

District Weed Management Guide North Flinders



November 2023

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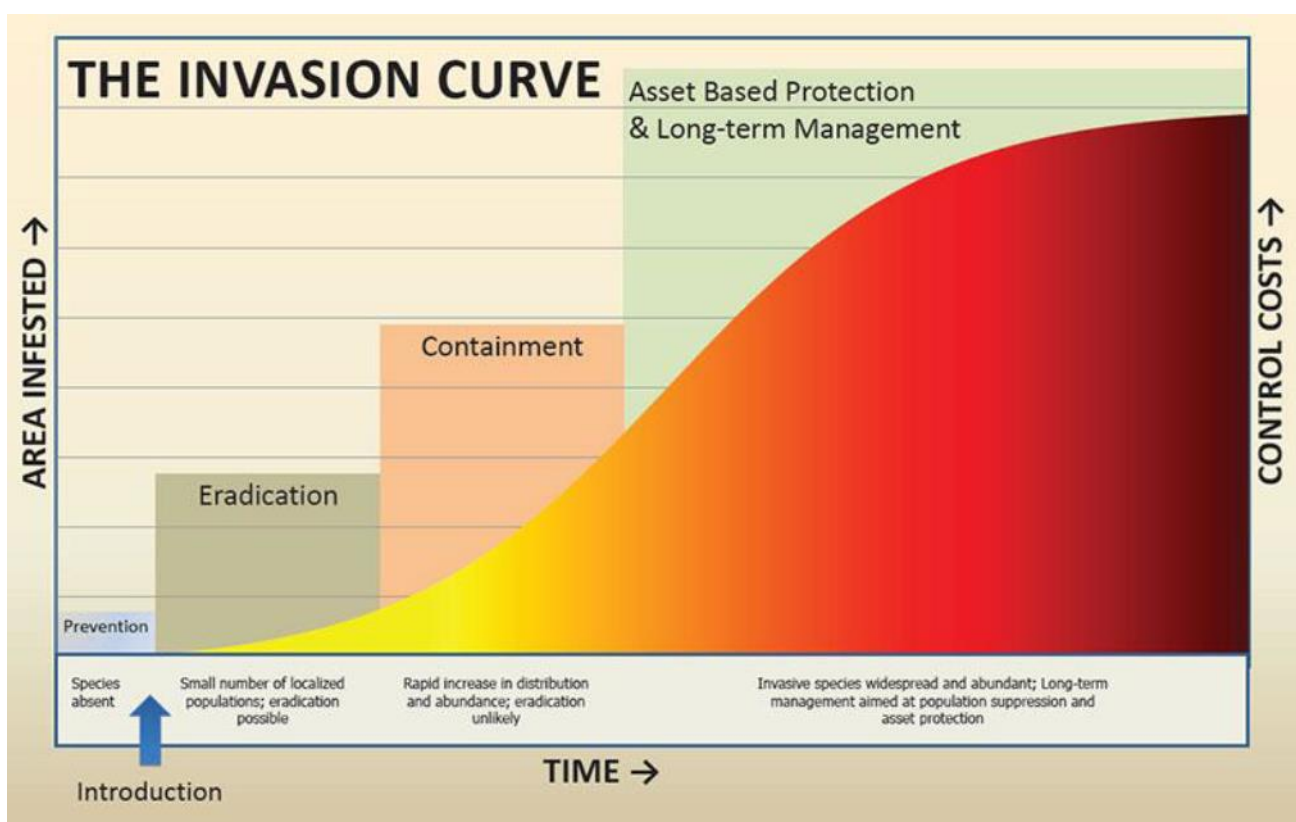
Photo front page: African boxthorn (Credit: P Hodges), Devil's rope Cactus (Credit: P Hodges) and African rue (Credit: DWLBC).

Purpose of the Guide

This guide provides information on priority weeds in the North Flinders 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 included weeds 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 North Flinders 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 North Flinders District:

- Buffel grass
- African rue

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 Sustainable Landscapes 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.

North Flinders District

The North Flinders Landscape District is bounded by Lake Frome to the east, Lake Torrens to the West, the dog fence to the north and comes south to around Hawker. The spectacular mountainous region covers an area of 33,500 square kilometres, has a population of approximately 900 people and incorporates the townships of Hawker, Cradock, Leigh Creek, Parachilna, Nepabunna, Copley, Beltana and Blinman.

Sheep and cattle production is the most extensive land use of the district however several properties are managed for conservation including the two well-known National Parks: Ikara-Flinders Ranges and the Vulkathunha-Gammon Ranges. Other land uses include Aboriginal managed lands, coal, uranium, magnesite and barite mining, tourism and small scale cropping.

The climate is semi-arid with hot dry summers and mild to cool winters. Rainfall is low and highly variable ranging from 200mm on the plains to 300mm in elevated areas. There is no seasonal rainfall in the north-west of the district and a weak winter maximum in the south.

The region makes up the northern portion of the Flinders Lofty Block bioregion and also includes a portion of the Gawler bioregion in the west and small portions of the Broken Hill Complex, Stony Plains and Simpson Strezelecki Dunefields bioregions. The major landforms and dominant vegetation of the district are

- Alluvial plains with wattles, black oak, Mitchell grass, bluebush and saltbush;
- Drainage systems with red gum or coolabah, samphire, nitre bush, cane grass, other grasses and forbs;
- Plains with Mitchell grass, poverty bush, dead finish, saltbush, prickly wattle, bluebush, black oak, cypress pine and mallee box;

- Dunes with mulga, cypress pine, black oak, copper burr and grasses; hills with prickly wattle, dead finish, red mallee, red box, Cyprus pine, mulga and hop bush; and
- Mountains with Red gums, cypress pine, red mallee, red box, spinifex, other grasses, yacca, broombush and mallee bluebush.

A number of natural springs provide near-permanent waterholes for stock use, tourism and native animals, however pumped groundwater is the primary water source of the pastoral industry, followed by dams.

Given its long history of grazing and settlement the North Flinders District has a larger portion of weeds when compared to the other districts. Common and widespread weeds include Ward's weed, Horehound, Salvation jane, Onion weed, Winged sea lavender and Bathurst burr. Some of these weeds are eaten by stock including Wards weed, Salvation jane, Horehound and Bathurst burr and although they are not preferred pasture they play a role in maintaining surface cover and reducing erosion.

Species that constitute a larger threat to the region (and those dealt with in this guide) include African boxthorn, African rue, Buffel grass, Cactus species, Mesquite, Parkinsonia, Athel pine and Pepper trees. Buffel grass is a competitive invader resulting in mono-specific stands and carries fire in areas where fire is not normally part of the ecosystem, however many cattle graziers view it as a desirable pasture species. Athel pine and Pepper trees are valued plants within station gardens but have naturalised at various locations around the region. Mesquite and Parkinsonia have a very limited distribution but, along with Athel pine, are considered Weeds of National Significance due to their invasiveness and persistence. African rue is common along selected roads and is very difficult to control due its deep perennial roots while African boxthorn is common throughout the region and often overlooked as a priority for control. All these priority weeds have a demonstrated ability to invade, persist and impact upon semi-arid Australia. The North Flinders district is a unique area with an opportunity to strategically and effectively manage weed threats for the long term protection of its productive and environmental assets.

Declared Weeds

The weeds identified as priorities for the North Flinders District and 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 North Flinders 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 North Flinders 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:

- [Innocent Weed \(*Cenchrus longispinus*\)](#)
- [Khaki weed \(*Alternanthera pungens*\)](#)
- [Noogoora burr \(*Xanthium strumarium*\)](#)

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:

- [Bathurst burr \(*Xanthium spinosum*\)](#) – [Declared Plant Policy](#)
- Castor oil plant (*Ricinus communis*) – Not declared – [Plant Policy](#)
- Mexican poppy (*Argemone ochroleuca*) – Not declared ([See Appendix 1](#))
- Pepper tree (*Schinus molle*) – Not declared ([See Appendix 1](#))
- [Salvation Jane \(*Echium plantagineum*\)](#) – [Declared Plant Policy](#)

Priority weeds in the North Flinders District

Priority Weed	Management Guide	Distribution in the District	Description of management guide
African boxthorn	Manage weed	Common	Reduce overall economic and/or social impacts through targeted management. See page 10 for more details.
African rue	Protect sites	Common	Prevent spread of the weed species to key sites/assets of high economic, environmental and/or social value. See page 13 for more details.
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 16 for more details.

Buffel grass	Protect sites	Limited	Prevent spread of the weed species to key sites/assets of high economic, environmental and/or social value. See page 20 for more details.
Cactus species (Prickly pear, Wheel cactus, Engelmann's prickly pear, Devils rope, Jumping cholla, Hudson pear, Coral cactus)	Destroy infestations	Common	Aims to significantly reduce the extent of the species. See page 23 for more details.
Mesquite	Destroy infestations	Limited	Significantly reduce the extent of the species. See page 30 for more details.
Parkinsonia	Protect sites	Limited	Prevent spread of the weed species to key sites/assets of high economic, environmental and/or social value. See page 34 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 **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**

- Undertake control measures if required for the benefit of other land uses at risk
 - Otherwise limited advice to land managers, if required
-

African boxthorn *Lycium ferocissimum*

Description

Branched shrub to 5 m high and 3 m wide. Spines occur on the main stems and branchlets, and branchlets terminate with a spine. Slightly fleshy leaves, 10-40 mm long, in clusters at the nodes. Flowers are pale lilac to white with purple markings at the base. Flowers predominately in summer but may occur all year round. Fruit is dull orange-red berry, 1 cm diameter. Originally from South Africa, African boxthorn was introduced in 1845 as a hedge plant. The fruit is a breeding place for numerous insects including common house fly, fruit fly and dried fruit beetles.

Do not confuse African boxthorn (*Lycium ferocissimum*) with the native [Australian boxthorn \(*Lycium australe*\)](#).



Leaves and spines (Credit: J Pitt)



Immature and mature fruit (Credit: J Pitt)

Distribution

Australian distribution: All states

SA distribution: Common in large areas of the arid lands and along and near the coast of Eyre Peninsula.

District distribution: Common at low densities throughout the district.

Potential distribution: Has the potential to infest watercourses and flood plains, especially where boxthorns are located upstream. Boxthorns may increase in density where unmanaged.

Threats and Impacts

Invasiveness

African boxthorn can only be dispersed through seed, which is eaten by birds and foxes and viable when excreted. Seed can be easily dispersed over large areas, particularly under trees, poles and fences where birds have perched. Regrowth may occur from broken roots and cut stumps following physical control.

Impacts

African boxthorn may form dense stands which compete with native species and pastures. The sharp spines prevent grazing and make stock movement difficult, particularly near watercourses which may prevent access. African boxthorn can impact on native fauna by reducing habitat quality. Thickets of African boxthorn can harbour feral pests such as foxes and rabbits.

Persistence

African boxthorn has the ability to reshoot and reinvade areas where control has been undertaken, therefore long-term follow-up is required. Reinfestation of Boxthorn may occur from untreated plants in surrounding areas.

Policy

National Strategy

African boxthorn is classified as a Weed of National Significance (WONS). The extent and potential extent in Australia will be well understood, stakeholders well equipped with information tools and knowledge, and strategic management will contain and reduce the weed's impacts.

State Policy

To protect native vegetation and maintain access to pasture throughout SA, under the *Landscape SA Act 2019*:

- Restrict movement of African boxthorn on public roads
- Prohibit sale of African boxthorn or produce or goods carrying African boxthorn
- Require landholders to destroy African boxthorn and inhibit its propagation as far as is reasonably achievable
- Allow Landscape Boards to recover costs of control of African boxthorn on road reserves from adjoining landholders.

SA Arid Lands Landscape Board Risk Assessment

The SAAL Landscape Board risk assessment for African boxthorn is to **MANAGE WEED**.

Aim: To reduce the overall economic, environmental and/or social impacts of the weed species through targeted management.

North Flinders 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		

Control method	Best time to control	Link for PIRSA current best practice chemical control and rates
Useful for all sized plants. The entire plant is sprayed when actively growing, i.e. when the plant has green healthy leaves. Plants should not be sprayed when they are stressed or when plants do not have foliage. Boxthorns are deciduous plants and will shed their leaves during winter and/or when stressed.	Summer and Spring when actively growing	African boxthorn - PIRSA
Basal Bark		
Useful for all sized plants Spray all sides of each stem with the recommended herbicide mix, to a height of between 250 – 750 mm above soil level.	Summer and Spring when actively growing	African boxthorn - PIRSA
Cut Stump		
Useful for all sized plants Cut the entire plant down at the base using a chainsaw and immediately (within 10 seconds) spray or paint the recommended herbicide mix onto the cut stump.	Summer and Spring when actively growing	African boxthorn - PIRSA
Physical and/or Organic Control		
<p>Small plants can be hand-pulled or dug up. Large plants can be removed using heavy machinery. Best done when there is ground moisture as the plants will be more readily removed.</p> <p>Uprooted plants should be piled & destroyed by burning as they can provide shelter for vermin and the spines can still cause injury.</p> <p>After removal, the area should be monitored for regrowth from root fragments left in the soil, and for germinating seedlings.</p>		

Recommended Actions for African boxthorn Management in North Flinders District

1. Support landholder education in identification, monitoring and control of African boxthorn.
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 African boxthorn infestations.
4. Assist in identifying and coordinating African boxthorn control programs using integrated weed management, especially in areas where key sites are threatened.
5. Encourage landholders to monitor success, following control of African boxthorn, and carry out follow up control as necessary.
6. Encourage landholders to use best practice hygiene, to prevent movement and spread of African boxthorn.

Surveys and Monitoring

Keep an eye out for African boxthorn during routine pastoral management activities. Best time for monitoring is during spring and summer as well as in the weeks and months after rainfall events when the leaves are bright green.

African rue *Peganum harmala*

Description

Perennial herb or shrubby plant 30-80 cm high. Leaves 1-5 cm long, bright green, divided several times into three or more linear segments. Flowers with five white broad petals, 12-17 mm long, in late spring to early summer. Fruit is slightly flattened capsule, 8-12 mm across and 7-12 mm long, which opens at the top, containing black angular seeds. Originally from the Mediterranean region and the Middle East, introduced in the 1930s for unknown reasons. It is considered to be an aphrodisiac in India, and its seeds and leaves have been used traditionally to treat various ailments including asthma, jaundice, colic and as a diuretic.



African rue plant (Credit: B Shepherd)



African rue flowers (Credit: DWLBC)

Distribution

Australian distribution: Confined to News South Wales and South Australia.

SA distribution: Known to occur in patches at Tintinara, Taylorville, Snowtown and the mid-north as well as numerous other sites. In the SAAL region African rue primarily occurs along roadsides and flood out areas. A core infestation exists in the eastern pastoral district and other occurrences exist in the northern Flinders Ranges and in the area between Lake Torrens and Port Augusta including along the Stuart Highway.

District distribution: There are core infestations of African rue near the south east border of the District and along roads that extend into south eastern and eastern areas of the District as well as other smaller infestations at selected locations around the district.

Potential distribution: African rue has the potential to become widespread throughout the SAAL region in disturbed areas such as roadsides and areas receiving run-on water such as flood outs and depressions. The zone of potential distribution has been described as between the 350 mm and 175 mm isohyets.

Threats and Impacts

Invasiveness

Dispersal of the plant is predominately through seed, with the majority being dropped close to the parent plant. Seeds can easily be dispersed through water flow, but also in mud moved by animals or vehicles. Stock and other animals may also eat the fruit and aid in the dispersal. African rue prefers disturbed sites with little or no competition, and requires moisture for seed germination. African rue is drought and salt tolerant, and therefore has the potential to thrive in semi-arid and arid areas.

Impacts

African rue can be toxic containing more than 25 alkaloids, however the plant is highly unpalatable to livestock with few poisonings reported. The likely impact on native vegetation is unknown, but due to its tolerance to drought and salt the potential impacts could be significant.

Persistence

African rue is difficult to destroy once established as regeneration may occur from severed root pieces. African rue is known to persist despite treatment with herbicide or manual removal.

Policy

National Strategy

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

State Policy

African rue is a declared species under the *Landscape SA Act 2019*, to prevent establishment in pastoral lands:

- Prohibit movement of African rue on roads
- Prohibit the sale of African rue or contaminated produce
- Require landholders to **notify** Landscape Board of African rue infestations
- Require landholders to control African rue on their properties
- Allow recovery of roadside control costs of African rue from adjoining landholders

SA Arid Lands Landscape Board Risk Assessment

The SAAL Landscape Board risk assessment for African rue is to **PROTECT SITES**.

Aim: To prevent spread of African rue to key sites/assets of high economic, environmental and/or social value.

North Flinders 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		
Useful on all sized plants. African rue has very deep roots and glyphosate may not effectively translocate to kill established plants. Repeated application over successive seasons is required. Spray the entire plant until run off. Better results will occur on plants that have dust free foliage. Spot spraying with a knap sack or quad/ute mounted spray unit can be used for scattered occurrences.	After rainfall events and retreat annually. Best sprayed before the plant flowers.	African rue - PIRSA

Boom spray can be used for dense infestations where no native vegetation exists between African rue plants e.g. along roads.

Cut stump

Cut off close to the ground and apply herbicide to stump surface immediately.

When actively growing.

[African rue - PIRSA](#)

Physical and/or Organic Control

Due to its deep roots, African rue cannot be successfully controlled through hand-pulling or grubbing (it will regrow from the broken root).

Organic properties - To provide long term suppression and reduce African rue proliferation, increasing competition from native plants, by reducing grazing pressure from livestock, rabbits and kangaroos, in areas where African rue is present, is the best option.

Recommended Actions for African rue Management in North Flinders District

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

Surveys and Monitoring

Undertake targeted surveys and/or opportunistic monitoring of African rue during pastoral management activities, especially along and adjacent to roadsides and other disturbed areas. Targeted surveys and control activities should occur annually, especially 2-3 weeks after rainfall. Record locations with GPS or appropriate app and advise SA Arid Lands Landscape Board of infestation.

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: Common throughout the District and were planted in station gardens, community areas and around waters for shade and shelter trees. There are 6 known locations where Athel pine and/or its close relative Tamarisk, have naturalised in a drainage line or swamp. 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.

North Flinders 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 North Flinders 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 watercourses 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 row 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: There is a dense area of Buffel grass in a creek line (and its tributaries) near Lake Frome and other occurrences in nearby creek lines in the north east of the district. Buffel grass is also sparsely scattered along the Leigh Creek Road and in paddocks and drainage lines around the Commodore Swamp and Brachina Gorge area.

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

North Flinders District Risk Management Action

North Flinders District Risk Management Action is to **PROTECT SITES** from the spread of Buffel grass.

Aim: To prevent spread of Buffel grass to key sites/assets of high economic, environmental and/or social value.

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 the North Flinders 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. Look in areas adjacent to roads, railways and beside watercourses. In the weeks following rainfall, look for a large clumpy grass with purple or black seed heads.

Cactus Species (*Austrocylindropuntia*, *Cylindropuntia* and *Opuntia*)

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 Cactus 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*

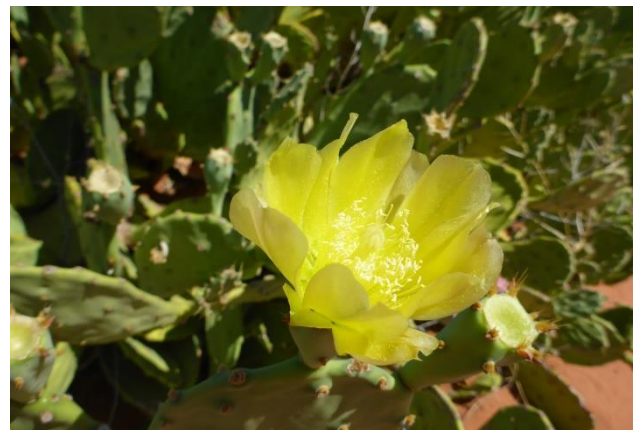
Description

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/or 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 west 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: There are cactus infestations in various areas in the North Flinders District. The largest infestations of Prickly pear and Wheel cactus and to a much lesser extent Devil's rope Cactus, occur in the ranges and drainage lines around Blinman.

Potential distribution: 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 *Austrocylindropuntia*, *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 by Landscape Board.

SA Arid Lands Landscape Board Risk Assessment

The SAAL Landscape Board risk assessment for *Opuntoid* and *Cylindropuntia* cacti species is to **DESTROY INFESTATIONS**.

Aim: To significantly reduce the extent of *Opuntoid* and *Cylindropuntia* cacti species in the SAAL Landscape region.

North Flinders 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 Opuntioidean 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.

Information about accessing and use of cochineal is available from the SAAL Landscape Board on 8429 9666.

Note: Different cochineal species and lineages work on different Opuntioidean 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
<p>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.</p>	<p>Any time of year providing plants are not stressed. Warmer months are preferred.</p>	<p>Opuntia cacti (prickly pear/wheel cactus) - PIRSA Cylindropuntia cacti (Devils rope, Hudson pear) - PIRSA</p>
Stem inject		
<p>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.</p>	<p>Any time of year</p>	<p>Opuntia cacti (prickly pear/wheel cactus) - PIRSA Cylindropuntia cacti (devils rope, Hudson pear) - PIRSA</p>
Physical		
<p>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.</p>		
Fire		
<p>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.</p>		

Volunteers

Volunteer groups play a critical role in cactus management in the North Flinders. For more than a decade, four-wheel drive and bushwalking clubs have actively worked with pastoral stations in the Blinman area to carry out biological and chemical control of cactus. The volunteer effort equates to about 4,000 hours per year and is a great example of landscape scale weed control.

If you would like to know more about engaging a volunteer group to help with cactus control, contact a SAAL Landscape Board's Community Landscape Officer on 8429 9666.

Recommended Actions for Cactus Management in North Flinders 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 on their property.
- 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. Look for old plantings of cactus in historic gardens around ruins, railway sidings, beside watercourses and areas associated with human settlement. Survey at any time of year.

Mesquite *Prosopis species*

Description

Mesquite are a group of shrubs or small trees, which reproduce by seed and suckers. Leaves are fern-like, often with one or two thorns. Flowers are greenish-yellow, small, arranged on cylindrical-shaped flower heads 50-80 mm long, in spring and early summer. Seed pods, up to 20 cm long, are generally straight or slightly curved, and resemble a string of beads. Originally from USA and Mexico, introduced in 1900 as an ornamental plant, fodder and shade tree. There are around 44 species of *Prosopis*, and only a few have been introduced to Australia.

Do not confuse Mesquite with prickly acacia trees. For more information click [here](#).



Mature Mesquite tree (Credit: B Shepherd)



Mesquite leaves and thorns (Credit: B Shepherd)



Mesquite flowers (Credit: B Shepherd)

Distribution

Australian distribution: Mesquite occurs in every mainland state. Mesquite has infested large tracks of pastoral country in the semi-arid and arid areas of QLD and WA.

SA distribution: Mesquite was infrequently planted in gardens in arid areas around SA. There are four known naturalised populations of Mesquite in northern SA, in the eastern districts around Cockburn, around Woomera, on the south eastern side of Lake Torrens and near Port Augusta. Despite numerous control efforts, infestations have persisted.

District distribution: An infestation of Mesquite in the sand dunes on the south eastern side of Lake Torrens has been recorded. The current status of this infestation is unknown.

Potential distribution: Mesquite's combination of a long life cycle, ability to survive drought, high seed production and long seed life makes it well suited to establishment in northern SA. Mesquite has the ability to establish in the rivers, swamps and other areas where soil moisture persists, throughout northern SA.

Threats and Impacts

Invasiveness

The occurrences of Mesquite in SA are on the outer extent of their preferred range and it tends not to spread as rapidly as in the northern Australian climate. However, vigorous establishment and growth of the SA populations demonstrate its potential to successfully invade and establish. Mesquite reproduces from seeds that are readily eaten and dispersed by animals.

Impacts

Mesquite forms dense thickets that prevent stock from accessing water points and make mustering difficult. The thickets overrun grazing land, exclude all other vegetation and use valuable ground water.

Persistence

Mesquite will grow in most of the semi-arid and arid environments of northern SA however it prefers areas prone to flooding or where soil moisture is retained. Mesquite is a very hardy plant that can tolerate dry conditions and seeds remain viable for several years.

Policy

National Strategy

Mesquite species and hybrids are confined and eventually eradicated from Australia.

State Policy

To maintain production from semi-arid pastoral lands and protect the integrity of native vegetation, under the *Landscape SA Act 2019*:

- Prohibit entry of Mesquite into SA and movement on public roads.
- Prohibit sale of Mesquite or contaminated material.
- Require landholders to **notify** Landscape Board of Mesquite infestations.
- Require landholders to destroy Mesquite on their properties.
- Recovery of control costs on adjoining road reserves by the Landscape Board.

SA Arid Lands Landscape Board Risk Assessment

The SAAL Landscape Board risk assessment for Mesquite is to **DESTROY INFESTATIONS**.

Aim: To significantly reduce the extent of Mesquite in the region.

North Flinders 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
Basal Bark		
Useful for smaller to mid-sized plants that have not developed rough bark. Spray all sides of each stem with the recommended herbicide mix,	Most of the year assuming the plant is not stressed. Most effective when actively growing.	Mesquite - PIRSA

from the ground up to a height of between 500 - 750mm.

For seedlings spray the entire plant.

Foliar Spray

Best for seedlings & regrowth of previously treated areas on plants under 1.5m height
Spray the entire plant

Best time to spray is when plants are actively growing and soil moisture is good.

[Mesquite - PIRSA](#)

Cut Stump

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.
The stump should be cut as close to the ground as possible.

Any time of year

[Mesquite - PIRSA](#)

Physical and/or Organic Control

Useful for very large trees, dense infestations and broad scale germinations or regrowth - 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.

Where regrowth occurs spray using the foliar method.

Branch and root fragments of Mesquite can take root, therefore woody material must be moved out of creek lines and moist areas.

Ongoing inspections and hand-pulling of seedlings will additionally be required where recruitment is occurring, until the seedbank is exhausted.

Recommended Actions for Mesquite Management in North Flinders District

1. Support landholder education in identification, monitoring and control of Mesquite.
2. Encourage landholders to report any infestations of Mesquite they detect so that it can be surveyed, mapped and control sites monitored.
3. Destroy all Mesquite from the North Flinders District including removal of cultivated plants.
4. Encourage landholders to monitor success, following control of Mesquite, and carry out follow up control as necessary.
5. Consider quarantine provisions around known occurrences of Mesquite.
6. Prevent sale and movement of Mesquite within SAAL Landscape region.

Surveys and Monitoring

Keep an eye out for Mesquite during routine pastoral management activities. Record locations with GPS or appropriate app and advise SA Arid Lands Landscape Board of infestation. Monitor any time of year, look for fern like leaves, long yellow flower heads and sometimes bright light green leaves.

Parkinsonia *Parkinsonia aculeata*

Description

Parkinsonia is a much branched shrub or tree, 2-8 m tall but at times reaching 10 m tall. Parkinsonia has extensive surface roots and a deep taproot. Leaves consist of a flat, green leaf stalk (up to 30 cm long) with numerous pairs of small oval leaflets, often with a sharp spine (3-20 mm long) Flowers are fragrant up to 2 cm diameter, bright yellow in colour becoming reddish with age, summer to early autumn. The top petal either has orange spots or turns completely orange. The pod is almost straight (3-13 cm long and 3.5-8 mm wide), narrowing at each end.

Originally from Central America, Parkinsonia was introduced in the 1890s to early 1900s as a shade and ornamental shrub. Parkinsonia has the potential to invade more than three quarters of mainland Australia.



Parkinsonia tree (Credit: B Shepherd)



Parkinsonia flowers (Credit: B Shepherd)



Parkinsonia seed pods (Credit: B Shepherd)

Distribution

Australian distribution: Parkinsonia was commonly planted in many areas around Australia in the late 1800s. Over one million hectares of Australia is now infested with Parkinsonia primarily throughout coastal, central and western QLD, central and northern NT and the Kimberly and Pilbara regions of WA.

SA distribution: Within northern SA there are 3 current locations where Parkinsonia has naturalised – near Leigh creek in northern Flinders Ranges, around Woomera and Port Augusta. All these occurrences are small

populations (2-10 plants). Historically there have been more occurrences recorded within gardens, however all of these have been successfully controlled.

District distribution: There are 6 known individual Parkinsonia plants in the Copley area. One of these was a township planting that has been eradicated and the rest are naturalised plants within a creek line that runs into the Leigh Creek Coalfields from Leigh Creek Station to the east. The plants originated from the old Leigh Creek township.

Potential distribution: Parkinsonia has the potential to establish in watercourses, swampy areas and other watered areas throughout arid and semi-arid areas of northern SA.

Threats and Impacts

Invasiveness

Parkinsonia reproduces by seeds that are spread by flood waters and in mud attached to vehicles or animals. It establishes and grows in a wide variety of conditions from semi-arid to sub-humid environments and prefers drainage lines, swamps, floodplains and other watered areas. Mature plants typically produce 5000 seeds annually, and germination after flood event or disturbance can be prolific.

Impacts

Parkinsonia forms dense thickets and can take over vast tracks of land replacing native plant species including valuable pasture species. It reduces access to land and water and increases difficulty when mustering stock. Parkinsonia reduces habitat for native species and provides a refuge for feral animals. The areas at risk are the more productive arid rivers and floodplains.

Persistence

Parkinsonia can re-shoot from roots. Germination from seed after control disturbance can be prolific. Parkinsonia seeds remain viable for many years.

Policy

National Strategy

Parkinsonia is confined and its impact reduced to a minimum.

State Policy

To maintain access to pastoral lands, and the integrity of native vegetation, under the *Landscape SA Act 2019*:

- Prohibit movement of Parkinsonia into SA.
- Prohibit movement of Parkinsonia on public roads.
- Prohibit sale of Parkinsonia, or produce or goods carrying Parkinsonia.
- Require notification of Parkinsonia infestations to authorities.
- Require landholders to destroy Parkinsonia on their properties.
- Allow recovery of costs of roadside control of Parkinsonia.

SA Arid Lands Landscape Board Risk Assessment

The SAAL Landscape Board risk assessment for Parkinsonia is to **PROTECT SITES**.

Aim: To prevent spread of Parkinsonia to key sites/assets of high economic, environmental and/or social value by removal of infestations.

North Flinders 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
Basal Bark		
<p>Useful for smaller to mid-sized plants.</p> <p>Spray all sides of each stem with the recommended herbicide mix. For smaller plants spray the trunk from the ground up to 30cm. For large trees spray from the ground up to 100cm</p> <p>For seedlings spray the entire plant.</p>	<p>Most of the year assuming the plant is not stressed. Most effective when actively growing.</p>	<p>Parkinsonia - PIRSA</p>
Foliar Spray		
<p>Best for seedlings & regrowth of previously treated areas on plants under 2m height and not drought stressed or bearing pods.</p> <p>Spray the entire plant</p>	<p>Best time to spray is when plants are actively growing and soil moisture is good.</p>	<p>Parkinsonia - PIRSA</p>
Cut Stump		
<p>Useful for medium to larger trees</p> <p>The main stem is 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>Any time of year</p>	<p>Parkinsonia - PIRSA</p>
Physical and/or Organic Control		
<p>Useful for very large trees, dense infestations and broad scale germinations or regrowth - the entire plant is removed from the ground using a suitably sized bull dozer or loader.</p> <p>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>Where regrowth occurs spray using the foliar method.</p> <p>Branch and root fragments of Parkinsonia 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 Parkinsonia Management in North Flinders District

- 1.** Support landholder education in identification, monitoring and control of Parkinsonia.
- 2.** Encourage landholders to report any infestations of Parkinsonia they detect so that it can be surveyed, mapped and control sites monitored.
- 3.** Destroy all Parkinsonia from the North Flinders District including removal of cultivated plants.
- 4.** Encourage landholders to monitor success, following control of Parkinsonia, and carry out follow up control as necessary.
- 5.** Consider quarantine provisions around known occurrences of Parkinsonia.
- 6.** Prevent sale and movement of Parkinsonia within SAAL Landscape region.

Surveys and Monitoring

Keep an eye out for Parkinsonia during routine pastoral management activities. Record locations with GPS or appropriate app and advise SA Arid Lands Landscape Board of infestation. Monitor any time of year, look for the distinctive small leaves and the overall bright light green colour of the plant.

Appendix 1 – Noted Weeds

The weeds in this section are not declared under the *Landscape SA Act 2019* and are not considered priority weeds by the North Flinders Landscape Group and are not a part of the priority list for the District Weed Management Guide. However, they are included in this appendix for identification for local landholders and other stakeholders.

Mexican poppy *Argemone ochroleuca*

Description

Stiff bluish-green prickly plant that grows up to 1 m in height. Leaves up to 20cm long, silvery green with white veining and deep regular lobes. The upper surface of the leaf is smooth while the underside has a few prickles along the midrib. The stem leaves, in contrast to the rosette leaves, are stalkless and clasp onto the plant's stem. Flowers 6 cm in diameter with four light yellow or cream petals, flowering generally November to February but is opportunistic in arid areas and can flower whenever moisture is available. Fruit spiny, oblong seed capsules, 3.5cm in length with three to six openings at the top. The capsule contains up to 400 seeds. Seeds are oval-shaped, blackish brown, about 1.5 mm long with a pitted seed coat and a ridge along one side.

Originally from Mexico, Central America and USA, it was first reported near Sydney in 1845, probably imported as a contaminant of wheat seed. *Argemone ochroleuca* is similar in appearance and far more widespread than *A. mexicana*, and both species are referred to as Mexican poppy. *A. mexicana* differs from *A. ochroleuca* in that it has bright yellow flowers as opposed to cream or pale-yellow flowers, and globular flower buds as opposed to the egg-shaped buds of *A. ochroleuca*.



Seed pod and flower (Credit: DAFF)



Flower and spiny leaves (Credit: DAFF)

Distribution

Australian distribution: All Australian states and territories, except Tasmania.

SA distribution: Some intermittent creek-lines, roadsides and areas of soil disturbance within the SA Arid Lands and Northern and Yorke regions.

District distribution: Isolated patches across North Flinders district. Found in intermittent creek-lines and areas of disturbed soil.

Potential distribution: Potential distribution of Mexican poppy extends across the range lands mainly in drainage lines and along roadsides.

Threats and Impacts

Invasiveness

Establishes readily on disturbed ground, overgrazed pastures, creek beds and roadsides. Seed is readily dispersed by moving water, especially where plants grow in riparian habitats and on terrain where erosion and

runoff occurs. Contaminated soil, fodder, vehicles and the fur and hooves of livestock are vectors for transport of Mexican poppy seed.

Impacts

The prickly fruits can become entangled in wool, reducing its value considerably. It is suspected of being toxic to animals and humans due to the presence of alkaloids in all parts of the plant. However, reported cases of poisoning are rare because livestock tend to avoid it in the field, due to the presence of a bitter sap that makes it unpalatable. Poisonings may occur as a result of hay and chaff containing traces of the plant. Poisonings in humans have occurred by the consumption of oils contaminated with the plant.

Persistence

A single plant can produce up to 30 000 seeds per year. The seed can stay dormant for many years, making control difficult.

Policy

National Strategy

Mexican poppy 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 Mexican poppy.

SA Arid Lands Landscape Board Risk Assessment

SAAL Landscape Board risk assessment for Mexican poppy is to **MONITOR** for any changes in the species weed risk.

Aim: To detect any significant changes in Mexican poppy's weed risk and monitor the spread of the species and review any changes in weediness.

North Flinders District Risk Management Action

As above.

Best Practice Control

Foliar Spray

While no herbicides are registered specifically for this weed, in general, it's legal to use a registered herbicide in accordance with the label directions, i.e. method of application and situation, on any weed, not just the ones mentioned by name on the manufacturer's label.

Physical and/or Organic Control

Hand pulling or grubbing using a mattock/hoe for immature plants that haven't seeded.

If you locate a plant with mature seeds, apart from removing plant, collect seeds and burn them (e.g. campfire).

Recommended Actions for Mexican poppy Management in North Flinders District

1. Support landholder education in identification, monitoring and control of Mexican poppy.
2. Monitor distributions of Mexican poppy over time through the use of surveillance and mapping.

3. Provide input into identification of key sites requiring control of Mexican poppy.
4. Encourage landholders to monitor success, following control and carry out follow up control as necessary.

Surveys and Monitoring

Monitor during routine pastoral management activities, particularly late spring to late autumn and after summer rains, and especially along roadsides and drainage lines.

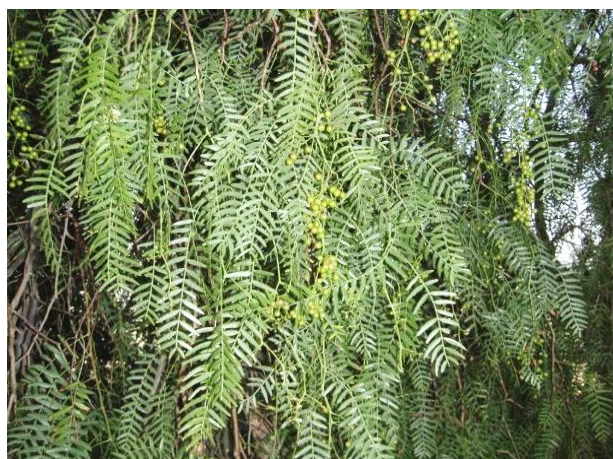
Pepper tree *Schinus molle*

Description

A large evergreen tree to 12 m tall and 5-10 m wide. Leaves are divided into 15-41 alternatively arranged, shiny leaflets, 4 cm long. Leaves are aromatic and sticky when crushed. Small white flowers hang in long sprays, all year round, and are followed by spherical shiny pink fruit, 4-6 mm in diameter. Originally from South America, it was introduced in 1870s as a shade tree. All *Schinus* species leaves and fruit are poisonous to livestock and possibly humans.



Mature Pepper tree (Credit: P Hodges)



Immature fruit (Credit: B Shepherd)



Mature fruit (Credit: B Shepherd)

Distribution

Australian distribution: Pepper trees are favoured garden plants throughout Australia and their ability to withstand dry conditions makes them well suited as garden and shade plantings in arid and semi-arid areas.

SA distribution: Common at nearly every township, station house and stockyard in northern SA. Naturalised Pepper trees are a common site, particularly along drainage lines of the Flinders Ranges, the Olary Ranges and in the mid north agricultural districts. Within some creeks and swamps, naturalised Pepper trees are the dominant tree choking out all other plants.

District distribution:

Pepper trees were planted at most stations throughout the North Flinders District, there are several locations where Pepper trees have naturalised along adjacent creek lines. In some areas such as around Blinman and in Commodore swamp the Pepper tree infestations are extensive.

Potential distribution: Pepper trees have demonstrated their ability to establish in many of the semi-arid drainage lines and swampy areas of SA.

Threats and Impacts

Invasiveness

Pepper trees reproduce from seed, and germination requires sustained soil moisture. The seeds are dispersed by birds, animals, water and human activity. Broad scale seed germinations can occur following floods and favourable rainfall events, especially in swampy areas.

Impacts

Pepper trees can form dense thickets in swamps and along rivers excluding native vegetation and using valuable ground water.

Persistence

Mature Pepper trees can re-shoot following initial chemical control and can re-shoot from root portions left in the ground following mechanical control. Seeds remain viable for less than three years.

Policy

National Strategy

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

State Policy

Pepper trees are not a declared species under the *Landscape SA Act 2019*, therefore there is no South Australian policy.

SA Arid Lands Landscape Board Risk Assessment

The SAAL Landscape Board risk assessment is to **PROTECT SITES** from Pepper tree infestation. Aim: To prevent spread of Pepper trees to key sites/assets of high economic, environmental and/or social value, through targeted control.

North Flinders District Risk Management Action

As above.

Best Practice Control

Cut Stump

While no herbicides are register specifically for this weed, in general, it's legal to use a registered herbicide in accordance with the label directions, ie method of application and situation, on any weed, not just the ones mentioned by name on the manufacturer's label.

Basal Bark

While no herbicides are registered specifically for this weed, in general, it's legal to use a registered herbicide in accordance with the label directions, ie method of application and situation, on any weed, not just the ones mentioned by name on the manufacturer's label.

Physical and/or Organic Control

Useful for very large trees, dense infestations and broad scale germinations or regrowth - 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.

Where regrowth occurs spray using a foliar method.

Best time to use this method - Summer or when plants are stressed e.g. during drought conditions.

Recommended Actions for Pepper tree Management in North Flinders District

- 1.** Support landholder education in identification, monitoring and control of Pepper trees.
- 2.** Provide input into identification of high priority areas such as significant rivers, creeks and waterholes and coordinate control programs to protect identified priority sites.
- 3.** Encourage landholders to control naturalised Pepper trees, and control cultivated Pepper trees where key sites are threatened.
- 4.** Encourage landholders to monitor success, following control of Pepper trees, and carry out follow up control as necessary.

Surveys and Monitoring

Keep an eye out for naturalised Pepper trees during routine pastoral management activities. Monitor any time of the year, look for the distinctive bi-pinnate leaves and the overall light green colour of the plant.

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. parkerii' 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. parkerii' lineage	Effective control provided.
<i>Cylindropuntia tunicata</i>	Brown spined Hudson pear	<i>Dactylopius tomentosus</i> 'acanthocarpa var. echinocarpa' 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

Credit: Shauna Potter, Dept. of Primary Industries and Regional Development, W.A.

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