

Hundreds of Australian plant species are under threat, but they can be saved. **Alastair Sarre** reports.



Main picture: *Stylidium coroniforme*, back from the brink of extinction.

Above: One of two survivors after sheep grazing at Wongan Hills, WA.

Teetering on the brink

In 1980, a species of trigger plant nearly vanished from the face of the Earth. Just one individual of the taxon *Stylidium coroniforme* was known, growing on a farm at Wongan Hills, about 150 kilometres north-east of Perth. It was declared a 'rare flora', and local authorities built a stockproof fence around it. In the spring of 1981, a second plant was discovered in flower. A third was found in 1982. The species was on its way back from the brink of extinction. Subsequent discoveries of some small, previously unknown populations have assisted the recovery.

Calothamnus accedens was not so lucky. The last known population of this Western Australian wheatbelt species was wiped out by a grader driver during roadworks. It's gone, and barring a miracle of rediscovery, it won't be back.

S. coroniforme and *C. accedens* are just two species in a cast of thousands of Australian plants that are extinct, endangered, vulnerable, rare or poorly

known. Thanks to work during the past 17 years by CSIRO scientists, we now have a good idea how many of our flora are in each of these categories. The latest edition of *Rare or Threatened Australian Plants* published by CSIRO lists some 5031 plant species and subspecies. Seventy-six of them are believed extinct.

The total number of rare or threatened plant species has more than doubled since the first version of the book was published in 1979, when 2053 species were listed. But that doesn't mean that the level of vulnerability of our flora has also doubled.

'The main reason for the increase in numbers is improved knowledge,' says John Briggs, a co-author of the book who has worked on the *Rare or Threatened Australian Plants* (ROTAP) lists for 15 years.

'It takes a long time to work through all the taxa and to identify ones that are obviously rare,' Briggs says. 'As we do, the list grows.



A herbarium specimen of *Acanthacladium dockeri*, a small shrub which is presumed extinct. It is known from only two collections, one in 1860 in western NSW, the other in South Australia in 1910. Grazing by domestic stock, coupled with sandhill erosion is thought to have caused its demise.

'Also, there has been a fair bit of taxonomic work going on since the first publication. Such work has identified new species out of ones that previously were lumped together. Species previously undescribed also have been added. In this latest list we've also included subspecies and varieties that weren't in earlier editions.'

Indeed, the rate of extinction of plant species has slowed.

'Most of the plant extinctions in Australia appear to have occurred before 1900, and certainly before 1930,' says Briggs. 'The major impacts had taken effect by then: rabbits, land clearance and grazing. *Calothamnus accedens* is the only species of which I am aware that has been lost since we started this work.'

Nevertheless, many species are only hanging on by the skin of their fine roots. More than 300 species are listed as endangered, which means they are at serious risk of disappearing from the wild in 10-20 years.

That number could increase: by far the biggest category within the rare or threatened flora – 2376 species – remains 'unknown'. This means we don't know enough about the distribution of a species to decide if it is endangered, or vulnerable.

Many species that we do know about are coming under increasing threat.

'Although we've lost only one species since we started this work, a large number has become more threatened, and we've lost populations,' Briggs says.

Every time a population is lost, a species becomes more vulnerable to extinction. It's a death of a thousand cuts.

'You only need the habitat to keep shrinking,' says director of the Centre for Plant Biodiversity Research at CSIRO Plant Industry, Dr Judy West. 'Populations get smaller and more isolated from the next patch; they become vulnerable to fire or over-grazing. Out-breeding becomes more difficult. And gradually, as the habitat diminishes and the abundance of species declines, the risk of extinction increases.'

As populations decline and disappear, genetic diversity is lost, even if the species itself continues to persist.

'From a scientific point of view, the importance of those outlying populations is that they represent genetic diversity,' says

a senior research scientist at the centre, Dr Jeremy Burdon. 'If you lose a population you make the species more uniform genetically and potentially in the longer run less able to cope with changing environmental conditions.'

Climate change is a case in point. Many scientists predict that increasing concentrations of greenhouse gases in the atmosphere will alter the world's climate in the space of a few generations. As climate changes, so will habitats. Plants can't just uproot and move to a place where conditions are more favourable, and mobility is also restricted by habitat fragmentation. So if climate change happens too quickly, many plant species may be unable to either move or adapt, and the extinction rate may accelerate.

On the other hand, some currently restricted species may benefit.

'One could argue that with climate change a species that's rare now might expand,' Briggs says. Even, perhaps, the Wollemi pine – apparently a left-over from moister times in Australia – which was discovered in 1994 in a few gullies west of Sydney.

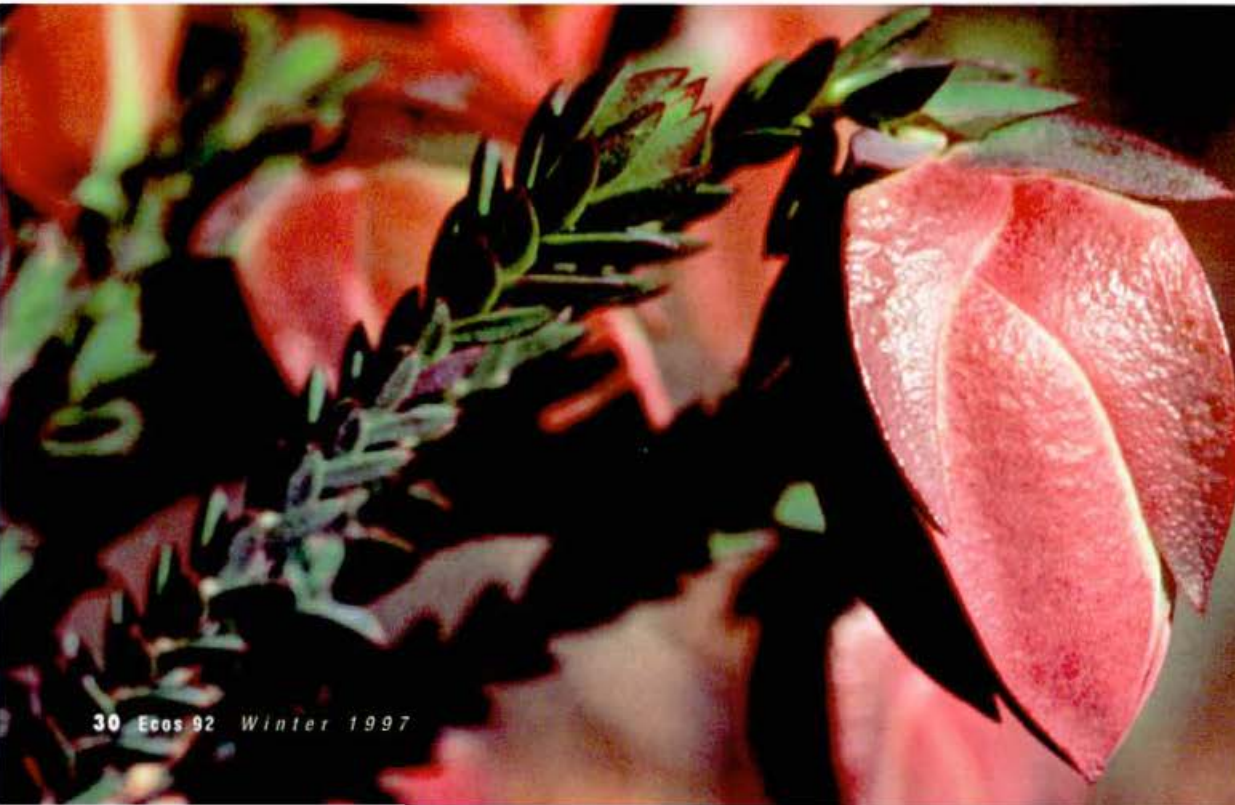
'At least the Wollemi pine is reproducing sexually,' Briggs says. This is a sign that the species retains the capacity to propagate and spread, given the right conditions. So today's ancient relic could be tomorrow's pioneer.

But do we need to care about extinctions? After all, plants have gone extinct before, and we don't miss them terribly.

'We are in one of the most diverse periods in the history of life on this planet,' Burdon says. 'But we are also on the cusp of one of the biggest extinctions of species. In general terms, it doesn't matter if a few species are going extinct, ticking through time; the real problem that we face in the world today is that we are going through such a massive extinction over such a very short period of time.'

There's a standard set of arguments for why we should try to conserve species. First, they may be useful to us. 'Species closely related to crop plants come into that category because they may contain genes that can be used for protecting our crops, there may be genes that give better yields,' Burdon says.

'For example, Australia is a major centre for cotton diversity. Australian species related to cotton have many characteristics that would be beneficial if they can be crossed to cultivated cotton.'



Darwinia carnea, an endangered small shrub which survives in two populations 250 km apart on private properties in the WA wheatbelt. One of these populations, near Narrogin, had declined to only six plants in 1978. Fencing of the site to prevent stock grazing has resulted in a population increase. The other population, north of Perth, consists of about 500 plants and has been fenced.



Grevillea rivularis, a Vulnerable riparian shrub known only from a single population of 1500-2000 plants growing on the NSW Central Tablelands. A small portion of the population is formally protected in the Buddaroo National Park. The remainder is on adjacent land. An inappropriate fire regime is a major threat to this species as all individuals are killed by fire. Too frequent fires (at an interval of about 10 years) could eliminate the species.

Australia also has species related to soy bean, rice and sorghum, and our eucalypts are important timber crops in many parts of the world. And any one of our estimated 22 000 plant species may contain a cure for cancer, AIDS, malaria or any other of dozens of fatal diseases. So our plant genetic resources are potentially valuable to the nation and to the world.

The second argument is that our rare and threatened plants are part of the ecosystems that sustain us: cleaning our air, purifying our water and holding our soil together. Take out a few species, so the argument goes, and the whole system might collapse.

'What does it matter if you lose one or two species?' Burdon asks. 'No one knows. It may not matter a damn, but it may start knock-on effects that in 50 years time mean that our water is less drinkable or our agricultural lands are less productive. That's the trouble with complex biological systems. You poke something over here and something over there goes squeak.'

The third argument is probably closest to the hearts of most scientists, although few may admit it.

'It's a philosophical thing,' Burdon says. 'Do you want your children to never see a real giraffe or elephant? Do you want your children never to reach out and touch a certain kind of plant? Do we have the right to push anything to the point of extinction?'

Lingering threats

The main threats to Australia's rare and endangered plants are the same ones that caused the first wave of extinctions at the turn of the century: land-clearing, over-grazing, rabbits, weed invasion and altered fire regimes.

Of these, land-clearing remains the most damaging. Some states – notably South Australia and Victoria – have managed to bring land clearance almost to a halt (in South Australia there's little left to clear). But elsewhere, it remains a major issue.

Most Threatened species occur in south-western Western Australia and in near coastal regions of eastern and southern Australia, as far west as the Eyre Peninsula. This pattern is largely due to those regions supporting the greatest biological diversity of native species coinciding with those areas which have been most intensively cleared and developed for agricultural purposes, particularly for cropping and stock grazing. (Source: Briggs and Leigh, 1996)

National summary of taxa in each conservation category

Distribution category	X	E	V	R	K	Total
1	32	2	2	0	163	199
2	33	240	468	825	1308	2874
3	11	59	238	745	905	1958
Total	76	301	798	1570	2376	5031

Distribution category:

- 1 - known from one collection only;
- 2 - geographic range in Australia less than 100 km;
- 3 - geographic range in Australia greater than 100 km.

Conservation status:

X - Presumed extinct: taxon not collected or otherwise verified over the past 50 years despite thorough searching in all known and likely habitats, or of which all known wild populations have been destroyed more recently. (Taxon can denote any genetic category such as genus or species.)

E - Endangered: taxon in serious risk of disappearing from the wild within 10-20 years if present land use and other threats continue to operate. This category includes taxa with populations possibly too small (usually less than 100 individuals) to ensure survival even in present proclaimed reserves.

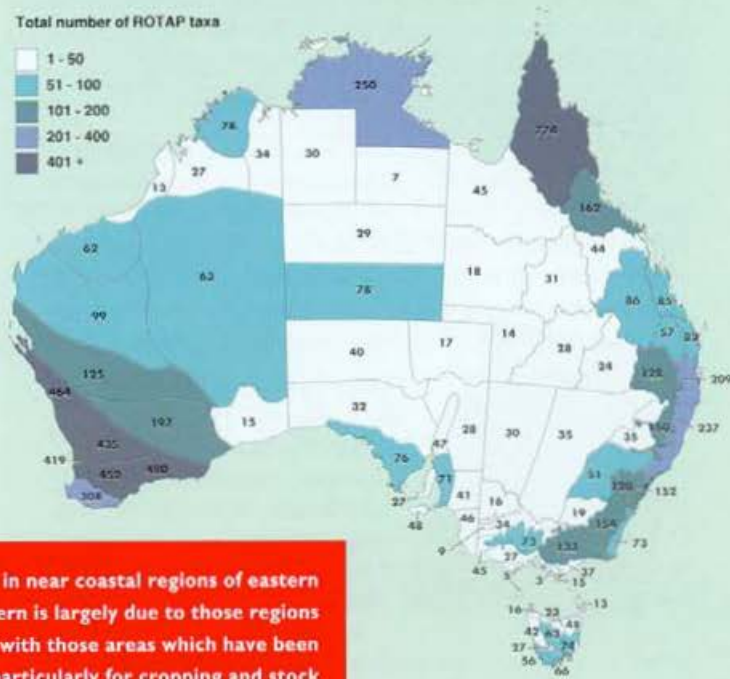
V - Vulnerable: taxon not presently Endangered, but at risk over a longer period (20-50 years) of disappearing from the wild through continued depletion, or which occurs on land whose future use is likely to change and threaten its survival.

R - Rare: taxon which is rare in Australia (and hence usually in the world) but which currently does not have any identifiable threat. Such species may be represented by a relatively large population in a very restricted area or by smaller populations spread over a wide range or some intermediate combination of distribution pattern.

K - Poorly known: taxon that is suspected, but not definitely known, to belong to one or the above categories. At present, accurate field distribution information is inadequate.

Source: Briggs and Leigh (1996)

Total numbers of Rare or Threatened taxa in all conservation categories



Fewer rabbits, more plants

PRELIMINARY data from South Australia's Flinders Ranges reveal the beginnings of a recovery among native plant species in the wake of rabbit calicivirus disease.

The rabbit calicivirus escaped from a trial on Wardang Island in Spencer's Gulf in October 1995. By November it had reached a rabbit-monitoring site in the Flinders Ranges. Within four weeks of its detection there, 95% of the local rabbit population had died. The population has recovered somewhat since then, but remains at about 10% of its original size. The number of perennial plants present at the site has increased by 26% since the virus arrived.

A research officer with the South Australian Animal and Plant Control Commission, Greg Muetze, says some perennial seedlings are being seen in the area for the first time in decades. Such species have only persisted in the region because of the longevity of adult plants.

But it may be several years before the slow-growing perennial plants of the semi-arid zone are safe from browsing animals. Moreover, the plant species that are returning are mostly those that are only

moderately palatable: many of the most palatable species are now so rare that they will rebound only slowly, if at all.

It's too early to gauge the long-term effect of lower rabbit numbers on our native plant species, and particularly those listed on the ROTAP list of rare or threatened species. But some effects are visible to the naked eye.

'In terms of general land condition, the impact has been extraordinary,' Muetze says. 'Six months after the last good rain, there continues to be an abundance of dry feed. This suggests the area is in good condition. In past years, the rabbits would have been getting stuck into things and we'd be seeing bare ground.'

To enable vegetation and land to recover, it is essential that when rabbits decline they are not fully replaced by increased stock numbers or by kangaroos or feral goats. In South Australia, maximum stock limits are set out in lease agreements. Within such limits, though, the easing of rabbit grazing pressure will give graziers more flexibility in the way they manage the land. This will be most apparent in drought, Muetze says.

Where is it now?

The August 1997 report of the national Rabbit Calicivirus Disease Monitoring and Surveillance Program shows that the calicivirus has spread over the southern half of Australia (including Tasmania), from Shark Bay in the west to Rockhampton in the east.

In general, the impact of calicivirus has been greater in arid and semi-arid areas (annual rainfall less than 300 mm) than on sites with higher rainfall. In contrast, many of the plant species listed in ROTAP occur in the higher rainfall areas of southwestern Australia, the eastern coastal fringe and far north Queensland.

Nobody expects the virus to deliver a miracle: it will not eradicate rabbits, and it may not even hold numbers down for more than a few years. The most significant impact on rabbit numbers can be expected where other means of rabbit control such as warren-ripping, fumigation and poisoning are carried out at the same time as RCD does its work. Rabbits could take many years to recover from such a concerted campaign.

'Six hundred thousand hectares of bush were cleared in the last year in Australia, most of it in Queensland,' says West.

This worries ecologists such as Jeremy Burdon.

'Clearing more land in Australia just doesn't make sense,' he says. 'We need to conserve what bush we have left.'

On the green-ink side of the ledger, one problem that might have been dealt a significant blow is rabbits. The effects of the rabbit calicivirus have been patchy, but rabbit numbers have declined dramatically in some regions. Might we see a resurgence of rare plant species if rabbit numbers come down and stay down? (See story above.)

'Certainly in Europe before myxomatosis came, many species had apparently disappeared from the downlands,' Burdon says. 'Myxo came, the rabbits disappeared and suddenly there was a

great flowering of orchids and all sorts of things that hadn't been seen for 20 or 30 years.'

Perhaps Australia's flora will experience a similar resurgence.

'That's what a lot of us hope,' says Burdon. 'If the rabbit goes, we may see a greener Australia.'

But maybe the key lies with the people who preside over the last remnant patches of bush: the farmers.

'It becomes very difficult for a government agency to manage these tiny pockets that are fragmented and spread all around the countryside,' Briggs says. 'A better way is to try to involve the landowners. They're there all the time. If they see a problem with stock getting through a fence then they're there to deal with it.'

Indeed, faced with massive land degradation problems, farmers are turning in large numbers to what has become known as the Landcare movement. This aims to combine tree-planting, the protection of remnant bush and less damaging farming practices to reduce land degradation and bring about more sustainable land management. It's as much a process of education as anything else.

'A lot of the people I meet aren't aware that 85% of Australia's flora is endemic to Australia,' Briggs says. 'They've never stopped to think about what they've got in their bit of bush. Often they're pretty amazed to think that this is the only place where a particular species occurs, in Australia or in the world. Quite often it has changed their attitude dramatically from one of ambivalence to one of pride, and a desire to look after what they've got.'

As Landcare grows, the strategy of conservation agencies is changing. Disappearing fast is the preoccupation with reservation:



Rare or Threatened Australian Plants draws together 17 years of research by taxonomists and ecologists, botanical consultants and amateur botanists. The 466-page publication lists 5031 plant taxa, their location and population status. Maps and tables summarising the data are included. It costs \$44.95 plus \$8 postage

and is available from CSIRO Publishing, (03) 9662 7500, fax (03) 9663 7555, email: sales@publish.csiro.au.

the 'lock-it-up' ethos. For a start, few agencies can afford to buy big chunks of land and then pay for their management. While the reserves that we do have will probably always be the safest havens for rare species and ecosystems, the focus is now shifting towards community participation and what is known as 'off-reserve' conservation.

Recovery plans have been developed for some of the most endangered species (see story at right). Where species occur 'off reserve', landowners are invited to join conservation efforts. The key is participation: few farmers will be cooperative if agencies wave a big stick at them. But they are often willing collaborators if a spirit of cooperation is developed.

The costs must be shared, too.

'We can't ask a small proportion of the community – the farmers – to pay for something that is a responsibility of the whole community,' Burdon says.

Compensation is a vexed issue. Governments are not always willing to spend tax dollars to save high-profile animal species, let alone an obscure plant species in somebody's back paddock. But often the costs are not high. Farmers and conservation agencies are, by necessity, expert in no-fuss, low-budget solutions.

The catalogue of rare and endangered plant species is a stark reminder that we urgently need many such solutions. It reads like a list of soldiers dead or missing in action.

The metaphor is oddly appropriate, because country cemeteries often house the last populations of what were once common species.

'Some of our rarest woodland habitats were once widespread throughout the sheep/wheatbelt areas of NSW and Victoria,' Burdon says. 'These days, the little patches of bush in old cemeteries are sometimes home to the last remaining fragments of those ecosystems.'

The good news is that there's still hope. Our rare and threatened species are clinging on; if the spirit is willing, we can resurrect our endangered species to their rightful places in the landscape.



The recovery plan for the Wee Jasper Grevillea includes fencing remnant populations and removing weeds such as blackberry and sweet briar.



The long road to recovery

IN 1992, the Federal Government passed a law which aimed to secure the status in the wild of endangered and vulnerable native plant and animal species and endangered ecological communities. A major part of this was the development and implementation of recovery plans.

A recovery plan describes all the actions necessary to support the recovery of a species or ecological community. A recovery team made up of people of relevant expertise is established to assist the lead agencies in the writing, implementation and monitoring of each recovery plan.

An example of a recovery plan in action is that concerned with the conservation of the Wee Jasper Grevillea (*Grevillea iaspicula*). Fewer than 250 individuals of this species survive at six sites, four of which are on private property. A recovery team involving local interest groups, four property owners, the local school teacher and scientists from agencies such as the NSW National Parks and Wildlife Service and Environment Australia has been working for several years to save the species.

The populations have been fenced off to protect against domestic grazing and programs to eradicate blackberry and sweet briar infestations have been undertaken. Additional plantings of the grevillea will be carried out on sites where numbers were particularly low.

About \$20 000 has been spent on implementing these activities. All the funds have gone to the employment of local contractors and community groups.

abstract

Improved knowledge of the conservation status of Australian plant species has contributed to an increase in numbers recorded as Rare or Threatened. Major threats include land-clearing, overgrazing, rabbits, weed invasion, climate change and altered fire regimes. Campaigns such as the release of the rabbit calicivirus, the Landcare movement and the implementation of specific recovery plans offer hope that some species may be saved.

Keywords: Native plants; Flora; Threatened species; Habitat decline; Plant populations; Genetic diversity; biodiversity; Pest control; Environmental management