastern Australia. After being carefully cleaned, the seeds were cultivated in a nursery until big enough for planting here on Nardoo Hills Reserve, where large tracts of woodland have suffered mass dieback. The team – led by Garry, a Bush Heritage volunteer and University of Melbourne researcher, and Dr Matt Appleby, Bush Heritage's senior ecologist for the South East – will plant over 9000 of these seedlings before the week is done.

The dieback events followed long heatwaves such as the two periods of five consecutive days over 40 degrees in January and February 2014

The revegetation is both refreshingly proactive and mind-blowingly complex. The cleared paddock has been divided into 18 blocks, half of which will be planted with Yellow Box and half with Grey Box. Each block is divided into 25 plots, and those plots are split further according to the different provenances. Ensuring that the seedlings go in the right plots is a logistical nightmare. But it's necessary because this planting is going to form the basis of a long-term experiment that will hopefully see scientists revisiting the plots regularly for decades to come.

Nardoo Hills is a 1207-hectare Bush Heritage reserve located about a three-hour drive north of Melbourne. Dja Dja Wurrung people refer to parts of this area as *upside-down country* – a reference to the gold rush of the mid-1800s that saw waterways diverted, woodlands cleared, and huge quantities of earth upended.

The Kara Kara-Wedderburn region, where Nardoo Hills is located, is one of the few parts of central Victoria that still retains large tracts of uncleared woodlands, and it is a refuge for many species as a result. But today there is another, more insidious threat to woodlands in the Kara Kara–Wedderburn region, and possibly farther afield: climate change.

Over the past five to 10 years, about 100 hectares of Grey Box and Yellow Box trees – almost 10 percent of the reserve – have collapsed. The dieback events followed long heatwaves such as the two periods of five consecutive days over 40 degrees in January and February 2014. Combined with low rainfall, these heatwaves were too much for the Nardoo trees, which have adapted to a less extreme climate.

→
Infographic by Mike Rossi/micrografik.com

Creating a climate resilient woodland

1 Climate change scenarios for Nardoo Hills

We came up with three future scenarios for Nardoo Hills – ranging from a slightly warmer SCENARIO 1 *to a much hotter and wetter* SCENARIO 3 *– based on a range of emissions pathways and time periods.*

Average maximum temperature | **Average annual rainfall**

CURRENT 2019

23.2°C
470mm

Target species for revegetation:

- **Grey Box** *Eucalyptus microcarpa*
- **Yellow Box** *Eucalyptus melliodora*

SCENARIO 1* 2050 RCP 4.5

24.4°C
475mm

Similar provenances:

- **Mathoura** (NSW)
- **Junee** (NSW)

SCENARIO 2* 2090 RCP 4.5

25.2°C
451mm

Similar provenances:

- **Quorn** (SA)
- **Narrandera** (NSW)

SCENARIO 3* 2090 RCP 8.5

26.0°C
521mm

Similar provenances:

- **Fifield** (NSW)
- **Condobolin** (NSW)

**These climate scenarios are based on CSIRO/BoM Climates Futures models. Visit climatechangeinaustralia.gov.au for more information.*

What are RCPs?

'Representative Concentration Pathways' are the four greenhouse gas concentration projections used in the IPCC's fifth assessment report: RCP 2.6, 4.5, 6 and 8.5. They cover a range of emissions scenarios.

RCP 8.5 *is the most dire and what we would likely see from a 'business as usual' approach.*

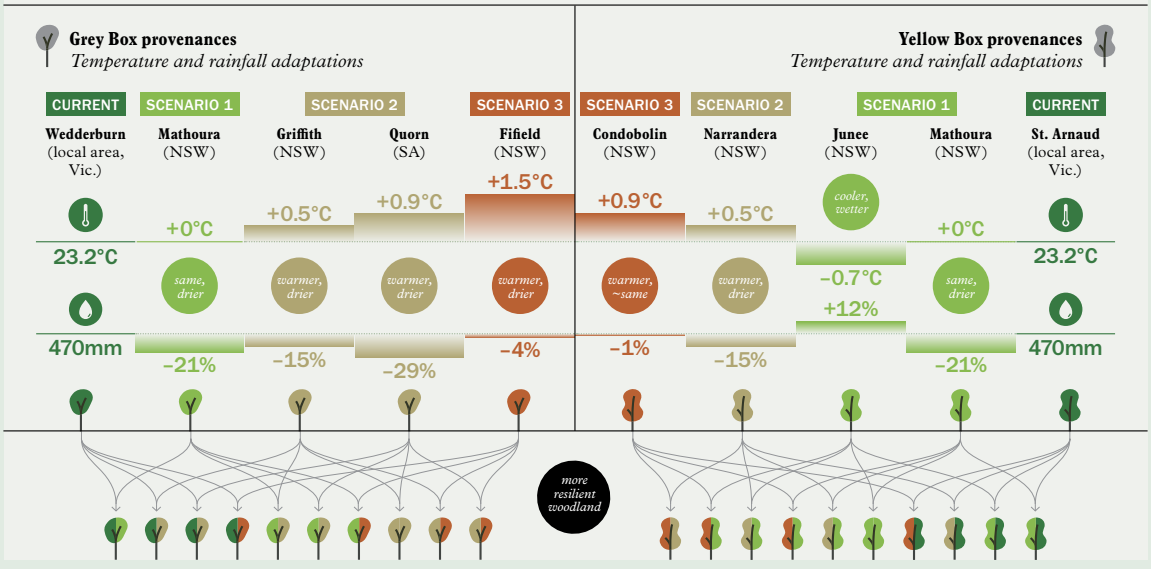
RCP 2.6 *is the most ambitious, and would require strong and urgent action.*

2 Sourcing seed from different climates

Grey Box and Yellow Box seeds of different provenances were collected, where possible, from regions with climates similar to the three future scenarios outlined above. Seeds from the local Nardoo Hills area were also collected.

3 Future proofing through cross pollination

Each provenance will be adapted to cope with a different temperature range and rainfall. Our hope is that, in decades to come, cross breeding will produce a far more genetically diverse and resilient woodland.



↑
Bush Heritage volunteer Dr Garry McDonald.
Photo by Kate Thorburn

↑
Dieback on Nardoo Hills (in foreground).
Photo by Amelia Caddy

"It's heartbreaking to look at," says Garry. "Now, when you stand on top of the hills and look north, you just see a mass of dead, dying or very stressed trees."

The cumulative losses sparked an urgent need to act; without new habitat soon, many woodland birds, insects and other animals at Nardoo Hills would suffer. But it made little sense to condemn more trees to the same fate. Instead, Garry and the team used climate modelling to pinpoint regions with climates analogous to the hotter, drier climate that is predicted for Nardoo Hills in 30-70 years' time, based on two different emissions scenarios.

They cross-referenced this list with records of Grey Box and Yellow Box populations and set about collecting seed from areas such as Fifield, Junee and Narrandera, in central-western NSW, as well as locally.

> "The nice thing about this project is that, rather than sitting back and watching the environment unravel, I'm actually taking tangible actions to protect against those impacts."

"Our hope is that the different provenance seedlings will grow and cross pollinate with the local provenance trees to generate maybe tens of thousands of new seedlings that are more robust and resilient in the face of a harsher climate," says Garry.

With the seedlings lined up next to each other in the cleared paddock at Nardoo Hills, their genetic diversity is obvious; the different provenances vary greatly in size and appearance from one another.

As the seedlings grow, Bush Heritage and other scientists will closely monitor their growth and survival rates. The data will be made publicly available to inform future climate-related revegetation projects as Australia's climatic zones shift and other dieback events inevitably occur.

Having spent over two years looking at future climate scenarios in preparation for this project, one could forgive Garry for despairing at the crisis we find ourselves in. But he says quite the opposite has occurred.

"The nice thing about this project is that, rather than sitting back and watching the environment unravel, I'm actually taking tangible actions to protect against those impacts." ●

Bush Heritage acknowledges the support of its volunteers and project partners, environmental not-for-profit Greenfleet and the Aborline Nursery in Hamilton, Victoria.

Parting shot

My happy place

Phil Palmer
Scottsdale Reserve Manager

I've grown up on rivers; I spent my childhood on the Murray River and then I spent 20 years on the Fitzroy River in the Kimberley, and now I'm down here living alongside the Murrumbidgee River. So, mountain rivers have always been a big part of my life.

When I moved down here to Scottsdale I didn't expect to fall in love with the 'Bidgee, but I really have. It's especially amazing here where it comes out of the mountains and flows through this lower land country. And the more time you spend on the river, the more in tune you become with its movements and its seasons.

There's a place on the Murrumbidgee River about a kilometre upstream from the boat ramp and just around the corner from the rest of the world. When you sit on a beach there with the Scottsdale bushland behind you, you can look across the river and you see the Namadgi Main Range and it's really easy to envisage what this place would've looked like hundreds of years ago. There's no sign of agriculture or disturbance - it's just that good, natural bushland.

When I'm there, it feels like I'm connected with the country. On a hot day you can swim in the waterholes, fish and eat good food, and it brings back memories for me of being back in the Kimberley.

↑
Phil Palmer on the Murrumbidgee River in NSW, with Scottsdale Reserve on the left bank and the base of the Namadgi Main Range on the right. Photo by Annette Ruzicka

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