Good will and best practice – controlling oleander (*Nerium oleander*) in Parachilna Gorge, South Australia

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Summary Common oleander (*Nerium oleander*) is widely used for amenity plantings across Australia. Rarely does it become established as a weed. However, in some situations where permanent water is available, and a warm Mediterranean climate prevails, oleander can develop monocultures, displacing native vegetation, altering stream flow, and impacting on sensitive riparian ecosystems. All parts of the plant are toxic, posing health risks for those who handle it. *Nerium oleander* is difficult to control and treatments are limited due to the highly sensitive nature of riparian environments. On marginal land, the cost of control may exceed the resources available to landholders and local communities. Concerned about a local outbreak of oleanders in South Australia's Flinders Ranges, landholders, volunteers and contractors collaborated to systematically remove them. Herbicide trials were conducted to determine the most safe and effective control option. The community successfully sought funding to engage contractors and support volunteers. Over a 5 year period, tens of thousands of oleander stems were treated along a 13 km section of Parachilna Creek. A maintenance program has been devised, again with support from volunteers, to ensure that the creek remains free of *Nerium oleander*.

Keywords Oleander, riparian environments.

INTRODUCTION

Common oleander (*Nerium oleander* L.) is arguably Australia's most ubiquitous inland ornamental plant. A native of Northern Africa, Mediterranean Europe and SE Asia, *Nerium oleander* has become naturalised in many parts of the world, including Australia. More than 400 cultivars of *Nerium oleander* exist, with single and double-flowered varieties. Botanist David Symon from the State Herbarium of South Australia has suggested that single-flowered cultivars are responsible for oleander outbreaks in Australia (Barker 2006).

A low maintenance species, *Nerium oleander* has been planted in school-grounds, parks, at civic centres, in home gardens and nature strips across Australia. It responds well to pruning and makes a very effective screening plant. Whilst it thrives in warm, moist situations, once established, *Nerium oleander* becomes drought-tolerant. A successful plant on nitrogen deficient soils, *Nerium oleander* has become a highly valued ornamental throughout inland Australia, where soils are typically infertile.

Nerium oleander is among the most toxic of all ornamental plants (Covacevich *et al.* 1987). More than fifty toxins have been isolated, including cardiac glycosides, general cell toxins and the strychnine-like compound rosagenin. Oleander toxins affect the central nervous system, the muscular tissue of the heart and the gastro-intestinal tract. Despite its toxicity, *Nerium oleander* has been used in therapeutic preparations for more than 3500 years to treat a variety of conditions from asthma to venereal disease. In parts of Africa, an oleander-derived preparation is still used to induce abortion. The patented oleander extract Anvirzel™ is also used in Africa as a treatment for HIV-AIDS. There have been few documented cases of accidental death by oleander poisoning in Australia. Children below the age of five have been identified as the group most at risk from accidental poisoning through the ingestion of toxic plant material (Covacevich *et al*. 1987).

BACKGROUND

In Australia, invasion of natural areas by *Nerium oleander* is uncommon. Robinson noted an outbreak in a central Victorian riparian area after a flood event (Csurles 1998). Symon (2002) identified oleander as a potential environmental weed in the Flinders Ranges after a visit to Parachilna Gorge where he observed many flowering plants and seedlings. He noted that all flowering plants were of the single-flowered variety (State Herbarium records). In South Africa, *Nerium oleander* was identified as a riparian invader that threatened the biodiversity and water flows of the Gouritz River, Little Karoo, Western Cape Province (Siyabulela Project 2007). In South Africa, single-flowered oleander cultivars are declared weeds under the *Conservation of Agricultural Resources Act, 1983*. All trade in oleander seeds and cuttings is prohibited, plants cannot be propagated and where outbreaks occur, the land user must control them. *Nerium oleander* is not a declared weed in any Australian jurisdiction.

Parachilna Gorge is the only location in the Flinders Ranges, South Australia, where *Nerium oleander* has invaded natural areas. Although it is not known when oleanders became established in the gorge, an entry in Flora of South Australia, Part 2 (Jessop and Toelken 1986) confirms that it was not a pest plant in 1986. Only one record for *Nerium oleander* was listed for the Flinders Ranges at that time. However, there is no doubt that oleanders would have been growing as ornamental plants in most Flinders Ranges' towns and settlements when the entry was made.

Local landholders believe that garden plantings at Angorichina Tourist Village within Parachilna Gorge, was the likely source of the oleander invasion. The densest stands throughout the gorge were located adjacent to, upstream and downstream of the village. Dispersing as a garden escapee and establishing with all the silent stealth of a classic sleeper weed, oleander thickets were identified as a problem by the mid 1990s. In 1995, Michelmore observed 'thousands of plants' near Angorichina Tourist Village (State Herbarium record). The garden plants were removed from Angorichina Tourist Village a decade ago.

Oleander thickets extended their range through wind- and water-borne seed dispersal. They migrated both upstream and downstream of the likely source location. It is probable that prevailing south-westerlies promoted seed dispersal upstream, the feather-like seeds trapped within the confines of the gorge walls. Oleander densities increased around permanent springs and in areas with surface and sub-surface flows, primarily through vigorous suckering.

IMPACTS

The physical environment of Parachilna Gorge suited the rapid establishment of dense thickets of *Nerium oleander.* Seed germinated readily in the gravelly substrate of the creek bed. Ephemeral flood events and permanent spring-fed surface and sub-surface flows helped to both distribute and sustain oleanders. Warm sunny conditions for much of the year promoted continuous growth. Aggressive suckering developed, with some plants producing hundreds of stems. With each flood event, debris was trapped around the base of plants, gradually consolidating and held together by densely interwoven root masses. Over time silt beds developed as much as 2 m above the floor of the creekbed. Surface flows disappeared from some sections of the gorge. Although no attempt was made to ascertain the volume of water extracted from the system by the oleander biomass, the reappearance of surface flows within days of treatment suggest it was considerable.

It is highly probable that native riparian vegetation such as river red gums (*Eucalyptus camuldulensis* Dehnh), water bush (*Myoporum montanum* R.Br.), and *Cyperus* spp. were adversely impacted by competition for water resources, particularly during protracted dry spells. Oleander thickets displaced common reed (*Phragmites australis* (Cav.) Trin. ex Steudel) and cumbungi (*Typha domingensis* (Pers.) Steudel), species that provided cover and breeding sites for various inland waterbirds, including several species of duck and the clamorous reed warbler (*Acrocephalus stentoreus* Linné). Surface and sub-surface waters host diverse communities of aquatic macroinvertebrates that underpin a complex food chain. This aquatic system provides an important food resource for resident and nomadic bird species such as the white-faced heron (*Ardea novahollandiae* Latham). It is likely that the amount of habitat available for aquatic animals and riparian specialists was significantly reduced with the spread of oleanders through Parachilna Gorge.

CONTROL TRIALS AND RESULTS

By the late 1990s, landholders had begun to physically remove oleanders in an attempt to prevent them from breaching the gorge and establishing thickets in valuable run-on areas and swamps on the flanking plains.

The first control trial was undertaken in 2004, in response to landholders' growing concerns about the rapid rate and density of spread of oleanders through Parachilna Gorge. Rural Solutions, a public sector consultancy, formerly part of the South Australian Department of Agriculture, undertook the trial. The objective of the trial was to test the safety and efficacy of a suitable herbicide on a dense oleander stand adjacent to Angorichina Tourist Village. The herbicide Access™ (triclopyr 240 g L^{-1}, picloram 120 g L^{-1}) was selected. It was mixed with diesel at a rate of 1:60 and carefully painted onto all cut stems in a 400 m^2 control trial. All treated plants appeared to die. However, within 12 months most had resprouted from the root bole and were growing prolifically. A follow-up foliar spray treatment using Roundup® Biactive™ (glyphosate 360 g L^{-1}), was undertaken with no effect. It was concluded that the chemical mixture was neither effective nor suitable for use in the sensitive riparian environment.

In late 2004, a group of nine landholders and one local business established the Blinman Parachilna Pest Plant Control Project. The group successfully competed for funding with support from the South Australian Arid Lands NRM Group. Although the target plant was wheel cactus (*Opuntia robusta* H.L.Wendl), scope was built into the project to facilitate oleander control trials.

In 2005, the community engaged a contractor to undertake a series of trials to test suitable herbicides, application rates and techniques on oleanders in

Parachilna Gorge. Only herbicides identified as appropriate for sensitive riparian environments were considered. Eleven foliar spray treatments using glyphosate (Roundup Biactive) and two cut and swab treatments (Vigilant® and Biactive) were tested.

A sample of fifty plants was used for each of the 11 foliar spray treatments. Dosage rates ranged from 100 to 2000 mL 20 L^{-1} water. All foliar treatments failed. At the weaker end of the spectrum, no visible effects were observed. Stronger application rates stressed plants but all recovered. In the first cut and swab treatment, Vigilant (a pre-mixed gel containing 5% picloram) was used. A slow release product, Vigilant was developed in New Zealand specifically for use in very sensitive environments. A brushcutter was used to cut 272 plants. A 5 mm layer of herbicide was applied as recommended, using an applicator pack. After 3 months most plants had resprouted. The best results were achieved where plants were cut very close to the ground. In the second cut and swab trial, the registered herbicide Roundup Biactive was used on 241 plants. Plants were cut low to the ground and swabbed using neat glyphosate applied with a weed wand. After 3 months 96% of treated plants had died, including all small and medium plants. Access to the bases of some large plants had been impeded by flood debris. Results were enhanced by removing debris, cutting stems lower to the ground, drilling an 8 cm hole through the stem stub into the root bole and filling with neat glyphosate. This methodology was adopted for the project. Of tens of thousands of stems treated in this way over 5 years, less than 50 stems have regrown.

COLLABORATION AND FUNDING

Finding a treatment that was both safe and effective was a huge breakthrough. The next challenge was affordability. In marginal pastoral country, the cost of delivering weed control is often far greater than the value of land. This is the case in the Flinders Ranges where control of pest species like wheel cactus and oleander is well beyond the resources of individual landholders and the small communities to which they belong. Demonstration trials had revealed that control of oleanders was going to be very labour intensive. With remote area contractor rates at \$65 h^{-1}, it would be most unlikely that the community could attract sufficient funding to engage contractors to treat the entire infestation.

Regular visitors to the Flinders Ranges, a Blackwood Church of Christ group had become alarmed by the rapid spread of *Nerium oleander* through Parachilna Gorge. The group offered to partner with the Henery family of Alpana Station to eradicate the oleander infestation. From 2005 to 2009, the volunteers visited each autumn and spring donating more than 100 days of labour annually. The group was given inductions in safety and treatment methods. Where possible, contractors treated the densest thickets, leaving scattered stands for the volunteers. In this way, morale was maintained, with volunteers seeing appreciable gains in control after each visit. By 2009 access had become an issue. As they progressed upstream, volunteers had to walk several kilometres to reach the work site.

Over the 5 year life of the project, the community successfully bid for targeted oleander control funding valued at \$72,489. This comprised: \$3000 in 2006 to part-fund herbicide trials (Rangeland Action Project); \$24,543 in 2008 to engage contractors to treat dense thickets adjacent to Angorichina Tourist Village (Round 9 Envirofund); \$15,000 in autumn 2009 to engage contractors to work alongside volunteers to treat dense thickets (Pest Management and Rangeland Rehabilitation Program, SAAL NRM); \$9946 in June 2009 to provide support for volunteers (Complimentary State NRM Program); \$20,000 in spring 2009 to engage contractors to treat remaining plants in areas where access was difficult for volunteers (Pest Management and Rangeland Rehabilitation Program, SAAL NRM). Funding was matched by an in-kind volunteer labour contribution of \$88,000. At a shared cost of less than \$200,000, a 13 km outbreak of oleander was controlled. The community has now been able to move from a funding-dependent position, into a maintenance program that can be delivered at no further cost to taxpayers.

RISK MANAGEMENT

In those countries where oleanders originate, strong oral traditions provide cultural insurance against accidental poisoning. However, in countries where people and oleanders have no shared history, the risks of accidental ingestion or inhalation of toxic substances are increased. The provision of public, volunteer and contractor safety was a key consideration for the community.

As oleanders are known to strike from cuttings, it was imperative that all cut stems were burned so that none would reshoot. To minimise the risk of accidental inhalation of toxic smoke, this work was only undertaken by contractors. Volunteers stockpiled cut material at intervals in the work areas. The cut stems were left to dry for 6–8 weeks and were then burned by contractors on suitably calm days. Where possible, seedpods were gathered in bags before they split and they were burned with stems.

The Flinders Ranges oleander outbreak occurred in a popular camping and bushwalking area, visited by families from mostly urban areas. Campfires are a valued part of the bush-camping experience and firewood is collected around camping sites. When the oleander program began, visitor safety was identified as a significant risk. Cut stems, stockpiled along dry creek beds, would provide a ready source of firewood for campers. The long dried stems would make ideal forks for the ritual toasting of marshmallows and dampers. Toxic smoke from oleander-fuelled campfires would create a high level of risk for families. A risk assessment was undertaken and a communications strategy was developed. Laminated signs identifying oleanders and their toxic properties were posted at the Angorichina Tourist Village shop and at popular camping sites throughout Parachilna Gorge. The proprietors of the shop and contractors involved in control, were encouraged to interact with visitors, particularly during school holiday periods, and share information about the risks. Over the 5 year life of the project there were no instances of accidental poisoning of visitors, contractors or volunteers by ingestion or smoke inhalation.

CONCLUSION

Where major weed invasions occur in remote areas, the cost of control may be prohibitive and logistics can be extremely challenging. Small communities in sparsely populated landscapes, where landholdings are large, but returns often meagre, do not have the resources to control major weed outbreaks. But with a measure of funding, careful management, strong and effective communication systems, vigilant OHWS procedures, and collaboration between skilled contractors, dedicated landholders and committed volunteers, effective control programs can be delivered. The Parachilna Gorge oleander control project is an outstanding example of what engaged communities can achieve. At the 2009 South Australian Landcare Awards, the Blinman and Parachilna communities received the Community Group Award for their efforts in controlling oleander and wheel cactus in the Flinders Ranges.

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REFERENCES

Barker, J. (2006). Weed watch, Volume 2, No. 13. Newsletter of the Cooperative Research Centre for Australian Weed Management.

Csurles, S. and Edwards, R. (1998). Potential environmental weeds in Australia. National Weeds Program, Environment Australia, Canberra.

Covacevich, J., Davie, P. and Pearn, J. (1987). Toxic plants and animals: a guide for Australia. (Queensland Museum, Brisbane).

Jessop, J.P. and Toelken, H.R. (1986). 'Flora of South Australia, Volume 2'. (D.J. Woolman, Government Printer, Adelaide).

Van Vuuren, P. (2007). Siyabulela booklet, making a difference to people and countryside. (Cape Nature, Cape Town).