

District Weed Management Guide Marla-Oodnadatta



November 2023

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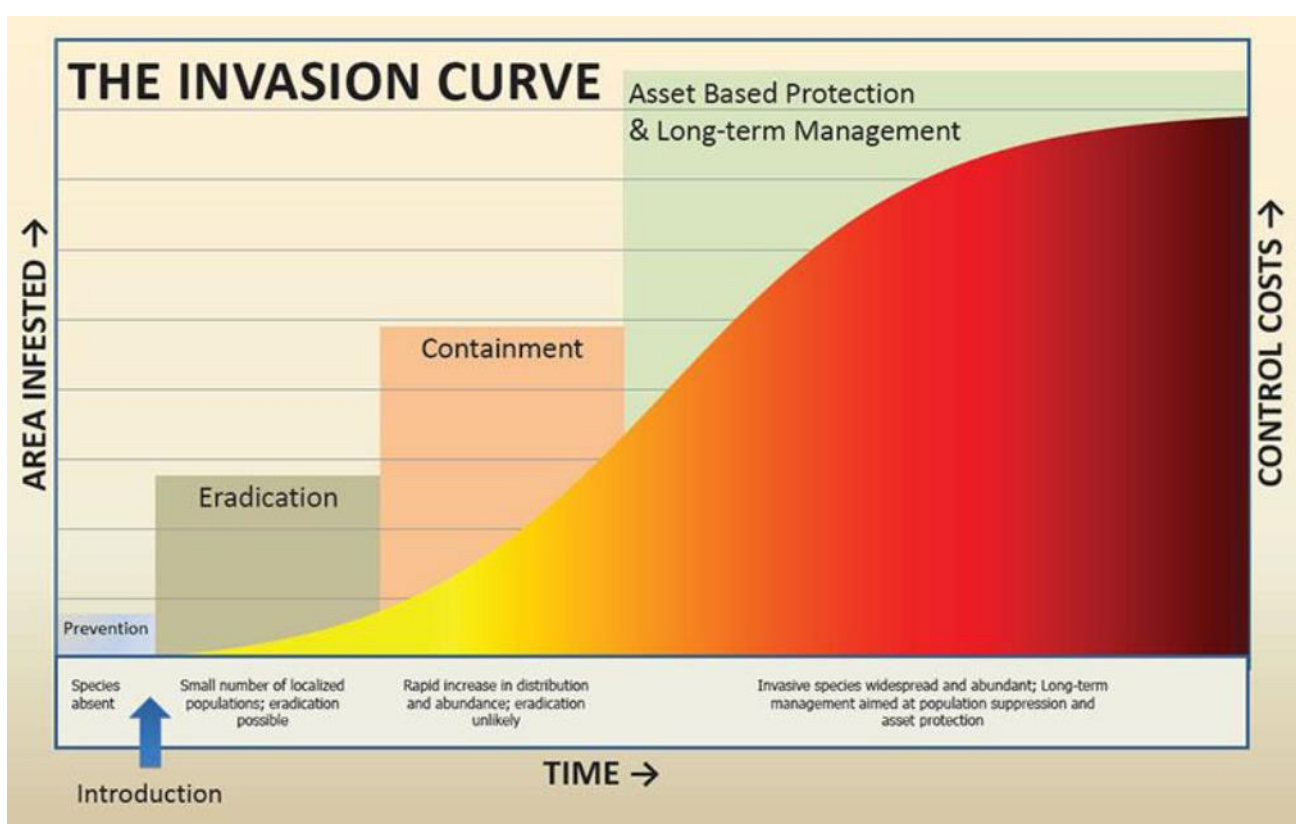
Photo front page: Buffel grass (Credit: P. Hodges), Coral Cactus (Credit: B. Shepherd), Athel Pine (Credit: B. Shepherd)

Purpose of the Guide

This guide provides information on priority weeds in the Marla-Oodnadatta District within the SA Arid Lands (SAAL) Landscape Board region. The intent is to guide prioritisation of weed management activities within the district over the next five years.

This document outlines management actions that landholders and organisations can implement within the District with the aim to reduce the current and potential impacts of priority weeds. These management actions, outlined for each of the priority weeds, are in accordance with South Australian State policies for declared weeds and the SAAL Landscape Board regional weed policies.

It also provides information regarding the known locations, possible threats, impacts, policy and monitoring activities for each of the priority weeds and provides a link to current best practice control methods.



Weed species included in this guide are at differing stages on the invasion curve. All of the weeds included have a demonstrated ability to rapidly expand their distribution given favourable seasonal conditions. Preventing the establishment of new infestations and eradication of localised populations is considered the most efficient use of resources. Conversely, trying to control widespread, well-established, persistent weeds can quickly exhaust resources. Keeping this in mind we have sought to prioritise weeds that can be controlled before they become too widespread to contain.

The District groups can be influential in the implementation of on-ground land management programs within their district. By following this guide, landholders, group members and organisations can develop proactive weed management programs' within their district for the long term protection of its environmental and productive assets.

Role of the Landscape Board

The SA Arid Lands Landscape Board have a strong commitment to weed control and have a responsibility under the Landscape SA Act 2019 to ensure this is carried out by landholders across the region.

Weed species that are declared under the Landscape Act requiring landholders to control on their land can be found at https://www.pir.sa.gov.au/biosecurity/weeds/landholder_responsibilities.

The Board staff are available to provide advice and assistance on weed issues and coordinate projects addressing identified priority weed control when funding is available.

Roadsides Management

Road reserves are a recognised pathway for the introduction and movement of declared plants. It is a priority of the Marla-Oodnadatta District to stop the establishment and minimise the spread of weeds by managing road reserves through a systematic inspection and strategic control regime.

The Landscape Board is responsible for the control of declared weeds on public roadsides outside of townships and may recover costs from the adjacent landholder. Further information on management of roadsides can be found at https://www.pir.sa.gov.au/_data/assets/pdf_file/0009/388593/manual-for-roadside-weed-management.pdf

Limited resources determine that not all declared plants will be managed on road reserves to the same levels. A plant's level of management will be determined by the Weed Risk Assessment system and the potential threat that it poses to the adjoining land-use.

The following plants have been identified as priorities for roadside control in the Marla-Oodnadatta District:

- Buffel grass

New Infestations or Unknown Weeds

Controlling new infestations early provides the best likelihood of eradication from your property and be achievable at the lowest cost. If you find a new infestation of a weed you haven't had before or a weed that you don't know, the Landscape Board would like to know about it. You can contact the SA Arid Lands Landscape Board on (08) 8429 9666 and ask for the Community Landscape Officer for your District or the Biosecurity Officer.

If you could provide the following information when you call, this will help us assist you:

- Your name
- Name of property (if applicable)
- Paddock name (if applicable)
- GPS location or description of location
- Description of weed
- Extent of weed
- Description of site where weed is located

It would also help if you could take some photos of the weed. The Officer you speak to will be able to provide an email address for the photos to be sent to. We will then attempt to identify the weed and if we don't know what it is, we will forward the information and photo to the Weeds Botanist at the State Herbarium.

Marla-Oodnadatta District

The Marla-Oodnadatta District covers an area of approximately 132,000 square kilometres in the north-west pastoral region of South Australia. The District is bounded by the Simpson Desert and Lake Eyre on the east, the Great Victoria Desert on the west and the Northern Territory border to the north. Clay pans, red sand-hills, gibber, creek lines, floodplains, mesas, plateaus and weathered hills are all features of the District. The elevation ranges from 647 metres above sea level at Mount Chandler in the north-west of the District to as much as 15 metres below sea level in parts of Lake Eyre. Population density is extremely low with Coober Pedy, the major service centre for the District, the exception with a population of 3,500. The other largest towns in the District are Oodnadatta with a population of 230 and Marla with a population of 240.

The climate is characterised as hot to very hot, dry summers with maximum temperatures averaging 36-39°C and cool to mild, dry winters with maximum temperatures averaging 18-24°C. Temperatures in the sand hills are often hotter than the plains, rising to the high 50°C range in summer. In winter the temperature can drop well below freezing overnight. Rainfall averages for the District are between 150 mm in the southeast to 225 mm in the far northwest and average evaporation can be around 3,500 mm/year. The region can experience prolonged dry periods of no significant rain and flooding summer rains.

The landscapes which characterise the District include gibber tableland and mulga woodland. The gilgai gibber tableland supports chenopod shrubland vegetation. These tablelands are dissected by creeks, which form wide braided channels as they flow east towards Lake Eyre. Gidgee, coolibah and river red gums follow creek lines. Mulga woodland or sand-hill cane-grass is associated with sandier soils and sand dunes. Annual vegetation is highly dynamic, ranging from a flush of brilliant green, after rains, to an appearance of parched dusty land during dry times.

Ongoing access and availability of ground and surface water are essential for human occupation, continued utilisation of the land's resources and the success of the pastoral industry. The best quality groundwater

occurs in the main aquifer of the Great Artesian Basin (GAB). Due to the lower relief, the free flowing bores and mound springs occur in the eastern part of the District. Further to the west there is not enough pressure in the aquifer to cause the water to flow to the surface. Apart from the main GAB aquifer, there are few sources of useable groundwater. In the sandy dune country, good quality groundwater can be found at shallow depths adjacent to the major watercourses (e.g. the Alberga and Hamilton Rivers). Natural waterholes occur along major and some minor drainage lines. Water lasts in many of these waterholes for six months or more, with some lasting over 12 months. Many dams have been constructed throughout the District wherever good clay and clay silt beds are found. The high annual evaporation rate in the District significantly reduces the available water in surface catchments.

The dominant land use is beef cattle pastoralism, with some small areas dedicated to opal mining. Tourism is a growing industry in the District particularly for the two formal conservation reserves, Witjira National Park including Dalhousie Springs and Wabma Kadarbu Mound Springs Conservation Park. The arid climate makes any other form of agriculture unviable. Most of the District is held under Pastoral lease, with the exception of the National Parks, the Pitjantjatjara Aboriginal Land in the north-west and the Coober Pedy Precious Stones Reserve in the south. Several Aboriginal communities are located within or just outside the District. The Breakaways reserve is located within the District, just to the north of Coober Pedy.

The main land management issues in the District are centred on pastoralism, mining and tourism. They include the maintenance of native pastures, pest animal and plant control, wind and water erosion and mine site rehabilitation.

Declared Weeds

The weeds identified as priorities for the Marla-Oodnadatta District dealt with in this guide are declared weeds under the *Landscape SA Act 2019* and demonstrated to be regional threats where their management is a strategic option.

Weed risk assessments have been undertaken by the SAAL Landscape Board on each of the priority weeds. This process determines a weed's risk as low, medium or high, in a particular land system by assessing the weeds invasiveness, impact and potential distribution. The management guide for each weed was identified using the assessment of each weed's risk category in the table on the following page.

Alert Weeds

These declared weeds have not been sighted in the Marla-Oodnadatta District. However, there have been infestations of them in neighbouring district(s) and the threats they pose are significant. If you discover any of these plants in the Marla-Oodnadatta District please contact SA Arid Lands Landscape Board on (08) 8429 9666 immediately and report the location. The following links are provided for information and identification:

- [African rue \(*Peganum harmala*\)](#)
- [Innocent Weed \(*Cenchrus longispinus*\)](#)
- [Noogoora burr \(*Xanthium strumarium*\)](#)
- [Parkinsonia \(*Parkinsonia aculeata*\)](#)
- [Prickly acacia \(*Vachellia nilotica subsp. indica*\)](#)

Established Weed Species

Weed species that are widespread and/or established, will be managed if opportunity arises through project funding or on a case by case situation, with the same objective as this plan. Landholders are encouraged to contain any weed on their land to prevent further spread. The following links are provided for information, identification and/or policies:

- [Annual beardgrass \(*Polypogon monspeliensis*\) – Not declared](#) (See Appendix 1)
- [Date palm \(*Phoenix dactylifera*\) – Not declared](#) (See Appendix 1)
- [Mimosa bush \(*Vachellia farnesiana*\) – Not declared](#) (See Appendix 1)
- [Neurada \(*Neurada procumbens*\) – Not declared](#) (See Appendix 1)
- [Rubber bush \(*Calotropis procera*\) – Not declared](#) (See Appendix 1)
- [Wards weed \(*Carrichtera annua*\) – Not declared](#) (See Appendix 1)

Priority weeds in the Marla-Oodnadatta District

Priority Weed	Management Action	Distribution in the District	Description of Management Action
Athel Pine	Protect sites	Limited	Prevent spread of the weed species to key sites/assets of high economic, environmental and/or social value. See page 10 for more details.
Buffel Grass	Manage weed	Common	Reduce overall economic and/or social impacts through targeted management. See page 14 for more details.
Cactus species (<i>Cylindropuntia</i> spp.)	Destroy infestations	Limited	Significantly reduce the extent of the species. See page 17 for more details.
Khaki Weed	Destroy Infestations	Limited	Significantly reduce the extent of the species. See page 24 for more details.

Definitions of management guide aims

Management Action	Aims
Alert	<p>Species that are not known to be present in the management area and present a significant threat if permitted to enter and establish.</p> <p>Aims to prevent the species arriving and establishing:</p> <ul style="list-style-type: none">• Prevention of entry to management area• Ongoing surveillance for incursions• Training & awareness activities for the community to enable early detection
Eradicate	<p>Aims to remove the species:</p> <ul style="list-style-type: none">• Detailed surveillance & mapping to locate all infestations• Destruction of all infestations including seed banks• Prevention of entry to management area and movement within• Must not be grown and all cultivated plants to be removed• Monitor progress towards eradication
Destroy	<p>Aims to significantly reduce the extent of the species:</p> <ul style="list-style-type: none">• Detailed surveillance & mapping to locate all infestations• Destruction of all infestations, aiming for local eradication at feasible sites.• Prevention of entry to management area and movement and sale within• Must not be grown• Monitor progress towards reduction
Contain spread	<p>Aims to prevent the ongoing spread of the species:</p> <ul style="list-style-type: none">• Surveillance & mapping to locate all infested properties• Control all infestations, aiming for a significant reduction in weed density• Prevention of entry to management area and movement and sale within• Must not allow to spread from cultivated plants (if grown)• Monitor change in current distribution
Protect sites	<p>Aims to prevent spread of the weed species to key sites/assets of high economic, environmental and/or social value:</p> <ul style="list-style-type: none">• Weed may be of limited current distribution but only threatens limited industries/habitats (lower weed risk). Or the weed may be more widespread but is yet to invade/impact upon many key industries/habitats (higher weed risk)• Surveillance & mapping to locate all infested properties• Identification of key sites/assets in the management area• Control of infestations in close proximity to key sites/assets, aiming for a significant reduction in weed density.• Limits on movement within the management area• Must not allow to spread from cultivated plants (if grown) in close proximity to key sites/assets• Monitor change in current distribution within and in close proximity to key sites/assets

Manage weed	<p>Aims to reduce the overall economic, environmental and/or social impacts of the weed species through targeted management</p> <ul style="list-style-type: none"> • Research and develop integrated weed management (IWM) packages for the species, including herbicides and biological control, where feasible • Promote IWM packages to landholders • Monitor decrease in weed impacts with improved management • Identify key sites/assets in the management area and ensure adequate resourcing to manage the weed species
Manage sites	<p>Aims to maintain the overall economic, environmental and/or social value of key sites/assets through improved general weed management.</p> <ul style="list-style-type: none"> • Promote general IWM principles to landholders, including the range of control techniques, maintaining competitive vegetation/crops/pastures, hygiene & property management plans • Identify key sites/assets in the management area & ensure adequate resourcing to manage these to maintain their values • Broaden focus beyond weeds to all threatening processes
Monitor	<p>Aims to detect any significant changes in the species' weed risk</p> <ul style="list-style-type: none"> • Monitor the spread of the species and review any perceived changes in weediness
Limited action	<p>The weed species would only be targeted for coordinated control in the management area if its local presence makes it likely to spread to land uses where it ranks as a higher priority</p> <ul style="list-style-type: none"> • Undertake control measures if required for the benefit of other land uses at risk • Otherwise limited advice to land managers, if required.

Athel Pine *Tamarix aphylla*

Description

Tree to 15 m high, with branchlets which appear jointed but are small leaves, 1-2 mm long, surrounding the stem. Flowers are pink-white, summer. Produces bell shaped fruit containing numerous seeds. Originally from Mediterranean region, north Africa and India. Athel Pine was introduced in the 1930-1940s to arid and semi-arid areas for shade, shelter and erosion control. Tamarisk or Salt Cedar (*Tamarix ramosissima*), is similar to Athel Pine and has also shown weedy tendencies in SA, NSW and WA.



Mature Athel Pine (Credit: B Shepherd)



Athel Pine in riparian zones (Credit: B Shepherd)



Pink-white flowers (Credit: B Shepherd)



Athel Pine flowers (Credit: B Shepherd)

Distribution

Australian distribution: Semi-arid and arid areas of SA, NT, QLD, WA and NSW. Plantings occur across Australia.

SA distribution: Athel Pines are common in the SAAL Landscape region where planted and there are 18 known locations where Athel Pine is wild (naturalised). The largest population of wild Athel Pine occurs in the eastern area of the SA arid lands where approximately 50 km of river and lake environment are infested.

District distribution: Athel Pines are common throughout the District and were planted in station gardens, community areas and around waters for shade and shelter trees. They have become established around bores and springs at three known locations. At two of these locations infestations are thick and quite large.

Potential distribution: Athel Pine is classified as a Weed of National Significance (WONS). Athel Pine has the potential to infest all rivers, creeks and waterways in arid areas. Drainage lines and lower reaches of water courses are of particular risk of invasion.

Threats and Impacts

Invasiveness

Seeds of Athel Pine require a moist environment to germinate, however generally germinate in autumn. Seed is easily moved by flood waters and wind, but also by animals including birds. Athel Pine also has the ability to reproduce from pieces of stem and root and therefore has the capability spread easily.

Impacts

Athel Pines may form dense stands which compete with native trees and understorey plants. Athel Pines may also alter the flow of watercourses, lower water tables, decrease pasture production and make mustering more difficult. The leaves of Athel Pine excrete salt which leads to high salinity levels in leaf litter.

Persistence

Athel Pine is tolerant to drought and fire resistant, and has the ability to sucker. Athel Pine commonly reshoots following chemical and mechanical control and therefore follow up control is imperative.

Policy

National Strategy

Athel Pine is classified as a Weed of National Significance (WONS).

- Non-riparian - Locate, map and remove all high risk Tamarix spp. plantings adjacent to ephemeral lakes and streams in arid and semi-arid areas.
- Riparian - Eradicate all infestations in riparian areas.

State Policy

To protect native vegetation from invasion by preventing further plantings of this species and by removing existing Athel Pine from high risk areas, under the *Landscape SA Act 2019*:

- Prohibit sale of Athel Pine or contaminated material; and
- Require landholders to control Athel Pine on their properties where it is within 100m of a watercourse.

SA Arid Lands Landscape Board Risk Assessment

The SAAL Landscape Board risk assessment for Athel pine is to **PROTECT SITES**. Aim: To prevent spread of Athel pine to key sites/assets of high economic, environmental and/or social value.

Marla-Oodnadatta District Risk Management Action

As above

Best Practice Control

Control method and description	Best time to control	Link for PIRSA current best practice chemical control and rates
Cut stump		
<p>Useful for medium to larger trees. The main stem(s) are cut off by chainsaw and the stump immediately (within 10 seconds) painted or sprayed with the recommended herbicide mixture.</p> <p>The stump should be cut as close to the ground as possible.</p> <p>Remove all cut material from moist environments to prevent root growth from tree sections.</p>	Any time of year	Athel pine - PIRSA
Basal bark		
<p>Useful for smaller trees that have not developed rough bark.</p> <p>Remove all debris from around the base of the tree prior to applying the herbicide.</p> <p>Spray all sides of each stem with the recommended herbicide mix, to a height of between 250 – 750 mm above soil level.</p>	Any time of year	Athel pine - PIRSA
Foliar spray		
<p>Useful when plants are smaller than 2 m.</p> <p>Spray the entire plant with the recommended herbicide mix.</p>	Any time of year	Athel pine - PIRSA
Physical		
<p>Useful for very large trees, dense infestations and broad scale germination or regrowth. The entire plant is removed from the ground using a suitable bulldozer or loader. Roots must be cut about 30-50 cm below the soil surface to reduce the incidence of regrowth. This is best done with a blade plough.</p> <p>Branch and root fragments of Athel Pine can take root, therefore woody material must be moved out of creek lines and moist areas.</p> <p>Ongoing inspections and hand-pulling of seedlings will additionally be required where recruitment is occurring, until the seedbank is exhausted.</p>		

Recommended Actions for Athel Pine Management in Marla-Oodnadatta District

- 1.** Support land manager education in identification, monitoring and control of Athel Pine.
- 2.** Encourage landholders to provide data on distribution of Athel Pine so that it can be surveyed and mapped.
- 3.** Provide input into identification of high priority areas such as significant rivers, creeks and waterholes and coordinate Athel Pine control programs to protect identified priority sites.
- 4.** Require landholders to undertake control of Athel Pine plants within 100m of rivers, creeks and waterholes.
- 5.** Encourage landholders to monitor success, following control of Athel Pine, and carry out follow up control as necessary.
- 6.** Restrict introductions and movement of Athel Pine within SAAL Landscape region.

Surveys and Monitoring

Regular searches along rivers for new occurrences of wild Athel Pine, especially in areas downstream from planted Athel Pine, is important to detect and control Athel Pine before it becomes a problem. Athel Pine is a perennial plant and will be detected anytime of the year. Look for grey, green pine looking leaves growing within river beds in swamps and around water holes.

Buffel Grass *Cenchrus ciliaris*

Description

Buffel Grass is a perennial grass to approximately 1 m high, with very strong root stock. Leaves bluish-green, 3-25 cm long, 1-6 mm wide. Leaf blade base with a ring of short hairs, 0.2-2 mm long. Flower heads form dense hairy cylindrical spikes 2-15 cm long, pale or purplish. Flowers in summer. Originally from Africa and south western Asia and introduced in the 1840s as a pasture species and for erosion control. It can withstand heavy grazing and is the most drought tolerant introduced grass species in Australia.



Buffel Grass seed head (Credit: B Shepherd)



Buffel grass infestation (Credit: B Shepherd)



Buffel grass plant (Credit: B Shepherd)

Distribution

Australian distribution: Common throughout central Australia. Widely cultivated by pastoralists as a preferred pasture species for cattle. In some outback towns, namely Alice Springs it was cultivated for dust control and has since successfully naturalised and overrun large tracts of land.

SA distribution: Large areas in the far north west of northern SA are infested with Buffel Grass and it is common along the Stuart Highway (from the Northern Territory border down to about Port Pirie) and the Tarcoola Road. Buffel Grass also occurs along selected rivers of the region with infestations ranging from scattered single occurrences to dense patches. It also occurs in other areas including around townships and as isolated patches along secondary roads.

District distribution: Large infestations throughout north-west of district. Infestations also reported around Coober Pedy and on gilgai tablelands.

Potential distribution: Buffel Grass establishes readily and has the capacity to expand across a large proportion of northern and central Australia.

Threats and Impacts

Invasiveness

Buffel Grass is easily distributed by wind, water, stock and machinery. High levels of disturbance, such as flood, fire and heavy grazing, can assist the establishment. Buffel Grass can also root from lower nodes. The species requires summer rain for growth, and is not frost tolerant.

Impacts

Buffel Grass competes with and displaces native species. It forms monospecific stands, out-competing native grasses. Plants are fire resistant but can carry fire in areas where fire is not normally part of the ecosystem. Buffel Grass aids fire by increasing the intensity and frequency of natural fire regimes to the point of removing competing shrubs and trees.

Persistence

Buffel Grass is the most drought tolerant introduced grass species in Australia, is highly persistent on lightly textured soils and is quick to respond to small amounts of rainfall.

Policy

National Strategy

Buffel Grass is not classified as a Weed of National Significance, therefore there is no National Strategy for this species.

State Policy

Buffel Grass is a declared species under the *Landscape SA Act 2019*. Buffel grass must be contained to minimise its impacts on native vegetation, grazing systems, remote communities and infrastructure.

Objectives:

- Protect vulnerable sites currently free of Buffel Grass from invasion.
- Contain Buffel Grass within its present range in SA, and reduce this range incrementally where possible.
- Remove Buffel Grass infestations from key dispersal nodes and pathways.
- Protect natural and built assets from the fire risk associated with Buffel Grass infestations.
- See *SA Buffel Grass Strategic Plan 2019-2024* for details.

SA Arid Lands Landscape Board Risk Assessment

All SA Arid Lands Landscape Districts (except Marla-Oodnadatta) lie within Zone 2 (**PROTECT SITES**) in the South Australia Buffel grass Strategic Plan 2019-2024. The Marla-Oodnadatta Landscape District lies within Zone 1 (**MANAGE WEED**) in the South Australia Buffel grass Strategic Plan 2019-2024.

Aim: Zone 1 – To reduce the overall economic, environmental and/or social impacts of Buffel grass through targeted management. Zone 2 - To prevent spread of Buffel grass to key sites/assets of high economic, environmental and/or social value.

Marla-Oodnadatta District Risk Management Action

Marla-Oodnadatta Landscape District Management Action is to **MANAGE WEED**. Aim: To reduce the overall economic, environmental and/or social impacts through targeted management.

Best Practice Control

Control method and description	Best time to control	Link for PIRSA current best practice chemical control and rates
Foliar Spray		
<p>Spray all sides of the entire plant.</p> <p>Ensure the entire plant is covered in the herbicide mix.</p> <p>Spot spraying with a knap sack or quad/ute mounted spray unit can be used for scattered occurrences.</p> <p>Boom spray can be used for dense infestations where no native vegetation exists between Buffel grass plants e.g. along roads.</p> <p>Buffel grass can quickly regenerate from seed and ongoing monitoring and control is required after warm season rain.</p>	<p>Between 2-4 weeks after warm season rain</p>	<p>Buffel grass - PIRSA</p>
Physical and/or Organic Control		
<p>Burning dried-out Buffel grass allows for better control from chemical spraying when plant re-shoots after rain (e.g. better coverage of new foliage).</p> <p>Organic foliar spraying can be carried out using Bioweed (680g/L pine oil) at a rate of 20L per 100L water. Complete coverage of plant is required and should be applied when the plant is actively growing. This mixture will also kill seed it contacts both on the plant and on the ground.</p> <p>Grubbing can be used for isolated occurrences or small infestations.</p> <p>Dig the entire plant out of the ground.</p> <p>Ongoing monitoring and follow up hand pulling/grubbing will be required annually.</p>		

Recommended Actions for Buffel Grass Management in Marla-Oodnadatta District

1. Support landholder education in identification, monitoring and control of Buffel Grass.
2. Encourage landholders to provide data on distribution of Buffel Grass so that it can be surveyed and mapped.
3. Provide input into identification of key sites requiring control of Buffel Grass.
4. Assist in identifying and coordinating Buffel Grass control programs using integrated weed management, especially in areas where key sites are threatened.
5. Encourage landholders to monitor success, following control and carry out follow up control as necessary.
6. Restrict introductions and movement of Buffel Grass within SAAL Landscape region.

Surveys and Monitoring

Monitor during routine pastoral management activities and record locations using a GPS. Look in areas adjacent to roads where the soil has been disturbed. In the weeks following rainfall, look for a large clumpy grass with purple or black seed heads.

Cactus Species

Coral Cactus *Cylindropuntia fulgida* var. *mamillata*

Description

Usually 1-1.5 m high and occasionally up to 3 m. Upper segments are smooth greyish to dark green, 6-70 cm long and 1-5 cm wide. Segments resemble coral as they mature. Spines (1-6) emerge from depressions, with white woolly hairs and minute bristles. Flowers dull red 2-3.5 cm wide, in late spring to summer. Fruit is yellow-green, spiny, barrel shaped. Originally from Ecuador and Peru, it is unknown when or why it was introduced. Floodwaters may damage plants and also disperse segments resulting in new infestations.



Coral Cactus plant (Credit: B Shepherd)



Mature Coral Cactus plant (Credit: B Shepherd)

Devil's Rope Cactus *Cylindropuntia imbricata*

Description

Usually 1-2 m high and occasionally up to 3 m, often with a woody trunk. The plant is made up of strong woody segments dark to grey-green which are rope like in appearance. Sharp spines (2-30) emerge from depressions in segments, spines, 2-3 cm long, enclosed in yellow bristles. Flowers are 3-7.5 cm wide, purple or purplish-red, in late spring to summer. The fruit is usually spineless, barrel shaped and matures to a yellow colour. Originally from southern USA and Mexico, it is unknown when it was introduced but used as an ornamental garden plant. Previously called *Opuntia imbricata*.



Mature Devil's Rope Cactus (Credit: J Pitt)



Devil's Rope flower (Credit: J Pitt)

Jumping Cholla *Cylindropuntia prolifera*

Description

Up to 2m high. Segments are grey-green up to 15 cm long and 5 cm wide. Segment depressions contain 6-12 spines up to 2 cm long. Flowers rose to magenta, to 4 cm wide, spring to early summer. Fruit 2-4 cm long, 2-3 cm wide, spineless occasionally in short chains. Originally from USA and Mexico, first record in NSW in 1993, unknown why introduced.



Jumping Cholla plant (Credit: R Holtkamp)



Jumping Cholla flower (Credit: R Holtkamp)

Hudson Pear *Cylindropuntia pallida*

Description

Branched, 1.5 m high to 3 m wide. Segments are cylindrical up to 90 cm long and 4 cm wide. Segment depressions contain clusters of 4-8 spines, up to 3.5 cm long. Pink flowers to 5 cm wide, late spring and summer. Fruit is wider towards the tip, 2 - 4.5 cm long. Originally from Mexico and introduced in 1960s as an ornamental garden plant.



Mature Hudson Pear cactus (Credit: G Patrick)



Hudson Pear flower

Engelmann's Prickly Pear *Opuntia engelmannii*

Description

Up to 2m tall. Upper segments are dull mid to grey-green and oval to circular shaped, 9-26 cm long. Segment depressions contain 1-12 spines, with brown woolly hairs and short yellow-brown bristles. Yellow flowers. Fruit is pear to barrel shaped, spiny, and matures to reddish-purple. Originally from USA and Mexico, unknown when and why introduced.



Mature Engelmann's Prickly Pear (Credit: B Shepherd)



Segments (Credit: B Shepherd)

Wheel Cactus *Opuntia robusta*

Description

Usually 1-2 m tall, occasionally to 4 m generally with a well developed trunk. Segments are circular, bluish green to bluish grey to 40 cm in diameter. Segment depressions are widely spaced containing 1-12 spines, 5 cm long with brown woolly hairs and yellow to brown bristles. Flowers are yellow ageing to white, 5-8cm diameter. Fruit is pink to purple, barrel shaped to 8 cm long and 6 cm wide. Originally from Mexico, unknown when introduced but used as an ornamental garden plant. Wheel Cactus is considered rare and endangered in its native habitat and is listed on the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).



Mature Wheel Cactus plants (Credit: J Pitt)



Wheel Cactus segments (Credit: J Pitt)

Prickly Pear *Opuntia stricta*

Description

Usually 0.5-1m tall, and 0.5-5m across. The basal stem segments often thicken and form a trunk. The upper stem segments are dull mid to grey-green and oval shaped. Segment depressions are usually spineless or contain 1-11 spines, 1-6 cm long, with brownish woolly hairs and short yellow bristles. Flowers are yellow, 5-8 cm wide, summer. Fruit is pear shaped, smooth and purple at maturity. Originally from drier tropical and sub-tropical America, introduced before 1839 as an ornamental garden plant and for use as food for cochineal insects used to produce dye for soldiers' coats. Plants may still establish from segments following disposal of garden waste unless buried to a depth greater than 1 metre.



Prickly Pear plant (Credit: P Hodges)



Prickly Pear flower (Credit: P Hodges)

Distribution

Australian distribution: These cacti species are common throughout Australia, both in gardens and as naturalised plants. In most states one or several cactus species are declared weeds.

SA distribution: There are significant infestations of Prickly Pear and Wheel Cactus near Peterborough, Terowie, along the River Murray cliffs, in the Blinman Parachilna area of the Flinders Ranges and around Port Augusta. There is an infestation of Engelmann's Prickly Pear in the Flinders Ranges north of Quorn which is often confused with Wheel cactus. Devil's Rope Cactus occurs to a lesser extent in these areas as well as in other areas around northern SA, primarily in the mid north agricultural district, the Flinders Ranges and the Olary Ranges.

There are three sites – two east of Coober Pedy and one in the North Flinders - where Coral Cactus and/or Jumping Cholla have naturalised and are spreading, however these populations are small and manageable. It is likely that these are not the only occurrences in northern South Australia and that others exist possibly in abandoned gardens or around ruins. Hudson Pear occurs near Port Augusta and Whyalla.

District distribution: Various locations throughout the District. Known infestations of Jumping Cholla and Coral Cactus occur in the south-west of the District. Prickly Pear has been reported in the central west.

Potential distribution: These cacti species have the potential to establish across most of the arid and semi-arid areas of South Australia.

Threats and Impacts

Invasiveness

Wheel Cactus, Prickly Pear and Engelmann's Prickly Pear are highly invasive. They have high seed production, reproduce vegetatively, seeds are dispersed by birds and other animals and seedlings establish easily. Flood events have also been observed to promote spread of cacti species. Devil's Rope cactus, Jumping Cholla and Coral Cactus are also invasive species well adapted for vegetative spread and able to withstand drought conditions.

Impacts

At high density, infestations of cacti species can render land unsuitable for grazing as thickets exclude livestock and can degrade biodiversity as the infestations outcompete native plants and reduce habitat for native fauna.

Persistence

The ability of cacti to recover from control is very high. Re-establishment is assisted by the longevity of seed stored in the soil and the fact that new plants can grow from untreated or dropped pads. Follow up control is essential.

Policy

National Strategy

All *Opuntia* (including *Austrocyllindropuntia*, *Cylindropuntia* and *Opuntia*) species are classified as Weeds of National Significance. The Strategic Plan aims to deliver the following goals and objectives:

- Prevent new infestations from establishing.
- Strategically manage established infestations.
- Increase capability and commitment to manage opuntoid cacti.

State Policy

Prevent *Opuntia* species from competing with more desirable plants and restricting access in the pastoral areas of the State, under the *Landscape SA Act 2019*:

- Prohibit movement of *Opuntia* species on public roads and entry into SA;
- Prohibit sale of *Opuntia* species or their seeds, or contaminated material;
- Require landholders to destroy *Opuntia* species on their properties; and
- Allow recovery of costs of *Opuntia* species control on road reserves.

SA Arid Lands Landscape Board Risk Assessment

SAAL Landscape Board Risk assessment for *Opuntia* species is to **CONTAIN SPREAD**. Aim: To prevent the spread of *Opuntia* through control of all infestations.

SAAL Landscape Board Risk assessment for *Cylindropuntia* species is to **DESTROY INFESTATIONS**. Aim: To significantly reduce the extent of *Cylindropuntia* species in the SAAL Landscape region.

Marla-Oodnadatta District Risk Management Action

As above

Best Practice Control

Following initial control of mature cactus plants, cactus seeds deposited under mature plants and pads that were missed or dropped off during treatment will germinate and grow, therefore follow up monitoring and control around mature plants is required for several years.

Control method and description

Biological

Cochineal scale (*Dactylopius* spp.) may be used as a biological control for various Opuntoid cacti and *Cylindropuntia* species including Engelmann’s prickly pear, Hudson pear, Prickly pear, Wheel cactus, Devil’s rope, Coral cactus and Jumping cholla.

Evidence of the presence of cochineal appears as small white “cotton wool” spots on the cactus pads. Cochineal create these structures and live under them. They suck fluid from plant tissues and in high enough densities energy production may be impacted and the plant’s growth is restricted or the plant may die.

Pads from infected plants may be removed and wedged low on a new host plant, protected from rain where possible, with the most heavily infested surface as close as possible to the surface of the new host plant. This will allow for movement of wingless cochineal to the new host plant.

Note: Different cochineal species and lineages work on different Opuntoid cacti species. Please see Appendix 2 for more information.

Foliar spray	Best time to control	Link for PIRSA current best practice chemical control and rates
Useful for all cacti species. Suitable for larger infestations. Spray all sides of every cactus pad until chemical runs off. Spray only when cacti are green and healthy.	Any time of year providing plants are not stressed. Warmer months are preferred.	Opuntia cacti (prickly pear/wheel cactus) - PIRSA Cylindropuntia cacti (Devils rope, Hudson pear) - PIRSA
Stem inject		
Useful for most cactus species. Suitable for isolated plants or small infestations. Inject a measure of herbicide into each cactus stem or in at least every 4th pad utilising a Velpar® gun and injecting lance.	Any time of year	Opuntia cacti (prickly pear/wheel cactus) - PIRSA Cylindropuntia cacti (devils rope, Hudson pear) - PIRSA
Biological		

Cochineal scale (*Dactylopius* spp.) may be used as a biological control for various Opuntoid cacti and *Cylindropuntia* species including Engelmann's prickly pear, Hudson pear, Prickly pear, Wheel cactus, Devil's rope, Coral cactus and Jumping cholla.

Evidence of the presence of cochineal appears as small white "cotton wool" spots on the cactus pads. Cochineal create these structures and live under them. They suck fluid from plant tissues and in high enough densities energy production may be impacted and the plant's growth is restricted or the plant may die.

Pads from infected plants may be removed and wedged low on a new host plant, protected from rain where possible, with the most heavily infested surface as close as possible to the surface of the new host plant. This will allow for movement of wingless cochineals to the new host plant.

Note: Different cochineal species and lineages work on different Opuntoid cacti species. Please contact SA Arid Lands Landscape Board (08) 8429 9666 for detailed information regarding this.

Physical

It is possible to dig out cacti but care must be taken due to their spines. This is only practical for small isolated plants. Care must be taken not to drop any segments, as these may grow and develop into new plants. Material must be disposed of via deep burial (at least 1m). This method may be used all year round.

Fire

Hot fires may kill plants but regrowth may occur, requiring follow-up control. Burning can assist in gaining access to large infestations allowing use of other control activities. This method may not be practical where cacti are growing amongst native vegetation.

Recommended Actions for Cactus Management in Marla-Oodnadatta District

1. Support landholder education in identification, monitoring and control of Opuntia species.
2. Encourage landholders to provide data on Opuntia infestations so that it can be surveyed and mapped.
3. Provide input into identification of key sites requiring control of Opuntia species.
4. Assist in identifying and coordinating Opuntia control programs using integrated weed management, especially in areas where key sites are threatened.
5. Encourage landholders to undertake control of all Opuntia species infestations.
6. Encourage landholders to monitor success, following control of Opuntia, and carry out follow up control as necessary.
7. Restrict sale and movement of all Opuntia species within SAAL Landscape region.

Surveys and Monitoring

Keep an eye out for cactus plants during routine pastoral management activities and record location using a GPS. Look for old plantings of cactus in historic gardens around ruins, railway sidings and other areas associated with human settlement. Survey at any time of year.

Khaki Weed *Alternanthera pungens*

Description

Prostrate herb with perennial root system and annual above ground growth. Taproot often large, woody and deep-penetrating. Stems shortly silky hairy. Leaves ovate to circular, hairless to sparsely hairy, margins entire, leaf stalk 0.2–1 cm long. Inflorescence ovoid, 6–10 mm wide, flowers from March to April. Fruit 1–1.5 mm long. Seeds about 1 mm wide, brownish, globe-shaped. It forms carpets of sharp burrs that can injure people and animals. Originally from Brazil, Ecuador, Peru and Venezuela, it was first recorded in NSW in 1989 and first reported in Alice Springs in 1957.



Khaki Weed runners (Credit: www.weeds.org.au)



Khaki Weed burrs (Credit: www.depi.vic.gov.au)

Distribution

Australian distribution: Khaki Weed occurs in all mainland states and territories. In New South Wales it occurs in towns, in coastal areas north of Sydney and also agricultural regions in the central and north-west of the state. In Victoria and South Australia, Khaki Weed is confined to towns in the more arid areas. It is widespread in Queensland particularly around towns in the south-east. In the Northern Territory, it occurs in the Darwin, Gulf, Katherine, Victoria River and Alice Springs districts. In Western Australia, Khaki Weed can be found in and around towns in the Kimberley and Pilbara regions and around Perth and other centres in the south-west.

SA distribution: Records of Khaki Weed infestations are scattered in the Eyre Peninsula, Northern and Yorke, Kangaroo Island, SA Murray Darling Basin and South East regions, extending as far north as Marla in the pastoral zone. Many of these have been eradicated but its distribution is maintained by annual incursions on vehicles.

District distribution: Historical report of infestation near Marla. There have also been infestations reported in Coober Pedy township.

Potential distribution: Khaki Weed likes light soils and relies on summer rainfall, so providing these conditions are met, Khaki Weed can exist throughout mainland Australia. Due to its spiny seeds, it can easily be picked up on vehicle tyres and spread anywhere vehicles travel.

Threats and Impacts

Invasiveness

Spread by seed within spiny bracts that adhere to tyres, clothing and animals. Local spread may also occur through spreading stems that root at nodes. Cultivation can also encourage spread.

Impacts

Major weed of warm temperate and tropical areas around the world. Stock graze young plants. Widespread in wasteland, caravan parks, orchards and recreation areas. The sharp spiny fruit cause mechanical damage to the feet and mouths of stock and working animals when present in hay and pasture. Khaki Weed is believed to be poisonous to animals and to cause skin ailment in cattle. It is not readily eaten but sometimes young plants are consumed by sheep, apparently without ill effect. It is also claimed to cause hay fever, asthma and dermatitis in some people.

Persistence

Khaki Weed is a difficult plant to control as it is deep-rooted, the tap root also allowing it to survive periods of drought. It also forms a soil seed-bank under infestations, with seed surviving for more than 5 years.

Policy

National Strategy

Khaki Weed is not classified as a Weed of National Significance, therefore there is no National Strategy for this species.

State Policy

Amenity value can be reduced in recreational land or pasture production due to Khaki Weed.

Objectives:

- Detect and destroy all Khaki Weed infestations
- Prevent further spread and establishment in SA.

Implementation

- Biosecurity SA and other authorities to promote awareness of Khaki Weed.
- Landholders to report infestations to the local Landscape Board.
- Authorities to inspect camping grounds, ovals, roadhouses and roadside reserves for Khaki Weed.
- Landholders to destroy infestations growing on land they occupy.
- Authorities to ensure all infestations on public or private land are destroyed.
- Authorities to destroy infestations on road reserves as detected.

SA Arid Lands Landscape Board Risk Assessment

SAAL Landscape Board risk assessment for Khaki weed is to **DESTROY INFESTATIONS**.

Aim: To significantly reduce the extent of Khaki weed in the SA Arid Lands Landscape Region through destruction of known infestations.

Marla-Oodnadatta District Risk Management Action

As above

Best Practice Control

Control method and description	Best time to control	Link for PIRSA current best practice chemical control and rates
Foliar Spray		
Spot spraying with a knap sack or quad/ute mounted spray unit can be used. Spray the entire plant with the recommended herbicide mix. Soil residual. Do not use near desirable vegetation or in waterways.	Anytime	Khaki weed - PIRSA
Spot spraying with a knap sack or quad/ute mounted spray unit can be used. Spray the entire plant with the recommended herbicide mix Non-selective, avoid contact with desirable plants. Won't kill the root system, ongoing treatment required.	Whilst plant actively growing	
Fallow. Boom spray. DO NOT treat weeds which are beyond the rosette stage. Use higher rate on large weeds. DO NOT HARVEST, GRAZE OR CUT FOR STOCK FOOD FOR 7 DAYS AFTER APPLICATION.	Apply when weeds have at least 3-5 true leaves and are actively growing.	
Physical and/or Organic Control		
Individual plants may be grubbed. Ensure the complete removal of the tuber and root system. Dig beside the root 100mm down or more. Destroy any burrs found.		
Organic foliar spraying can be carried out using Bioweed (680g/L pine oil) at a rate of 20L per 100L water. Complete coverage of plant is required and should be applied when the plant is actively growing. This mixture will also kill seed it contacts both on the plant and on the ground.		

Recommended Actions for Khaki Weed Management in Marla-Oodnadatta District

1. Support landholder education in identification, monitoring and control of Khaki weed.
2. Occurrences of Khaki weed to be surveyed, mapped and reported to SAAL Landscape immediately.
3. Identify current distributions of Khaki weed in neighbouring Landscape regions/districts and ascertain possible pathways of entry into Kingoonya District.
4. Destroy all infestations as they are detected, aiming for local eradication.
5. Encourage landholders to monitor success following control, and carry out follow up control as necessary.
6. Prevent sale and movement of Khaki weed within Marla-Oodnadatta District.

Surveys and Monitoring

Keep an eye out for Khaki weed during routine pastoral management activities, particularly from spring to autumn. Record locations with GPS or appropriate app and advise SA Arid Lands Landscape Board of infestation.

Appendix 1 – Noted Weeds

The weeds in this section are not declared under the *Landscape SA Act 2019* and therefore are not considered priority weeds by the Marla-Oodnadatta Landscape Group. However, they are included in this appendix for identification for local landholders and other stakeholders.

Annual Beardgrass *Polypogon monspeliensis* (Not declared)

Description

Annual Beardgrass looks just like a rabbit's foot, stout and fuzzy. The leaf blades are hairless, long, narrow, 50-200 mm long by 2-8 mm wide, flat, and tapered to a fine point. Stems are single or in small tufts, 40-900 mm tall, branching near the base. The flower heads are dense, cylindrical, softly bristly, 10-160 mm long by 6-35 mm diameter with long, pale green to yellowish white covered in fine bristles that give it a silvery appearance in the sun. Flowers in spring. Originally from Europe, Asia and North Africa, it likes wet disturbed ground.



Annual Beardgrass (Credit: www.wnmu.edu)



Annual Beard grass spikelet (Credit: www.wnmu.edu)

Distribution

Australian distribution: NSW, VIC, ACT, TAS, SA, QLD (southern & central), WA (southern) & NT (southern & northern)

SA distribution: South-east, EP, Mt Lofty Ranges, Flinders and mound springs.

District distribution: At some of the mound springs.

Potential distribution: Mound springs and wetland areas.

Threats and Impacts

Invasiveness

It is considered a high threat weed species in grassy wetland and brackish wetland communities. Therefore it is a problem species around mound springs. It is a coloniser of disturbed wetlands.

Impacts

Annual ryegrass toxicity (ARGT) is a threat associated with this species, mainly in south-east Australia. The plant itself isn't toxic but can host a bacterium, *Rathayibacter toxicus*, which causes Flood Plain Staggers that can kill stock.

Persistence

Plants go dormant when dry conditions occur but respond when moisture is available.

Policy

National Strategy

Annual Beardgrass is not classified as a Weed of National Significance, therefore there is no National Strategy for this species.

State Policy

No State policy exists for Annual Beardgrass.

SA Arid Lands Landscape Board Risk Assessment

The SAAL Landscape Board risk assessment for Annual Beardgrass is to **MANAGE SITES**. Aim: To maintain the overall economic, environmental and/or social value of key sites/assets through improved management of Annual Beardgrass.

Marla-Oodnadatta District Risk Management Action

As above

Best Practice Control

Control method and description	Best time to control	Link for PIRSA current best practice chemical control and rates
Foliar Spray		
There are no herbicides registered for use in SA.		
Physical		
Ground can be cultivated in suitable areas before plant goes to seed.		

Recommended Actions for Annual Beardgrass Management in Marla-Oodnadatta District

1. Support landholder education in identification, monitoring and control of Annual Beardgrass.
2. Encourage landholders to provide data on distribution so that it can be surveyed and mapped.
3. Provide input into identification of key sites for control of Annual Beardgrass infestations.
4. Assist in identifying and coordinating Annual Beardgrass control programs using integrated weed management, especially in areas where key sites are threatened.
5. Encourage landholders to monitor success, following control of Annual Beardgrass, and carry out follow up control as necessary.

Surveys and Monitoring

Keep an eye out for Annual Beardgrass during routine pastoral management activities from mid-winter through to early summer, especially along drainage lines and around dams or springs, and record locations using a GPS.

Date Palm *Phoenix dactylifera* (Not declared)

Description

Plants male or female. Leaves often referred to as fronds, clustered at the top of the palm. Unbranched trunk covered with leaf bases, the base sometimes producing suckers and suckers also produced from roots. Grey-green leaves 2.5-4 m long with numerous leathery leaf segments folded upwards. Fruit about 2cm long known as a date, brown to dark orange when ripe, and around a large woody seed. Originally from northern Africa and/or south-western Asia, it was probably introduced in the 1870's by Afghan cameleers. Date Palm is a source of food in the arid lands.



Date Palms at Dalhousie Spings NP
(Credit: www.ausemade.com.au)



Date Palm fruits (Credit: www.weeds.org.au)

Distribution

Australian distribution: Date Palms were introduced in Australia for their fruit and were widely planted in Australia and throughout much of northern South Australia. They are an environmental weed in the Pilbara region of Western Australia along the Fortescue River and further north at Lake Kunnanura. National Parks and Wildlife, Western Australia have removed an estimated one million Date Palms in an effort to save the endemic palm *Livistona alfredii*.

SA distribution: Date Palms have been planted at a number of Great Artesian Basin Spring sites. They were planted at Dalhousie and have spread to 39 springs from the original planting. Palms planted at Old Nilpinna Spring in northern South Australia are now spreading and their impacts are of some concern. Date Palms have also been planted at Big Perry Springs, Freeling Springs, Wandillinna Springs and also near the Bubbler and Blanche Cup at Coward Springs Bore.

District distribution: Same as SA distribution.

Potential distribution: Date Palms rely on access to water. Therefore, less than 5% the SA Arid Lands is suitable for infestation.

Threats and Impacts

Invasiveness

The seed is often transported long distances by birds and animals. At Dalhousie the major vector for dispersal is the dingo, which eats large volumes of Date Palm fruit. Male dingos will often defecate at high points which at Dalhousie Springs is often at a spring vent.

Impacts

Date Palms are aggressive invaders of wetland habitats. They have the ability to grow in high densities, forming a continuous and dense canopy effectively excluding light, with the roots forming a dense mat that is both extensive and invasive. Date Palms inhibit the establishment of endemic species beneath the canopy and compete with species already present. They've been shown to significantly reduce the biodiversity and heterogeneity of flying invertebrates and soil nematodes, and they have impacted on and may have caused the localised extinction of several tree species in the spring complex. Date Palms use substantial amounts of water thus reducing environmental flow – water use is estimated to be between 493L and 274L of water per day.

Date Palms also threaten mound spring ecology through altered fire regimes. Masses of dead fronds and a high oil content in living fronds result in high intensity fires that can kill endemic species, particularly where palms occur in dense clumps around or adjacent to Melaleuca or Eucalyptus trees. The exotic palms are rarely killed by wildfire. Burnt palms sprout green leaves from the crown of the trunk.

Persistence

Date Palms reach sexual maturity at about five years. The female plant blossoms once per year. Date Palms are pollinated by wind and one large inflorescence may hold 6,000 to 10,000 flowers. On an individual tree there can be more than a dozen inflorescences. The palms live well over 100 years and can continue to produce fruit for a long time ensuring a large seed supply for recolonisation.

Policy

National Strategy

Date Palms are not classified as a Weed of National Significance, therefore there is no National Strategy for this species.

State Policy

No State Policy exists for Date Palms.

SA Arid Lands Landscape Board Risk Assessment

The SAAL Landscape Board risk assessment for Date Palms is to **PROTECT SITES**. Aim: To prevent spread of Date Palms to key sites/assets of high economic, environmental and/or social value.

Marla-Oodnadatta District Risk Management Action

As above

Best Practice Control

Control method and description

Physical

Fire is used to remove the excess palm fronds. Chainsaws are then used to remove the palms. Alternatively, a large logging machine, capable of grabbing the palm trunk and cutting it off at the base, can be used.

Recommended Actions for Date Palm Management in Marla-Oodnadatta District

- 1.** Support landholder education in identification, monitoring and control of Date Palms.
- 2.** Encourage landholders to provide data on distribution of Date Palms so that it can be surveyed and mapped.
- 3.** Provide input into identification of key sites for control of Date Palms infestations.
- 4.** Assist in identifying and coordinating Date Palms control programs using integrated weed management, especially in areas where key sites are threatened.
- 5.** Encourage landholders to control Date Palms whenever found.
- 6.** Encourage landholders to monitor success following control, and carry out follow up control as necessary.

Surveys and Monitoring

Look for Date Palm around springs and other permanent sources of water and record locations using a GPS or farm map.

Mimosa bush *Vachellia farnesiana* (Not declared)

Description

Spreading shrub usually less than 3 m high, rarely a small tree to 7 m high. Bark smooth or fissured, grey-brown. Straight spines 1–2.5 cm long at base of leaves, mature leaves bi-pinnate, a small gland is usually found on the leaf stalk. Flowers 1–3 per leaf axil, golden yellow, globular, autumn to early summer. Seedpod almost cylindrical, thick, straight to curved, 4–6 cm long, 0.9–1.2 cm wide, pithy inside between seeds, not opening at maturity. Seeds maturing black and remaining on plant. Originally from Central and South America.



Flowers and leaves (Credit: E Fatchen)



Seed pod and thorns (Credit: E Fatchen)



Mimosa bush south of Susan's Dam, Peake
(Credit: R Murphy)



Seeds and pod (Credit: LRT, North West Weeds)

Distribution

Australian distribution: Widespread throughout northern Australia (although absent from extreme north), north-eastern SA and the North Coast to western NSW as far south as Jerilderie.

SA distribution: Watercourses and disturbed roadsides in the north of the State. Cooper Creek and Neales-Peake catchments.

District distribution: Currently found in the Neales-Peake catchment.

Potential distribution: Watercourses and disturbed roadsides across the northern half of the State.

Threats and Impacts

Invasiveness

Mimosa bush often forms thorny thickets. Seeds sprout readily and plants grow rapidly. It does well in dry localities and on loamy or sandy soils, forming thickets and spreading along watercourses. Seeds are primarily dispersed when livestock and feral animals eat the fruit and pass the seeds intact. Seeds may also be dispersed along water courses when they are flowing.

Impacts

The thorny thickets cause considerable nuisance during mustering and can also hinder stock access to water. The thorns may also cause eye injuries to stock and native fauna. The thickets may provide harbour for rabbits. Biodiversity issues with native species being out-competed and becoming displaced.

Persistence

Mimosa Bush withstands drought well, is readily eaten by stock, and has good regrowth after grazing. It reproduces by seed and also produces suckers when its above-ground parts are damaged. Apart from chemical control, there are no other effective means of controlling this species. This is a very real problem on organic properties.

Policy

National Strategy

Mimosa bush is not classified as a Weed of National Significance, therefore there is no National Strategy for this species.

State Policy

No State policy exists for Mimosa.

SA Arid Lands Landscape Board Risk Assessment

SAAL Landscape Board risk assessment for Mimosa bush is to **CONTAIN SPREAD**. Aim: To prevent ongoing spread of the species.

Marla-Oodnadatta District Risk Management Action

As above.

Best Practice Control

Control method	Best time to control	Link for PIRSA current best practice chemical control and rates
Cut stump		
<p>Cut trunk off horizontally as close to the ground as possible. Immediately, within 15 seconds, swab cut surface with herbicide mixture.</p> <p>On organic properties, where scattered trees are not near water, tree guards, made from star droppers and chicken wire, can be put around each stump. Barbed wire can be threaded through the top of tree guards to prevent any access (by cattle) to the treated stump.</p>	Any time of year	Mimosa bush (Vachellia farnesiana)
Basal bark		
<p>For stems up to 10 cm basal diameter, carefully spray completely around base of plant to a height of 30 cm above ground level. Thoroughly spray into all crevices.</p> <p>Larger trees may be controlled by spraying to a greater height, up to 100 cm above ground level.</p>	Autumn, when plants are actively growing (providing summer rains have occurred).	Mimosa bush (Vachellia farnesiana)
Foliar spray		
Useful when plants are smaller than 2 m. Spray the entire plant with the recommended herbicide mix.	Any time of year – best when actively growing.	Mimosa bush (Vachellia farnesiana)
Physical		
<p>Useful for very large trees, dense infestations and broad scale germination or regrowth.</p> <p>The entire plant is removed from the ground using a suitably sized bull dozer or loader. Roots must be cut about 30-50 cm below the soil surface to reduce the incidence of regrowth. This is best done with a blade plough. Branch and root fragments of Prickly Acacia can take root, therefore woody material must be moved out of creek lines and moist areas.</p> <p>Ongoing inspections and hand-pulling of seedlings will additionally be required, where recruitment is occurring, until the seedbank is exhausted.</p> <p>Subject to fire restrictions, controlled burning (minimum 2 subsequent burns) can also be effective.</p>		

Recommended Actions for Mimosa bush Management in Marla-Oodnadatta District

1. Support landholder education in identification, monitoring and control of Mimosa bush
2. Encourage landholders to report any infestations of Mimosa bush they detect so that it can be surveyed, mapped and control sites monitored.
3. Provide input into identification of key sites requiring control of Mimosa bush.
4. Assist in identifying and coordinating Mimosa Bush control programs using integrated weed management, especially in areas where key sites are threatened.
5. Encourage landholders to monitor success, following control of Mimosa, and carry out follow up control as necessary.

Surveys and Monitoring

Keep an eye out for Mimosa during routine pastoral management activities, from autumn to early summer when plants are flowering, especially along roadsides and drainage lines and record locations using a GPS.

Neurada *Neurada procumbens* (Not declared)

Description

A distinctive low-lying annual herb that is adapted to dry, sandy environments, spreading up to 1 m in diameter. Stems are branching and lie flat on the ground with dense hairs that give a woolly appearance. Neurada also has an obvious tap root. Leaves are a distinctive blue-green colour and are lobed, covered in fine hairs and reach 6-25 mm in length. They are borne on woody stems that radiate from the base of the plant. Flowers are inconspicuous, usually solitary, small, generally off-white in colour and have five petals, flowering 2-4 weeks after rain. The fruit is star shaped, smooth on the underside but has spines on the upper surface that become sharp when dry. The fruit turns hard and woody at maturity. Originally from arid regions of Africa, India and the Middle East, first reported in Australia in 2000 in north-west corner of Simpson Desert.



Neurada flowers (Credit: www.lrm.nt.gov.au)



Neurada prickly seeds (Credit: www.lrm.nt.gov.au)

Distribution

Australian distribution: North-west corner of the Simpson Desert and in some campgrounds in southern Central Australia in Northern Territory. Far north of South Australia.

SA distribution: Simpson Desert and other scattered populations in northern South Australia.

District distribution: Simpson Desert and Witjira National Park.

Potential distribution: Across the SAAL, especially in the sandy dunefields in the north of the State. Also a threat throughout Central Australia.

Threats and Impacts

Invasiveness

Prickly fruit catches in animal fur and feet, vehicle tyres, shoes and camping gear and is easily transported to new areas. This species grows well in sandy soil and harsh climates and has the potential to spread across the arid lands.

Impacts

The major concern as a contaminant of wool. The burrs contribute to hardheads, which damage shearing machinery. Wool processors generally reject infested wool. Spines of this plant also cause physical damage to stock and people.

Persistence

There are several seeds in each fruit. At a rainfall event only one seed germinates and quickly establishes a fine tap root in the moist sand. If no further rain occurs and the soil dries out, this individual dies but the other seeds remain viable. After subsequent showers, further seeds germinate until at last one of them grows successfully. This system works as an insurance policy to ensure the plant has the best possible chance of reproducing in such a harsh environment.

Policy

National Strategy

Neurada procumbens is not classified as a Weed of National Significance, therefore there is no National Strategy for this species.

State Policy

No State policy exists for *Neurada procumbens*.

SA Arid Lands Landscape Board Risk Assessment

SAAL Landscape Board risk assessment for *Neurada procumbens* is to **MONITOR** for any changes in the species weed risk. Aim: To detect any significant changes in *Neurada procumbens* weed risk and monitor the spread of the species.

Marla-Oodnadatta District Risk Management Action

As above.

Best Practice Control

Control method	Best time to control	Link for PIRSA current best practice chemical control and rates
Foliar Spray		
There are no herbicides registered for use in SA.		
Physical		
Hand pulling or grubbing using a mattock/ho.	Seedling stage	
If you locate a plant with mature seeds, collect seeds and burn them (e.g. campfire).	Mature plants	

Recommended Actions for Neurada Management in Marla-Oodnadatta District

1. Support landholder education in identification, monitoring and control of *Neurada procumbens*.
2. Encourage landholders to provide data on distribution so that it can be surveyed and mapped.
3. Monitor distributions of *Neurada procumbens* over time to see if species weediness increases.
4. Assist in identifying and coordinating *Neurada procumbens* control programs, using current best practice, if the need arises.
5. Monitor campgrounds for the emergence of *Neurada procumbens* and destroy if found.

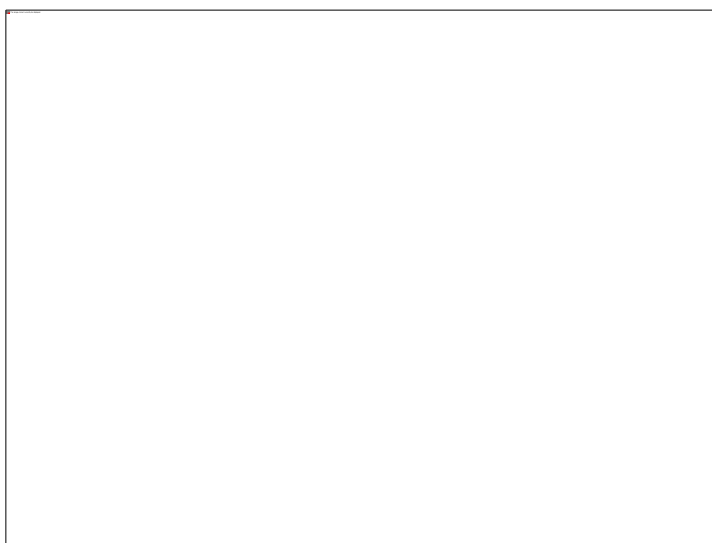
Surveys and Monitoring

Keep an eye out for *Neurada* during routine pastoral management activities within two months after rainfall events, especially along roadsides and on sandy ground, and near campgrounds in the far north of SA or Central Australia. Record locations using a GPS.

Rubber Bush *Calotropis procera* (Not declared)

Description

Shrub or small tree to 4 m high, distinguished by milky latex. Stems with soft thick corky bark. Leaves grey-green, 5–20 cm long, 4–15 cm wide, lower leaf surface densely covered in short white hairs. Flowers with petals 7–8 mm long, white with purple tips internally, flowering in winter. Fruit a grey-green pod splitting to release seeds. Pods 8–12 cm long and almost as wide with numerous flattened brown seeds ending in a tuft of white silky hairs. Originally from tropical Africa and Asia, introduced in the early 1900s possibly as a garden plant or in the packaging of camel saddles brought from India. Rubber Bush is most abundant on disturbed sandy sites such as dunes, periodically flooded areas such as sandy water courses and river flats, roadsides and sparsely vegetated arid and semi-arid grassland.



Rubber Bush (Credit: www.nretas.nt.gov.au)



Rubber Bush in flower
(Credit: www.nretas.nt.gov.au)

Distribution

Australian distribution: Widespread in northern Australia from tropical monsoon areas with annual rainfall over 1000 mm and arid areas with average rainfall as low as 150 mm. Found in WA, NT, QLD and northern SA.

SA distribution: Has been found in the Marla, Stony Plains and Great Victoria Desert regions.

District distribution: Has been found in the Marla, Stony Plains and Great Victoria Desert regions.

Potential distribution: This species could potentially inhabit the northern half of Australia, especially in sandy areas and flood-out zones. In SA, potential distribution could include the sandy areas throughout the Marla – Oodnadatta and Marree – Innamincka Landscape Regions.

Threats and Impacts

Invasiveness

Invades roadsides, watercourses, overgrazed land and previously cultivated areas. It has also been known to invade land that has good pasture cover. It prefers sandy soils and a hot, dry climate and can thrive in areas of annual rainfall above 150 mm.

Impacts

Reduces grazing potential, water access and hinders mustering. Very toxic to humans and cattle. Can form dense thickets which compete with native plants and transform the make-up of grassland plant communities.

Persistence

Mainly spread by seed that is transported by wind and water but also locally by suckering from the roots. Seed may also be dispersed in mud sticking to animals and vehicles.

Policy

National Strategy

Rubber Bush is not classified as a Weed of National Significance, therefore there is no National Strategy.

State Policy

No State policy exists for Rubber Bush.

SA Arid Lands Landscape Board Risk Assessment

The SAAL Landscape Board risk assessment for Rubber Bush is to **MONITOR** for any changes in the species weed risk. Aim: To detect any significant changes in Rubber Bush weed risk and monitor the spread of the species and review any changes in weediness.

Marla-Oodnadatta District Risk Management Action

As above

Best Practice Control

Control method and description

Foliar Spray

No herbicide currently registered for use in SA.

Cut stump

No herbicide currently registered for use in SA.

Basal bark

No herbicide currently registered for use in SA.

Physical

Roots are large and spongy; new plants quickly grow from the large taproot if cut off at ground level. Machinery capable of cutting plants off 10 to 20 cm below ground (such as blade ploughs or cutter bars) can cause high kill rates. However, with mechanical disturbance large scale seedling regrowth should be expected afterwards.

Recommended Actions for Rubber Bush Management in Marla-Oodnadatta District

- 1.** Support landholder education in identification, monitoring and control of Rubber Bush.
- 2.** Encourage landholders to provide data on distribution of Rubber Bush so that they can be surveyed and mapped.
- 3.** Monitor distributions of Rubber Bush over time to see if species weediness increases.
- 4.** Assist where possible in identifying and coordinating Rubber Bush control programs.
- 5.** Encourage landholders to control Rubber Bush where key sites are threatened.
- 6.** Encourage landholders to monitor success, following control of Rubber Bush, and carry out follow up control as necessary.

Surveys and Monitoring

Keep an eye out for Rubber Bush during routine pastoral management activities, from winter through to late spring especially along drainage lines, and record locations using a GPS.

Ward's Weed *Carrichtera annua* (Not declared)

Description

Erect annual herb to 40 cm high, rarely to 60 cm high. Plants branched mostly from the base. Leaves pinnately lobed and to 10 cm long. Flowers in winter and spring, cream to yellow in colour. Fruit opening at maturity to release seeds, on a stalk about 3 mm long. Seeds globe-shaped, 1–1.5mm long, compressed, dark brown. Originally from northern Africa, Asia and southern Europe, it was introduced in the early 1900s at Port Pirie possibly by accident in agricultural seed.



Ward's Weed (Credit: D Albrecht)



Ward's Weed in flowers (Credit: R & F Richardson)

Distribution

Australian distribution: Found across southern Australia in WA, SA, NSW and VIC. Well-suited to areas with winter-dominated rainfall and mild winter temperatures and calcareous soils.

SA distribution: Found mainly in the southern half of SA. It is also quite widespread in the North East Pastoral, North Flinders, Kingoonya and Gawler Ranges Districts. There are some minor incursions in the north of the State.

District distribution: Incursions have been reported around Coober Pedy and in isolated patches along the Stuart Highway and Adelaide to Alice Springs rail corridor.

Potential distribution: Already well-established in southern Australia, it can potentially spread further into areas of disturbed ground and degraded pastures, wherever winter rainfall is prevalent and mild winter temperatures occur.

Threats and Impacts

Invasiveness

Ward's Weed invades native grasslands, open woodlands, degraded pastures, and disturbed areas including roadsides and rail corridors. It replaces long-lived native species including native pasture in degraded pastures, where over-grazing has occurred.

Impacts

This species now dominates large areas of the semi-arid rangelands of southern Australia. Being a non-palatable weed of rangelands and pastures, Ward's Weed can significantly reduce the productivity of grazing areas.

Persistence

Ward's Weed can produce 30,000 seeds/m² annually. This species has two distinct seed banks – a pod seed bank, where seed is held in pods on dead plants between growing seasons and a soil seed bank, where the seed is dropped and a sticky coating on the seed helps it adhere to the soil. The two types of seed bank gives the species the best chance of prevailing the following season. Persistence is also aided by the low palatability of the plant.

Policy

National Strategy

Ward's Weed is not classified as a Weed of National Significance, therefore there is no National Strategy for this species.

State Policy

No State policy exists for Ward's Weed.

SA Arid Lands Landscape Board Risk Assessment

The SAAL Landscape Board risk assessment for Ward's Weed is **LIMITED ACTION**. Aim: Ward's Weed would only be targeted for coordinated control in the management area if its local presence makes it likely to spread to land uses where it ranks as a higher priority.

Marla-Oodnadatta District Risk Management Action

As above.

Best Practice Control

Control method and description

Foliar Spray

No herbicide currently registered for use in SA.

Physical

Manual removal is effective but must be done at least every 8-10 weeks. Once pods are formed, seed will often mature even if the plant has been uprooted. Soil disturbance often leads to a flush of seedlings.

Due to being unpalatable, grazing is not really a feasible means of controlling Ward's Weed.

Recommended Actions for Ward's Weed Management in Marla-Oodnadatta District

- 1.** Support landholder education in identification, monitoring and control of Ward's Weed.
- 2.** Encourage landholders to provide data on distribution of Ward's Weed so that it can be surveyed and mapped.
- 3.** Provide input into identification of key sites for control of Ward's Weed infestations.
- 4.** Assist in identifying and coordinating Ward's Weed control programs using integrated weed management, especially in areas where key sites are threatened.
- 5.** Encourage landholders to monitor success following control, and carry out follow up control as necessary.

Surveys and Monitoring

Keep an eye out for Ward's Weed during routine pastoral management activities, particularly from winter through to late spring, and record locations using a GPS or farm map.

Appendix 2 – Cactus and appropriate biocontrol species

Species name	Common name/s	Biological control agent/s	Effectiveness of agent
Species for which agents provide effective control			
<i>Cylindropuntia fulgida</i> var. <i>mamillata</i>	Boxing glove cactus, coral cactus	<i>Dactylopius tomentosus</i> 'cholla' lineage	Effective control provided.
<i>Cylindropuntia imbricata</i>	Rope pear, devil's rope pear	<i>Dactylopius tomentosus</i> 'cylindropuntia' lineage	Effective control provided. Released at several sites in north-western and western NSW, where field observations indicate this lineage is more damaging than 'imbricata'.
			Released at a small number of sites in Qld.
		<i>Dactylopius tomentosus</i> 'imbricata' lineage	Effective control provided. Prevalent in Qld and SA.
		<i>Dactylopius tomentosus</i> 'bigelovii' lineage	Research indicates good potential however further testing required.
<i>Cylindropuntia kleiniiae</i>	Klein's cholla	<i>Dactylopius tomentosus</i> 'imbricata' lineage	Effective control provided.
		<i>Dactylopius tomentosus</i> 'bigelovii' lineage	Research indicates good potential however further testing required.
<i>Cylindropuntia leptocaulis</i>	Candle cholla	<i>Dactylopius tomentosus</i> 'imbricata' lineage	Effective control provided.
<i>Cylindropuntia pallida</i>	White spined Hudson pear	<i>Dactylopius tomentosus</i> 'californica' var. <i>parkerii</i> ' lineage	Effective control provided in some locations, but has not proven to be effective in SA as yet.
<i>Cylindropuntia spinosior</i>	Snake cactus	<i>Dactylopius tomentosus</i> 'bigelovii' lineage	Effective control provided. Released at a small number of sites in NSW where it is impactful once established (which can take time).
		<i>Dactylopius tomentosus</i> 'spinosior-safford' lineage	Research indicates good potential however further testing required.
<i>Cylindropuntia prolifera</i>	Jumping cholla	<i>Dactylopius tomentosus</i> 'californica' var. <i>parkerii</i> ' lineage	Effective control provided.
<i>Cylindropuntia tunicata</i>	Brown spined Hudson pear	<i>Dactylopius tomentosus</i> 'acanthocarpa' var. <i>echinocarpa</i> ' lineage	Effective control provided.
<i>Opuntia aurantiaca</i>	Tiger pear	<i>Dactylopius austrinus</i>	Effective control provided.
		<i>Cactoblastis cactorum</i>	Provide some control, though not as effective as <i>Dactylopius austrinus</i> .
		<i>Tucumania tapiacola</i>	

<i>Opuntia elata</i>	Riverina pear	<i>Cactoblastis cactorum</i>	Effective control provided.
		<i>Dactylopius opuntiae</i> 'ficus' lineage	Further testing of <i>Dactylopius</i> in progress to determine effectiveness.
		<i>Dactylopius ceylonicus</i>	
<i>Opuntia englemannii</i>	Engelmann's prickly pear	<i>Dactylopius opuntiae</i> 'ficus' lineage	Effective control provided.
<i>Opuntia monacantha</i>	Smooth tree pear	<i>Dactylopius ceylonicus</i>	Effective control provided. Takes several years to kill plants.
		<i>Cactoblastis cactorum</i>	Attacks plants and limits growth but does not control it.
<i>Opuntia robusta</i>	Wheel cactus	<i>Dactylopius opuntiae</i> 'ficus' lineage	Effective control provided.
<i>Opuntia stricta</i>	Common prickly pear	<i>Cactoblastis cactorum</i>	Effective control provided.
		<i>Dactylopius opuntiae</i> 'stricta' lineage	
<i>Opuntia tomentosa</i>	Velvety tree pear	<i>Cactoblastis cactorum</i>	Effective control provided on young, small plants.
		<i>Dactylopius opuntiae</i> 'stricta' lineage	Effective control provided.
Further work required to identity an agent or to determine agent effectiveness			
<i>Opuntia elatior</i>	Red-flower prickly pear	<i>Dactylopius opuntiae</i> 'ficus' lineage	Effective control provided in NSW based on field observations. Released in SA in 2022, however field efficacy has not been evaluated.
<i>Opuntia humifusa</i>	-	<i>Dactylopius opuntiae</i> 'stricta' lineage	South African research indicates this lineage may be suitable, however there is a lack of data in Australia to confirm.
<i>Opuntia puberula</i>	-	None currently available.	Further testing of <i>Dactylopius</i> required
<i>Opuntia schickendantzii</i>	Chicken dance cactus	None currently available.	Further testing required to confirm efficacy
<i>Opuntia streptacantha</i>	Westwood pear	None currently available.	Further testing of <i>Dactylopius</i> required

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