War against weeds

Weeds have long been a seemingly intractable—and growing—problem affecting conservation lands and other areas, displacing natural plants and destroying biodiversity. A raft of new initiatives, however, means that authorities may be finally beginning to turn the corner in the war against weeds.

by Greg Keighery and Kate Brown

Everyone who gardens recognises that weeds are undesirable. In gardens, in crops and in the bush they compete for space and nutrients and crowd out desirable plants. In Australia, weeds are major threats to agriculture (costing more than $4 billion per year in control and lost production) and biodiversity (displacing irreplaceable native plants and animals).

Most weeds entered Australia with European settlement. Between 1829 and 2006 Western Australia gained 1233 species of naturalised flowering plants (weeds). Of these, 677 species (55 per cent) are environmental weeds, recorded from natural bushland areas. The rest are weeds growing in agricultural and man-made areas, such as crops, lawns and gardens.

These weeds comprise 12 ferns, 15 pines, 345 monocotyledons and 861 dicotyledons. Another 94 plant species are listed as semi-naturalised garden escapes, chiefly around Perth. Most WA weeds are herbaceous annuals or grasses, with the largest groups being the grasses (Poaceae), with 196 species; daisies (Asteraceae), with 115 species; peas (Papilionaceae) with 106 species; and 53 species within the iris family (Iridaceae).

Checklists published in 1994 and 2004 showed that new species of weeds were naturalising in WA at the rate of 10 per year over this period. Since more than 27,000 species of plants are known to be cultivated in Australia, this suggested we were facing a situation like New Zealand where weeds outnumber the natives! However, over the past five years, a series of initiatives has helped to slow the introduction of potential new weeds, identify potential new weeds, limit their availability, remove small infestations and limit the effect of major weeds.

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Main Bulbil watsonia (*Watsonia meriana* ssp. *bulbillifera*) invading the herb-rich shrublands and winter-wet claypans of Meelon Nature Reserve.
Photo – Kate Brown

Top Ruby dock (*Acetosa vesicaria*) is a widespread weed in the Pilbara. Major control measures by DEC, mining companies, main roads and the public are limiting its impact and spread.
Photo – Rob Olver

Above left Kate Brown monitors the effectiveness of grass-selective herbicides on *Tribolium*, a weedy grass targeted as part of biodiversity conservation initiatives in the Swan region.
Photo – Grazyna Paczkowska

Left Weeds and native plants compete with each other near Gingin.
Photo – Sallyanne Cousans

Right Arum lilies grow along a creek in Gingin.
Photo – Sallyanne Cousans

Below The garden succulents *Cotyledon orbiculore* (right) and *Aeonium haworthii* (far right) have established in parts of the south coast and are being targeted for eradication.
Photos – Greg Keighery

Recognising the menace

In 1999, a group of weed workers —Roger Cousens, John Dodd, Penny Hussey, Greg Keighery and Sandy Lloyd—pooled their collective knowledge and, with the aid of the Plant Protection Society and Lotteries Commission, produced a colour field guide to WA weeds. *Western Weeds* subsequently sold more than 5500 copies and has been revised for a third printing.

As recognition has grown of the threat posed by weeds to our unique biodiversity, so have the range of efforts aimed at lowering this threat. Several initiatives and changes in WA have begun to limit and then reduce this menace. These initiatives have provided the resources needed to begin tackling environmental weeds that threaten our unique bushland. New resources are being applied to prevent new weeds from entering or establishing in WA, to eradicate small infestations of potential weeds and to control major weeds.

Prevention

During the past decade, there have been major changes to Australia's quarantine laws aimed at preventing new weeds from entering the country. The Australian Quarantine Inspection Service now subjects all requests to import new plants to a screening test to determine if they have characteristics that could aid their escape from cultivation and become weeds. This has largely replaced the old prohibited list of known weeds. The rapid growth in computer databases and the internet has helped this process, providing ready access to information about the weediness of thousands of plants from all around the world.

New biosecurity provisions recently enacted mean that WA retains the capacity to exclude plants found elsewhere in Australia that could be weedy here. While physical surveillance will always rely heavily on the collective knowledge of the Department of Agriculture and Food staff, utilising the internet as a database on potential weeds was pioneered by Rod Randall at the Department of Agriculture and Food. Rod, as part of his work with the Cooperative Research Centre (CRC) for weed management, has produced the ultimate guide to the world's weeds, *A Global Compendium of Weeds*, published in 2002.

Equally important in preventing new weeds is to understand how they have been introduced and spread. We know that more than 60 per cent of our weeds were introduced as garden plants, so it seems obvious that this is still a major avenue for our current and next crop of weeds. Preventing new weeds from establishing—for example, by educating buyers and sellers about weeds—has been another major recent focus of many weed workers. A list of 'garden thugs' was coordinated by Rod, and the Nursery Association is actively encouraging the replacement of these species with less weedy alternatives. Legislation also has a role. For example, arum lilies (*Zantedeschia aethiopica*) have recently been banned from sale throughout WA. This species was introduced by early settlers as a garden plant and its seeds float down creeks and rivers, as well as being spread by birds, and choke out the natural vegetation.

Another major source of weeds has been the introduction of forage species for animal production. In cooperation with the CRC for Dryland Salinity and the CRC for Australian Weed Management, Lynley Stone of the Department of Environment and Conservation (DEC) has been developing weed risk management protocols for agronomists attempting to introduce new perennial forage species to help combat salinity. The protocols will ensure that new pasture plants stay in the paddock and don't escape into the bush. Lynley will subsequently develop weed risk assessments for each

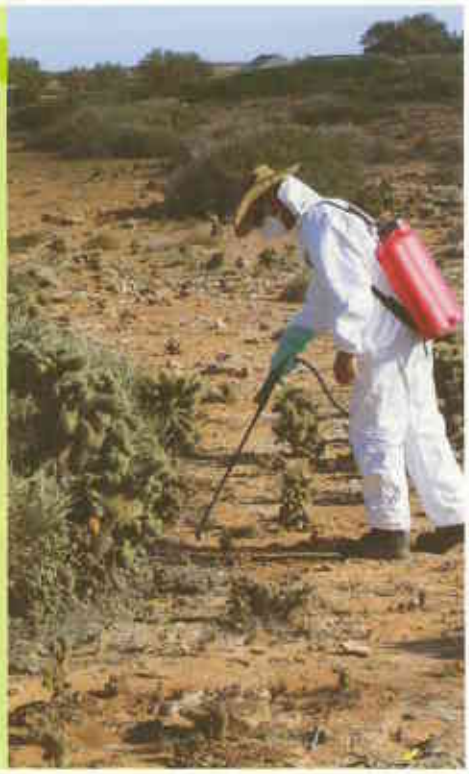
Eradicating Quobba cactus

The attack on Quobba cactus is a major conservation success story. Approximately 40 species of cactus are naturalised in Australia. Most of these (30 species) are in the broadly circumscribed genus *Opuntia*, which is currently normally divided into three genera: *Opuntia*, *Austrocylindropuntia* and *Cylindropuntia*. These weeds mainly infest areas of summer rainfall in semi-arid Australia.

Six taxa of *Cylindropuntia* (*C. imbricata* in NSW, VIC and SA; *C. tunicata* in NSW, SA, VIC and WA; *C. arbuscula* in NSW; *C. leptocaulis* in NSW and SA; *C. spinosior* in NSW; and *C. fulgida* var. *mamillata* in WA) are now naturalised in Australia. The genus is from southern USA and Mexico.

Quobba cactus (*Cylindropuntia fulgida*) is currently known from one infestation on Quobba Station—which lies 80 kilometres north of Carnarvon—on a low limestone ridge north of the homestead. The infestation covers between 12 and 20 hectares. Here, the cactus is locally abundant and is probably spreading via detached segments rather than by seed. Quobba cactus could be a major threat to the entire karst system of the North West Cape and the coastal limestone habitats between Shark Bay and Karratha, especially where fires are infrequent.

In eastern Australia some widespread species of *Cylindropuntia* are controlled by cochineal beetles, but this is not practical in WA. Conservation employees are killing the plants by means of the herbicide Garlon in Diesel or by pulling them up and burning them. Thanks to this work, the infestation has been greatly reduced and is on target to be eradicated by 2007.



State, and management guidelines to reduce weed risk during the breeding and selection process.

Another group in DEC's Science Division is checking the native species being trialled for forage, such as orange wattle (*Acacia saligna*), for their weediness and potential to cross-pollinate with local forms of these species. Orange wattle is a WA species that extends north to the Murchison River and east almost to Israelite Bay. It has become a serious pest in South Africa, where it was introduced to combat soil erosion, so it is best to be safe rather than sorry!

Staying ALERT

Removing weeds before they become widespread is the most cost effective means of reducing the future weed menace. While this has been long recognised as ideal, funding these programs has been difficult, since such weeds often occur on vacant lands that are not the direct responsibility of any land management or conservation body. However, three recent developments are proving highly effective in eradicating potential new weeds.

Weed control scientists have listed Australia's 20 worst weeds—Weeds of National Significance (WONS)—and a second list of potential weeds that need to be eradicated (ALERT list). While this has enabled some federal funding of these species, especially for biological control and targeting via the Natural Resource Management (NRM) process, many outbreaks of species on the ALERT list remained unattended.

This is changing. DEC recently received funding to employ 40 additional seasonal firefighters, who are available for weed control programs in the winter months. Programs for the conservation employees are set early each year, and more than 20 weed control projects are underway. The workers have been able to tackle several potentially serious weeds, including athel pine at Lake Boonderoo (see the box on page 43) and the Quobba cactus (see the box above). Since people and resources are usually the limiting factor in weed control, these additional employees are already making a major contribution.

Above Spraying Quobba cactus.
Photo – Scott Godley

Left A valley overgrown with introduced watsonia.
Photo – Sallyanne Cousans

The second development is the program of biodiversity conservation initiatives introduced in 2006 by the State government. The two-year, $15 million program comprises around 70 strategic projects targeting feral animals, weeds, biological survey and research, dieback and actions to recover threatened native plants, animals and ecological communities. Under the initiative, $1.7 million will be targeted to assist in removing 40 weed species—especially those nationally listed—across the State by whoever has management of the land and can carry out the program. Hopefully, over the next two years, this program will eradicate several weeds on the ALERT list (such as *Pelargonium alchemilloides*, several relatives of the bridal creeper and white broome) and reduce others, such as yellow soldiers (*Lachenalia reflexa*), to the point where eradication is feasible.

Conservation employees and biodiversity conservation initiatives in weed control are integrated by DEC's Michelle Widmer and Kellie Agar. This is facilitating coordinated activities against many widespread weeds across the department's administrative regions. For example, measures by Ian Wilson (Nature Conservation Coordinator in DEC's Donnelly district) to eradicate woody weeds such as acacias and Victorian tea tree from the karri forest are now being extended to control these weeds from Albany to Kalbarri.

Urban Nature

DEC recently established the Urban Nature program within its Swan region (encompassing Perth) to provide advice and assistance on bushland management, including weed control, to the numerous groups who manage remnant bushland in the region. This is urgently needed, as the region has the unfortunate distinction of having the largest number of weeds recorded from any natural bioregion (801 and 705 recorded for the Swan Coastal Plain and jarrah forest bioregions respectively).

The Urban Nature program is closely involved in the management of a number of regionally significant bushlands on the Swan Coastal Plain, and is undertaking research into how to best manage environmental weeds. The group provides advice on environmental weed management to DEC officers, local authorities, NRM and friends groups. It also prepares publications on environmental weed management, runs annual accredited training programs and organises specific workshops on weed management. In 2006, Urban Nature ran workshops on bulbous weeds and sharp rush. Proceedings and information sheets will result from the workshops.

A DEC project officer is currently undertaking a strategic review of environmental weeds in the Swan region for the Swan NRM group. This should result in robust ranking of all 1000 weeds recorded in the area, and control actions on six selected weed types.

The future

Cooperation and coordination at all levels of government and the public between scientists, managers, friends and practitioners is vital to hold back the weed menace. Fortunately, critically important resources—both human and financial—are also beginning to flow to this issue. We face new and occasionally daunting challenges in managing weeds on unallocated Crown lands and ensuring the implementation of the Good Neighbour Policy. However, the initiatives being undertaken acknowledge that weeds respect no administrative boundaries and are aimed at assisting and resourcing the coordination, cooperation and, most importantly, on-ground actions against weeds.

Athel pine at Lake Boonderoo

Athel pine (*Tamarix aphylla*) is a weed of national significance. A large, isolated infestation of this weed around the perimeter of Lake Boonderoo, with a total length of about 30 kilometres, is being removed in a joint project between DEC, Rangelands NRM, a local pastoralist and the Department of Agriculture and Food.

Lake Boonderoo is one of only two freshwater lakes in the Goldfields–Nullarbor region and provides an important habitat for waterbirds. The trees multiply rapidly and would take over the lake if left unchecked. This weed has caused enormous damage to the Finke River system in the Northern Territory, where it has infested 600 kilometres of the river system.

The eradication program, being carried out by a team of DEC conservation employees from Walpole, Perth, Kirup and Collie in the south-west, involves cutting the trees at ground level and spraying the stumps with herbicide. Removing this weed requires eight people to work for three weeks each year over three years. While this is a considerable investment, it should ensure the removal of the weed and the long-term protection of the wetland.

Above Athel pine along the shore of Lake Boonderoo.
Photo – Bill Muir

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