

A model for state wide co-ordinated management of invasive cacti

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Summary Opuntoid cacti management in South Australia is clustered under the banner of the leading invasive species – wheel cactus (*Opuntia robusta* H.L.Wendl. ex Pfeiff). Early in 2008 a State Opuntia Taskforce was formed in cooperation between four Natural Resources Management Boards, statutory bodies who administer the *South Australian Natural Resources Management Act, 2004* and the NRM Biosecurity Unit of the Department of Water, Land and Biodiversity Conservation in South Australia. The intent of the task force is to raise visibility and improve management and coordination of opuntoid cactus species across natural resources management jurisdictional boundaries.

Keywords Cactus, *Opuntia*, natural resources management.

INTRODUCTION

Introduced opuntoid cacti in Australia have increasingly been recognised as invasive weeds that create significant impacts on the environment and pastoral enterprises (Greenfield and Nicholson 2007). High densities of opuntoid cacti can render land unsuitable for grazing, with injury to stock and stock handlers particularly shearers, difficulties in mustering operations, and reduced production values through contaminated wool and damaged hides from barbs and spines.

Environmentally, opuntoid cacti compete with endemic species by reducing biodiversity and reducing aesthetic values of landscapes. In the semi-arid region of South Australia the current extent of opuntoid cacti is conservatively estimated at over 930,000 ha, with the full potential for expansion unrealised (Harvey 2009). Due to the distribution of the cacti over four natural resources management boards, there is a need to establish cooperative management actions to effectively reduce the impacts and spread of this weed.

To this end a State taskforce has been established to enable more strategic cross-regional management of *Opuntia* species in South Australia. The leading invasive *Opuntia* species in South Australia is wheel cactus (*Opuntia robusta* H.L.Wendl. ex Pfeiff). The impact and potential distribution of wheel cactus are particularly concerning in South Australia, and this

species is regarded as a highly significant invasive plant by the community and the NRM boards. This species has become the ‘banner species’ for the invasive opuntoids genera as it is the most common species in South Australia with the largest infestations. For the purposes of this paper wheel cactus is representative of all the opuntoid cacti.

BACKGROUND

The 20 Weeds of National Significance (WoNS) in Australia have strategies for control priorities at a national scale and Australian Government funding to implement these strategies (Commonwealth of Australia 2008). For weeds with significant priority at state level, but are not nationally significant, the taskforce model provides a vehicle for improved cross-regional management. It provides state-wide coordination of policy and control strategies, whilst also maintaining linkages with community through the NRM boards, a mechanism for networking at a national scale and high profile of the species.

Wheel cactus is recognised as a significant invasive weed in South Australia but is not classified as one of the WoNS (Thorp and Lynch 2000). Therefore wheel cactus is not specifically assisted at a national scale, and management is administered by the States. The establishment of a State *Opuntia* taskforce that represents a number of agencies working together is an initiative that attempts to achieve the benefits of high level strategic coordination.

INVASIVE CACTI

The invasive cacti group in the subfamily Opuntioideae of the Cactaceae family includes wheel cactus and 21 other cacti species, all of which are of concern, such as prickly pear (*Opuntia stricta*) and devil’s rope (*Cylindropuntia imbricata*). This group is commonly referred to here as ‘opuntoid cacti’. The difficulty of identifying invasive cacti species and understanding their classification has meant some species have been overlooked as belonging to the opuntoid cacti requiring strategic management. Recently, species in the *Opuntia* genus have more accurately been classified into 16 genera of which three are known to be invasive

in South Australia – *Opuntia*, *Cylindropuntia* and *Austrocylindropuntia* (Johnson *et al.* 2009). A State level management plan has now been prepared for the opuntoid group of cacti (Harvey 2009).

The invasiveness, potential impact and current density of wheel cactus along with the lack of biological control options currently in Australia, rank it the most significant member of the opuntoid group in South Australia. Wheel cactus is native to high-altitude regions of central and northern Mexico (Williams 2006). The opuntoid group is well adapted to the semi-arid environment of southern Australia and was valued as a hedge and garden plant in the years following settlement of pastoral districts. The Opuntoid cacti have three main loci within the State where they are now naturalised – in the central Flinders Ranges, the Parnaroo hills east of Peterborough and around lower Lake Torrens. Additionally they occur in low density, and very locally at higher density, in scattered locations around most of the semi-arid areas of South Australia (Figure 1).

SIGNIFICANCE

Like a number of other weeds that have a negative impact on the environment, the gradual expansion of wheel cactus was largely unnoticed in South Australia until relatively recently. Concern raised by the small Blinman-Parachilna community in the Flinders Ranges in 1999, initiated a locally-driven control effort (L. Edmunds pers. comm.). The landscape at risk is mountainous, rugged and spectacular, one of eight Australian landscapes designated an ‘Iconic National Landscape’ (Tourism Australia 2009). As this infestation in the Flinders Ranges is a socially higher valued site than other locations; this has assisted leveraging awareness of the potential impacts associated with wheel cactus expansion.

Wheel cactus is declared under the South Australian *Natural Resources Management Act, 2004*, as a species of prickly pear (*Opuntia* spp.). An assessment of weed risk and feasibility of containment has been undertaken at both State and regional scales using the SA Weed Risk Management System (Minister for Environment and Conservation 2005). These assessments identify risk categories from ‘medium’ to ‘very high’ for wheel cactus in rangelands landscapes (Harvey 2009). Opuntoid cacti use a specialised photosynthetic biochemical pathway (crassulacean acid metabolism) that minimises moisture loss and provides a competitive advantage under arid conditions (Nefzaoui and Ben Salem 2002, cited in Williams 2006) that leads to gradual infilling, resilience and dominance.

Opuntoid cacti are potentially able to spread through large parts of the southern rangelands. They

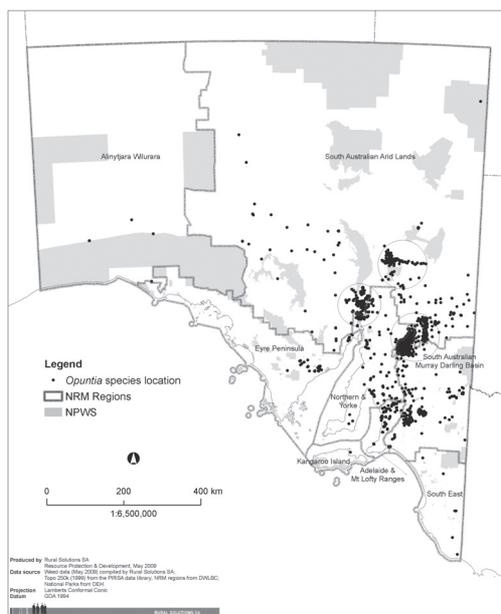


Figure 1. *Opuntia* species distribution in South Australia showing the three major areas of infestation (modified from Harvey 2009).

reproduce from fallen cladodes (pads) (Angus 2005, cited in Williams 2006) or from seed that is spread by birds and other animals that feed on the fleshy fruit.

The level of concern in relation to environmental and production ramifications of permitting wheel cactus to expand its range and establish at high density escalate when cost of control is considered. Costs have been estimated at \$4.50 per plant on average (Edmunds 2006), with additional cost incurred in treating new recruits that inevitably follows the initial removal.

STATE TASKFORCE

The concept of a cross-regional taskforce was initiated by the SA Arid Lands Natural Resources Management Board. The taskforce establishes a multi-regional collaborative forum that can undertake activities beyond the capacity of individual regional authorities with respect to invasive cacti. It was envisaged as a vehicle that could coordinate uniform policy, advocate the significance of the problem and develop a state-wide strategic approach to control (Table 1). In particular, the taskforce was established to overcome barriers difficult to resolve at a regional scale. Membership consists of representatives of four natural resources management regions and a State agency technical

advisor. Taskforce members report directly to each of the organisations represented.

In its inaugural year the taskforce developed a state wide distribution map for the opuntoid species. Existing distribution mapping was haphazard and generally at a regional scale. The lack of a state-wide distribution map was recognised as a limitation in planning cross-regional activities and in advocating the extent of the problem on a larger scale. A single map has been generated from collated data supplied by each regional authority. As a reliable estimate of area infested was not available, the taskforce also undertook to collate this information and estimated over 930,000 ha is infested by opuntoids in South Australia (Harvey 2009) In 2009–2010 the taskforce has successfully obtained state funding to conduct coordinated on-ground works in all four regions, facilitate a national invasive cacti forum in Adelaide and produce a poster for identifying the ten most common opuntoid cacti in South Australia.

DWLBC is developing a management plan to guide implementation of opuntoid policy across regions. The taskforce was able to function as a reference group and provide practitioner input to the plan. Wheel cactus has been listed by the Natural Resources Management Standing Committee as a candidate for biocontrol (Australian Weeds Committee 2008) and the taskforce has initiated preliminary work, including climate matching and initial surveys for suitable agents in the native range in Mexico. By building networks with key researchers and facilitating a national invasive cacti forum, awareness has been raised and mechanisms to support project development have been established.

THE MODEL

Species cluster It is significant that the taskforce is not limited to one cactus species. Instead the model that has been adopted utilises the comparatively higher profile of wheel cactus to develop strategic management of invasive opuntoid cacti in general. This model enables strategic principles to be based on a leading invasive species then applied to a group of weeds with commonalities. It is envisaged that by addressing multiple species within a management group, resources can be used with greater efficiency. The ‘species cluster’ concept is appropriate where several closely associated species have similar distribution and management practices for control do not differ substantially. If this model can demonstrate effective management of a species cluster, a cross-NRM operational management group could similarly be applied to the State’s other primary weed of concern, silverleaf nightshade (*Solanum elaeagnifolium*), as the banner species for the summer-active deep-rooted perennial weeds.

Community linkages The taskforce member regional bodies are each governed by a community-based board that is optionally supported by local groups. The community-based natural resources management structure reflects increasing recognition of the integral requirement for participatory decision making. A function of the regional NRM Boards is to ‘provide mechanisms to increase the capacity of people to implement programs or to take steps to improve the management of natural resources’ (sec. 29(1)(c), *Natural Resources Management Act, 2004*). A strength

Table 1. Challenges faced and managed by taskforce.

Challenge	Action
Lack of co-ordinated control actions across regional boundaries	Taskforce meets bi-monthly to plan co-ordinated programs and apply for funding for on-ground works. A recently-funded program has led to co-ordinated on-ground control of opuntia.
Lack of data on opuntoid species that are consistent across regions	Taskforce has facilitated each NRM region to conduct surveys of <i>Opuntia</i> infestations, share information and produce a state-wide distribution map.
Policy for management actions poorly aligned in different regions.	Taskforce enables development of policies to be recommended to the various NRM Boards and State Opuntoid Cacti Management Plan –draft
Knowledge gaps in options for control (particularly biological control)	Taskforce provides a venue to discuss what research or trials has been undertaken. It has unsuccessfully sought funding to undertake climate matching and initial surveys for suitable agents in the native range in Mexico.
Low capacity of individual NRM Boards to advocate the issue	Taskforce has the ability to raise a high profile and voice to state and federal governments for financial assistance. A recent outcome is to produce a poster of the ten most common <i>Opuntia</i> species in the state for extension purposes.

of the taskforce model is its integral commitment to engagement through the regions, and through community. As such an ongoing consideration of the taskforce is to foster processes for community engagement in opuntoid management that result in higher levels of education and ultimately effective management of opuntoid cacti.

Local 'cactus champions' are invited to regionally held meetings and the contributions of these individuals has emphasised the importance local communities place on preventing opuntoid cactus spread. It has also highlighted their need for support from regional and State authorities to achieve that goal. The Blinman-Parachilna Pest Plant Control Group in the Flinders Ranges is an example of investment through a community group that the taskforce recognises has contributed to on-ground opuntia control and also increased community capacity for strategic management in the longer term.

National network To enable linkages that would address issues more effectively managed at a national level the taskforce collaborated with the Rangelands NRM Alliance; a national alliance of NRM bodies in Australia, to convene a national forum for invasive cacti in 2009. This precipitated the establishment of a national network for practitioners interested in furthering decisions related to invasive cacti at a national scale.

CONCLUSION

Weeds that are significant at a State level require co-ordination of policy and strategy that is at a strategic scale but also closely linked to regional communities. The South Australian Opuntia Taskforce, a weed group with common management goals and practices for the opuntoid cacti, is a model that achieves these objectives. The taskforce has adopted the highly invasive species wheel cactus, as a banner species to provide strategic direction and highlight other species within the genus that have similar characteristics. The success of this model is illustrated by the development of key management tools including a state wide distribution map and State management plan. These foundational achievements link high level strategic planning with local community engagement in cactus management.

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