Government of South Australia
South Australian Arid Lands Natural Resources Management Board



Reviewed June 2015

South Australian Arid Lands Natural Resources Management Board

GAWLER RANGES NRM DISTRICT WEED STRATEGY

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RURAL SOLUTIONS SA

JUNE 2010

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Photo front page: African Boxthorn (*Lycium ferocissimum*). Photo: B. Shepherd
Engelmann's Prickly Pear (*Opuntia engelmannii*). Photo G. Patrick
Fountain Grass (*Pennisetum setaceum*). Photo B. Shepherd

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Purpose of Strategy

It is intended that this strategy be used by the Gawler Ranges NRM District Group to guide prioritisation of weed management activities within their district over the next five years.

The Strategy outlines management actions that the Group can implement within their District that will reduce the current and potential impacts of eight priority weeds.

The management actions outlined for each of the eight priority weeds are in accordance with South Australian State policies for declared weeds and the SA Arid Lands NRM Board regional weed policies.

The Strategy also provides information regarding the known locations, possible threats and impacts and policy on each of the eight priority weeds and outlines current best practice control methods and surveying/monitoring activities.

Furthermore, it is recommended that the Group review this strategy in five years to assess progress, update management actions where required and add further species if required.

Some of the plant species discussed in this strategy are valued amenity trees (e.g. Pepper Trees and Athel Pine) within station gardens, while others are generally undesirable plants (e.g. Cactus and African Boxthorn). All of the weeds are currently at low densities, and others are adjacent to the Gawler Ranges NRM District but may threaten its borders. All eight weeds have a demonstrated ability to rapidly expand their distribution given favourable seasonal conditions. For this reason the weeds dealt with in this strategy could also be described as sleeper weeds waiting for the right conditions to establish and spread. Removing or effectively managing such weeds before they establish and spread will save the considerable amounts of time and money required to control large infestations of persistent weeds.

The District groups can be influential in the implementation of on-ground natural resource management programs within their district. By implementing this strategy the Gawler Ranges NRM District group can develop proactive weed management programs' within their district for the long term protection of its environmental and productive assets.

The Gawler Ranges NRM District

The Gawler Ranges NRM District makes up the south western portion of the South Australian Arid Lands NRM region of northern South Australia. It covers an area of approximately 51,000 square kilometres and extends from the areas directly north of Port Augusta, west and over to the area north of the Eyre Peninsula. The population of the District is around 200 and made up of predominantly sheep graziers. Other land uses include National Parks, mining/exploration, defence operations and tourism.

The District is semi-arid and rainfall variations are moderate to high. Mean annual rainfall total ranges from less than 200 mm in the northeast to around 300 mm in the southwest of the District.

The District landforms consist of sand dunes and flats with mulga woodlands, calcareous plains with mulga, western myalls, black oak and chenopods, gibber tablelands with chenopod/samphire scrublands and granitic hills with mallee woodlands. The water resources of the District are limited to a small number of reliable wells or springs and bore water.

The Gawler Ranges District is free of large infestations of weeds however smaller occurrences of naturalised Pepper Trees, African Boxthorn and Cactus species exist. Onion Weed, Wards Weed and to a lesser extent Bathurst Burr are common in the district. There are several weeds that either occur within or adjacent to the District that present a potential threat to the region should they be allowed to spread. These plants include Cactus species, Athel Pine, Mesquite, Parkinsonia, Buffel Grass and African Rue.

The Gawler Ranges 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.

The Gawler Ranges NRM District Group

The District Groups were established to provide a vital link in communicating community issues to the SA Arid Lands NRM Board and provide a local perspective on implementing on-ground projects.

The District Group members of the Gawler Ranges NRM District Group as at December 2014 are:

Sandy Morris

Jane Anderson

Joanne Lee

Michael Starkey

Greg Johnston

Catherine McTaggart (Board Rep)

Target Weeds

The weeds chosen as priorities for the Gawler Ranges NRM District and dealt with in this strategy are declared weeds under the Natural Resources Management Act 2004 and/or demonstrated to be regional threats where the feasibility of control is high i.e. they are strategic control opportunities. An initial list of priority weeds were presented to the District Group from which the top eight priority weeds were selected.

Weed risk assessments have been undertaken by the SA Arid Lands NRM Board on each of the eight priority weeds. This process determines a weeds risk (low, medium or high) in a particular land system (in this case the Gawler Bioregion) by assessing the weeds invasiveness, impact and potential distribution. Through the assessment of each weeds risk, the management strategy for each weed was identified (Table 1).

Table 1. Eight priority weeds included in the Gawler Ranges NRM District Strategy, the management strategy and description of the management strategy for each weed. NB Cactus species have different management strategies depending on the weeds risk.

Priority Weed	Management strategy	Description of management strategy
African Boxthorn	Manage sites	African Boxthorn is common in the District and the Group should aim to reduce the overall economic and/or social impacts of this weed through targeted management. See page 10 for more details
African Rue	Protect sites	African Rue has a limited current distribution in the District and the Group should aim to prevent spread to key sites/assets of high economic, environmental and/or social value. See page 14 for more details.
Athel Pine	Protect sites	Athel Pine has a limited distribution within the District, primarily all amenity plants, and the Group should aim to prevent spread of this weed (particularly along water courses). See page 18 for more details.
Buffel Grass	Protect sites	Buffel Grass has a very limited distribution within the District. The Group should aim to prevent spread of Buffel Grass to key sites/assets of high economic, environmental and/or social value. See page 22 for more details.
Cactus species (Wheel Cactus, Engelmann's Prickly Pear & Prickly Pear)	Contain spread	These species are common in parts of the District and the Group should aim to prevent the ongoing spread of these species through targeted control. See page 26 for more details
Cactus species (Devils Rope, Hudson Pear, Jumping Cholla and Coral Cactus)	Destroy	These species have a very limited distribution within or close to the District and the Group should aim to significantly reduce the extent of these weeds through control of all infestations found. See page 26 for more details.
Fountain Grass	Monitor	Fountain Grass has a very limited distribution within the District and its spread should be prevented. See page 34 for more details.
Mesquite	Destroy	Mesquite has a very limited distribution within or close to the district and the group should aim to destroy all known occurrences. See page 38 for more details.
Pepper Tree	Protect sites	Pepper Trees are common within the District and the Group should aim to prevent spread to key sites/assets of high economic, environmental and/or social value. See page 42 for more details.

Table 2. Management Strategy aims and actions definitions

Management strategy	Aims & actions of management strategies
Alert	Species that are not known to be present in the management area and which represent a significant threat if permitted to enter and establish. **Aims to prevent the species arriving and establishing in the management area.** • Prevention of entry to management area • Ongoing surveillance for incursions of the species • Training & awareness activities for the community to enable early detection
Eradicate	**Aims to remove the weed species from the management area.** • 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 grow and all cultivated plants to be removed • Monitor progress towards eradication
Destroy	**Aims to significantly reduce the extent of the weed species in the management area.** • 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 grow • Monitor progress towards reduction
Contain spread	**Aims to prevent the ongoing spread of the weed species in the management area.** • 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	**Aims to prevent spread of the weed species to key sites/assets of high economic, environmental and/or social value.** • 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	**Aims to reduce the overall economic, environmental and/or social impacts of the weed species through targeted management** • 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	**Aims to maintain the overall economic, environmental and/or social value of key sites/assets through improved general weed management.** • 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	**Aims to detect any significant changes in the species' weed risk** • 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

Review period

This strategy was developed in 2010 and has been implemented over the past 4 years. This strategy was reviewed in June 2015 and will be reviewed every 5 years from now on.

Suggested time frame:

Year	Activity
2015	Strategy reviewed by the Group and feedback incorporated into the Strategy Strategy endorsed by the group
2016	Implementation
2017	Implementation
2018	Implementation
2019	Implementation
2020	Review progress and update the strategy as required.

Target Weeds and their strategy

African Boxthorn

Common name(s): African Boxthorn

Scientific name: *Lycium ferocissimum*

Plant 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.

Fruit is dull orange-red berry (1 cm diameter).

Photo 1: African Boxthorn leaves and spines (Photo J Pitt)

Photo 2: African Boxthorn with immature and mature fruit (Photo J Pitt)

Flowering: Predominately in summer (but may occur all year round)

Origin: South Africa

When introduced: 1845

Why introduced: Introduced as a hedge plant

Other information: African Boxthorn fruit is a breeding place for numerous insects including common house fly, fruit fly and dried fruit beetles.

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.

Distribution

Current Australian distribution:

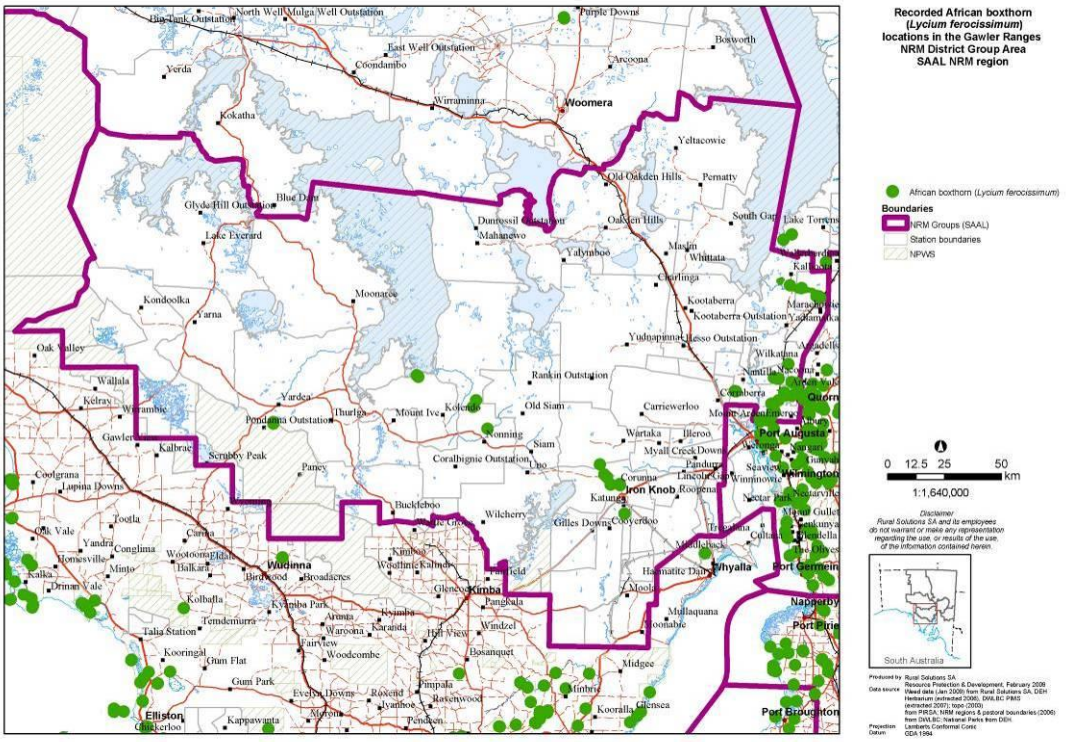
All states

Current South Australian distribution:

In South Australia, common in large areas of the arid lands and along and near the coast of Eyre Peninsula.

Current District distribution:

African Boxthorn occurs throughout the district at very low densities and predominantly within drainage lines and other wet areas. The locations marked on Map 1; do not represent all known locations of African Boxthorn, rather African Boxthorn data collected since 1972.



Map 1. Recorded African Boxthorn locations in the Gawler Ranges NRM District (data collected since 1972).
*Note: Weed distribution data is incomplete.

Potential distribution:

African Boxthorn has the potential to infest watercourses and flood plains, especially where Boxthorns are located upstream. Boxthorns may increase in density where unmanaged.

Policy

National Strategy:	African Boxthorn is classified as a Weed of National Significance (WONS). The extent and potential of African Boxthorn 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 *Natural Resources Management Act*, 2004: ▪ Restricting movement of African Boxthorn on public roads ▪ Prohibiting sale of African Boxthorn or produce or goods carrying African Boxthorn ▪ Requiring an owner of land to destroy African Boxthorn and inhibit its propagation as far as is reasonably achievable ▪ Allowing NRM Boards to recover costs of control of African Boxthorn on road reserves from adjoining landowners.
SA Arid Lands NRM Policy:	The SAAL NRM regional management strategy for African Boxthorn is to MANAGE sites. Aim: To reduce the overall economic, environmental and/or social impacts of African Boxthorn through targeted management.
Gawler Ranges NRM District Risk management strategy:	Gawler Ranges NRM District management strategy is to MANAGE sites infested with African Boxthorn, Aim: To maintain economic, environmental and/or social values of key sites/assets through improved management of African Boxthorn.

Gawler Ranges NRM District Strategy for management of African Boxthorn

Recommended Actions
Support land manager education in identification, monitoring and control of African Boxthorn.
Gawler Ranges NRM District Group to encourage landholders to provide data on distribution of African Boxthorn in Gawler Ranges NRM District to NRSAAL, so that it can be surveyed and mapped.
Gawler Ranges NRM District group to provide input into identification of key sites for control of African Boxthorn infestations.
Gawler Ranges NRM District group to assist, where possible, in identifying and coordinating African Boxthorn control programs using integrated weed management (combination of recommended best practices), especially in areas where key sites are threatened.
Land managers encouraged to monitor success, following control of African Boxthorn, and carry out follow up control as necessary.
Gawler Ranges NRM District group to encourage landholders to use best practice hygiene, to prevent movement and spread of African Boxthorn.

Best Practice Control

Control method and description	Best time to control	Active ingredients and example trade names	Herbicide rates and carrier
Foliar Spray			
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	Metsulfuron-methyl (600g/kg) e.g. Brush-off® + glyphosate (360g/L) e.g. Roundup®	Consistent with label rates in water with a penetrant e.g. Pulse®
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	Triclopyr 600 g/L e.g. Garlon® Triclopyr 240 g/L + Picloram 120 g/L e.g. Access®	33 mls/L mixed in diesel 17 mls/L mixed in diesel
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	Triclopyr 600 g/L e.g. Garlon® Triclopyr 240 g/L + Picloram 120 g/L e.g. Access®	33 mls/L mixed in diesel 17 mls/L mixed in diesel
Physical			
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. Uprooted plants should be piled & destroyed by burning as they can provide shelter for vermin and the spines can still cause injury. After removal, the area should be monitored for regrowth from root fragments left in the soil, and for germinating seedlings.			

Surveys/ Monitoring

General method:	Keep an eye out for African Boxthorn during routine pastoral management activities and record locations using a GPS.
Best time of year for surveys:	Spring and summer as well as in the weeks and months after rainfall events when it is bright green.

African Rue

Common name(s): African Rue

Scientific name: *Peganum harmala*

Plant 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 5 white broad petals (12- 17 mm long).

Fruit is slightly flattened capsule (8-12 mm across, 7-12 mm long) which opens at the top, containing black angular seeds.

Photo 3: African Rue plant (Photo B. Shepherd)

Photo 4: African Rue flowers (Photo Courtesy DWLBC)

Flowering: Late spring – early summer

Origin: Mediterranean region and Middle East

When introduced: Unknown

Why introduced: Unknown, was once used in Medicine

Other information: African Rue is considered an aphrodisiac in India. Its seeds and leaves have been used medicinally for treatment of various aliments including asthma, jaundice, colic and as a diuretic.

Threats and Impacts

Invasiveness Dispersal of the plant is predominately through seed, with the majority of seed 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 of African Rue.

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 have large impacts 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 (few poisonings have been reported).

The likely impact on native vegetation is unknown, but due to its tolerance to drought and salt the potential impacts could be large.

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.

Distribution

Current Australian distribution:

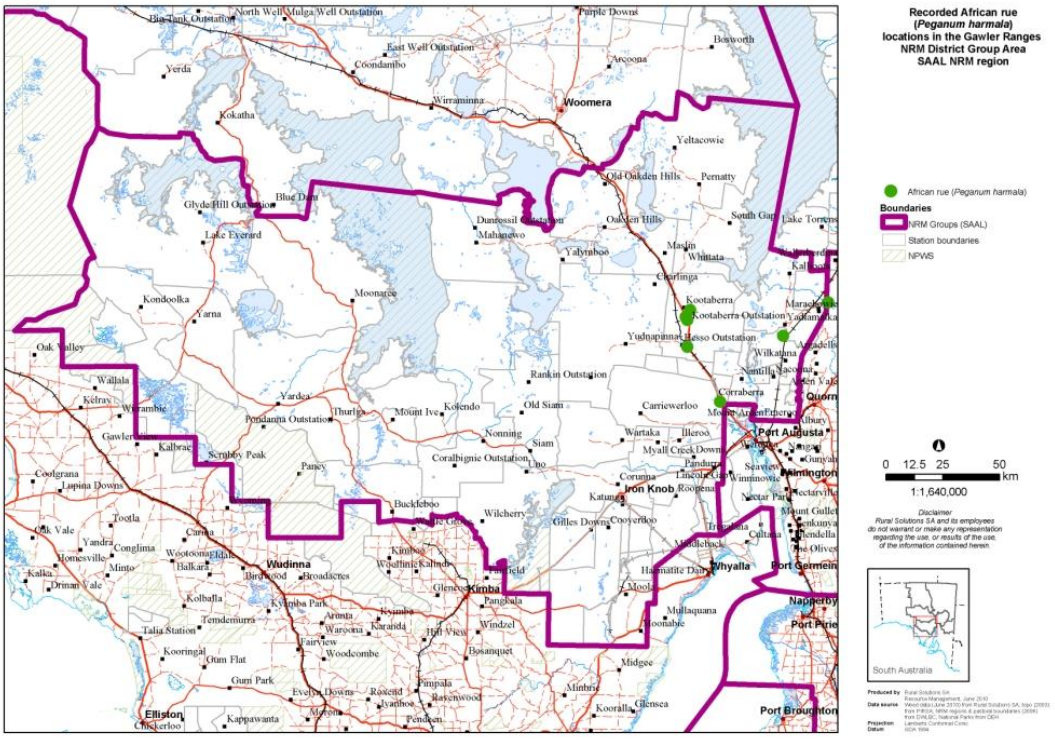
Confined to News South Wales and South Australia.

Current South Australian distribution:

Known to occur in patches at Tintinara, Taylorville and Snowtown 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.

Current District distribution:

African Rue distribution within the Gawler Rangers NRM District is confined to the far eastern areas of the District, along the Stuart Highway and other areas directly north of Port Augusta.



Map 2. Recorded African Rue locations in the Gawler Ranges NRM District.

*Note: Weed distribution data is incomplete.

Potential distribution:

African Rue has the potential to become widespread throughout the arid lands 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.

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 Natural Resources Management Act, 2004.

To prevent establishment in uninfested pastoral lands

Under the *Natural Resources Management Act*, 2004:

- Prohibiting movement of African Rue on roads
- Prohibiting the sale of African Rue or contaminated produce
- Requiring landholders to control African Rue on their properties
- Allowing recovery of roadside control costs of African Rue from adjoining landholders

SA Arid Lands NRM Policy: The SAAL NRM regional management strategy 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.

Gawler Ranges NRM District management strategy: Gawler Ranges NRM District management strategy is to PROTECT sites from the spread of African Rue

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

Gawler Ranges NRM District Strategy for management of African Rue

Recommended Actions
Support land manager education in identification, monitoring and control of African Rue.
Gawler Ranges NRM District Group to encourage landholders to provide data on distribution of African Rue in Gawler Ranges NRM District to NRSAAL, so that it can be surveyed and mapped.
Gawler Ranges NRM District group to provide input into identification of key sites for control of African Rue infestations.
Gawler Ranges NRM District group to assist in identifying and coordinating African Rue control programs using integrated weed management (combination of recommended best practices), especially in areas where key sites are threatened.
Land managers encouraged to monitor success, following control of African Rue, and carry out follow up control as necessary.
Sale and movement of African Rue to be restricted within SAAL NRM Region.

Best Practice Control

African Rue can be a difficult plant to kill due to its deep roots, on-going monitoring and repeated applications of herbicide will be required annually and after rainfall events.

Increasing competition from native plants, by reducing grassing pressure from livestock, rabbits and kangaroos in areas where African Rue is present will provide long term suppression and reduce its proliferation.

Control method and description	Best time to control	Active ingredients and example trade names	Herbicide rates and carrier
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.	After rainfall events and retreat annually. Best sprayed before the plant flowers.	Glyphosate (360g/L) e.g. Roundup®	Contact the SA Arid Lands NRM Board for current recommended rates in water. A penetrant e.g. Pulse® will also

Control method and description	Best time to control	Active ingredients and example trade names	Herbicide rates and carrier
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. Boom spray can be used for dense infestations where no native vegetation exists between African Rue plants e.g. along roads.			be required.
Cut stump			
Cut off close to the ground and apply herbicide to stump surface immediately.	When actively growing.	Glyphosate (450g/L) e.g. Roundup®	Undiluted
Physical			
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.			

Surveys/ Monitoring

General method:	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 and/or after rainfall.
Best time of year for surveys:	Anytime of year and especially 2-3 weeks after rainfall.

Athel Pine

Common name(s): Athel Pine

Scientific name: *Tamarix aphylla*

Plant 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, with bell shaped fruit containing numerous seeds.

Photo 5: Mature Athel Pine (Photo B Shepherd)

Photo 6: Athel Pine in riparian zones (Photo B Shepherd)

Photo 7: Pink-white flowers of Athel Pine (Photo B Shepherd)

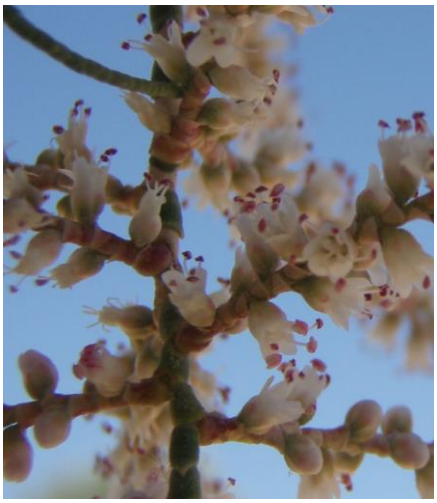


Photo 8: Athel Pine flowers (Photo B Shepherd)

Flowering: Summer

Origin: Mediterranean region, northern Africa and India.

When introduced: 1930-40s

Why introduced: Introduced to arid and semi-arid areas for shade, shelter and erosion control.

Other information: Tamarisk or Salt Cedar (*Tamarix ramosissima*), is a plant similar to Athel Pine which has also shown weedy tendencies in SA, NSW and WA.

Threats and Impacts

Invasiveness

Seeds of Athel Pine require a moist environment to germinate, but the main period of germination is 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 species, both other 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, therefore follow up control is imperative.

Distribution

Current Australian distribution:

Semi-arid and arid areas of SA, NT, Qld, WA and NSW. Plantings occur across Australia.

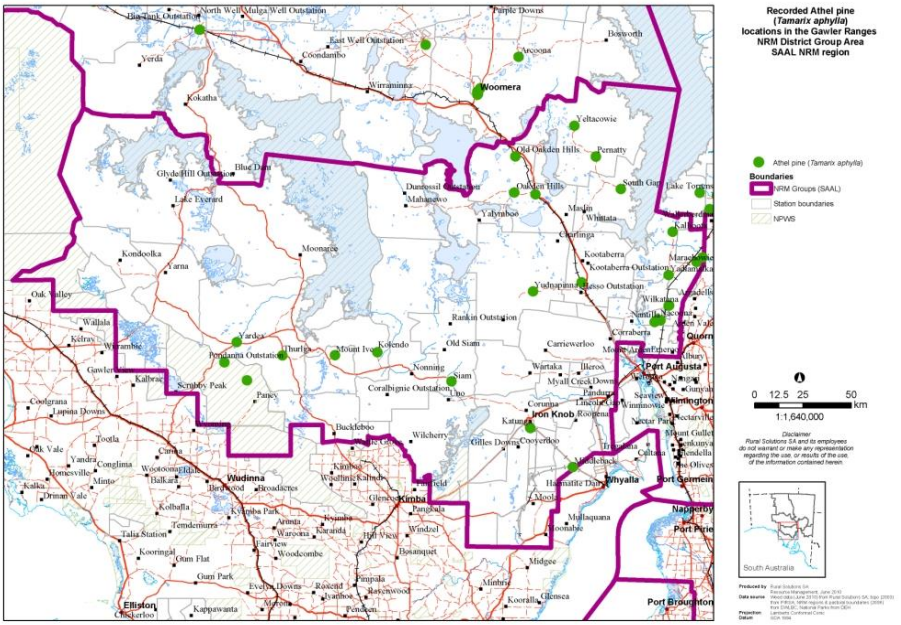
Current South Australian distribution:

In the South Australian arid lands planted Athel Pines are common and there are 18 known locations where Athel Pine has gone wild (naturalised).

The largest population of wild Athel Pine occurs in the eastern area of the South Australian arid lands where approximately 50 km of river and lake environment are infested.

Current District distribution:

Athel Pine is a common garden plant in station gardens throughout the Gawler Ranges NRM district. The only known naturalised plants in the District are 2 plants in a dam near the Stuart highway.



Map 3. Recorded Tamarisk and Athel Pine locations in the Gawler Ranges NRM District.

*Note: Weed distribution data is incomplete.

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. Where Athel Pines are located close to drainage lines the lower reaches of the water course are at risk of invasion.

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 *Natural Resources Management Act*, 2004:

- Prohibiting sale of Athel Pine or contaminated material; and
- Landowners are required to control Athel Pine on their properties where it is within 100m of a watercourse.

SA Arid Lands NRM Policy:

The SAAL NRM regional management strategy 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.

Gawler Ranges NRM District management strategy:

Gawler Ranges NRM District management strategy is to PROTECT sites from the spread of Athel Pine

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

Gawler Ranges NRM District Strategy for management of Athel Pine

Recommended Actions
Support land manager education in identification, monitoring and control of Athel Pine.
Gawler Ranges NRM District Group to encourage landholders to provide data on distribution of Athel Pine in Gawler Ranges NRM District to NRSAAL, so that it can be surveyed and mapped.
Gawler Ranges NRM District group to 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.
Land managers are required to undertake control of Athel Pine plants within 100m of rivers, creeks and waterholes.
Land managers encouraged to monitor success, following control of Athel Pine, and carry out follow up control as necessary.
Introductions and movement of Athel Pine are to be restricted within SAAL NRM Region.

Best Practice Control

Control method and description	Best time to control	Active ingredients and example trade names	Herbicide rates and carrier
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	Picloram (43 g/kg) e.g. *Vigilant® Herbicide Gel®* Triclopyr (600 g/L) e.g. *Garlon®*	Ready to use 35 ml/L mixed in diesel

Control method and description	Best time to control	Active ingredients and example trade names	Herbicide rates and carrier
Remove all cut material from moist environments to prevent root growth from tree sections.		Triclopyr (240 g/L) + Picloram (120 g/L) e.g. *Access*®	17 ml/L mixed in diesel
Basal bark			
Useful for smaller trees that have not developed rough bark. Remove all debris from around the base of the tree prior to applying the herbicide. Spray all sides of each stem with the recommended herbicide mix, to a height of between 250 – 750 mm above soil level.	Any time of year	Triclopyr (600 g/L) e.g. *Garlon*® Triclopyr (240 g/L) + Picloram (120 g/L) e.g. *Access*®	25 mls/L mixed in diesel 17 mls/L mixed in diesel
Foliar spray			
Useful when plants are smaller than 2 m. Spray the entire plant with the recommended herbicide mix.	Any time of year	Triclopyr (600 g/L) e.g. *Garlon*®	17 to 35 mls/L mixed in diesel or 10 mls/L mixed in water
Physical			
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. Branch and root fragments of Athel Pine 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.			

Surveys/ Monitoring

General method: 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.

Best time of year for surveys: 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

Common name(s): Buffel Grass

Scientific name: *Cenchrus ciliaris*

Plant 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 rig of short hairs (0.2-2 mm).

Flower heads form dense hairy cylindrical spikes 2-15 cm long, pale or purplish.

Photo 9: Buffel Grass seed head (Photo B Shepherd)

o 11: Buffel Grass infestation (Photo B herd)

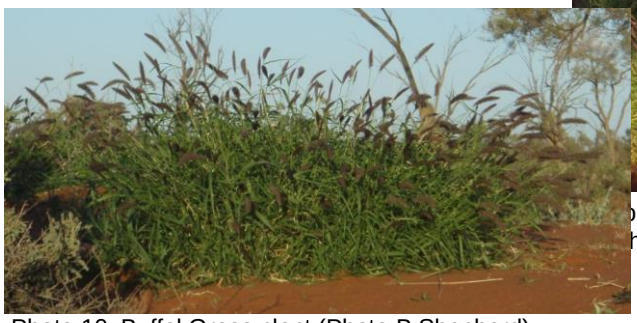


Photo 10: Buffel Grass plant (Photo B Shepherd)

Flowering: Summer

Origin: Native to Africa and south western Asia

When introduced: 1840s

Why introduced: Pasture species in areas with long dry season and for erosion control

Other information: Can withstand heavy grazing and is the most drought tolerant introduced grass species in 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. Buffel Grass is highly persistent on lightly textured soils and is quick to respond to small amounts of rainfall.

Distribution

Current Australian distribution:

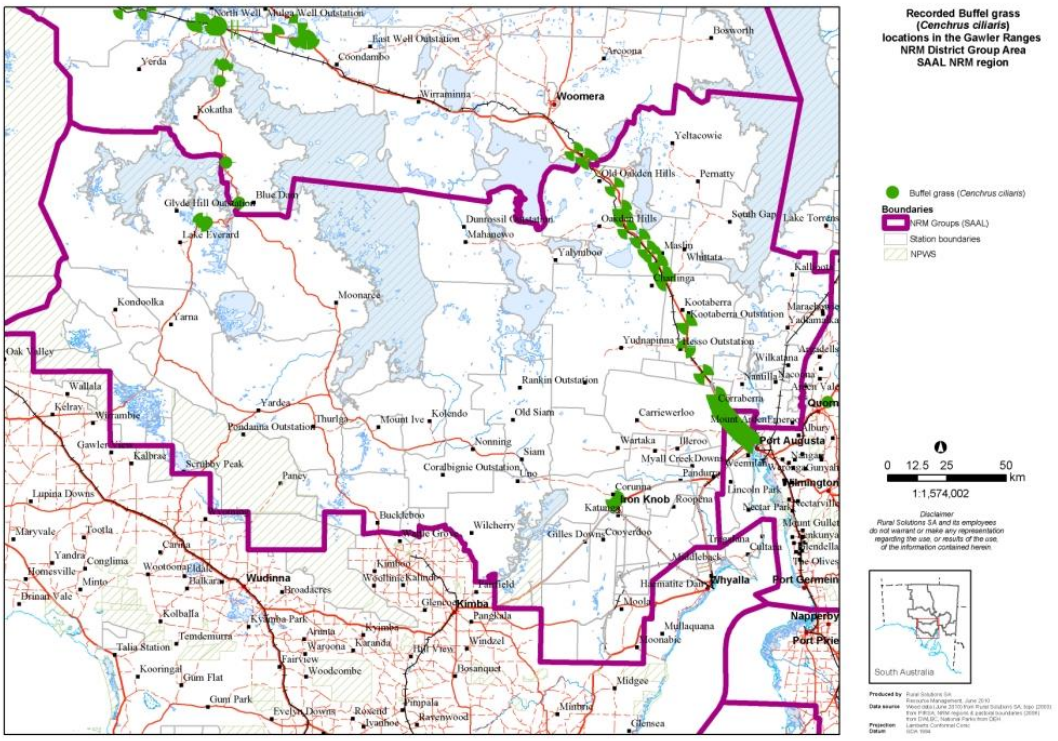
Buffel Grass is common throughout central Australia. It was (and continues to be) widely cultivated by pastoralists as a preferred pasture species for cattle. In some outback towns, namely Alice Springs it was cultivated for dust control and has since successfully naturalised and overrun large tracts of land.

Current South Australian distribution:

Large areas in the far north west of northern South Australia 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.

Current District distribution:

There are approximately 5 (known) locations in the Gawler Ranges NRM District, or just out of the district where very small roadside populations (between 10-50 plants) of Buffel Grass exist in roadside verges.



Map 4. Recorded Buffel Grass locations in the Gawler Ranges NRM District.

*Note: Weed distribution data is incomplete.

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

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 *Natural Resources Management Act,* 2004. Buffel grass contained and its impacts on native vegetation, grazing systems, remote communities and infrastructure in South Australia minimised. Objectives: • Vulnerable sites currently free of buffel grass protected from invasion. • Buffel grass contained within its present range in South Australia, and this range incrementally reduced where possible. • Buffel grass infestations are removed from key dispersal nodes and pathways. • Natural and built assets protected from the fire risk associated with buffel grass infestations. Regional Implementation: See NRM Act, 2004 or *SA Buffel Grass Strategic Plan 2012-2017* for details.
SA Arid Lands NRM Policy:	The SAAL NRM Board management strategy 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.
Gawler Ranges NRM District Risk management strategy:	Gawler Ranges NRM District management strategy 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.

Gawler Ranges NRM District Strategy for management of Buffel Grass

Recommended Actions
Support land manager education in identification, monitoring and control of Buffel Grass.
Gawler Ranges NRM District Group to encourage landholders to provide data on distribution of Buffel Grass in Gawler Ranges NRM District to NRSAAL, so that it can be surveyed and mapped.
Gawler Ranges NRM District group to provide input into identification of key sites requiring control of Buffel Grass.
Gawler Ranges NRM District group to assist in identifying and coordinating Buffel Grass control programs using integrated weed management (combination of recommended best practices), especially in areas where key sites are threatened.
Land managers encouraged to monitor success, following control of Buffel Grass, and carry out follow up control as necessary.
Introductions and movement of Buffel Grass are to be restricted within SAAL NRM Region.

Best Practice Control

Control method and description	**Best time to control**	**Active ingredients and example trade names**	**Herbicide rates and carrier**
Foliar Spray			
Spray all sides of the entire plant. Ensure the entire plant is covered in the herbicide mix. Spot spraying with a knap sack or quad/ute mounted spray unit can be	Between 2-4 weeks after warm season rain	Glyphosate (450g/L) e.g. *Roundup*® + Flupropanate (745g/L) e.g. *Tussock*	260 mL + 300mL / 100L water with a penetrant e.g. *Pulse*® It is also recommended that

used for scattered occurrences. Boom spray can be used for dense infestations where no native vegetation exists between Buffel Grass plants e.g. along roads. Buffel Grass can quickly regenerate from seed and ongoing monitoring and control is required after warm season rain.	a dye is used with the herbicide mix to show which plants have been sprayed.
Physical	
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). Grubbing can be used for isolated occurrences or small infestations. Dig the entire plant out of the ground. Ongoing monitoring and follow up hand pulling/grubbing will be required annually.	

Surveys/ Monitoring

General method:	Keep an eye out for Buffel Grass during routine pastoral management activities and record locations using a GPS. Especially look in areas adjacent to roads where the soil has been disturbed.
Best time of year for surveys:	In the weeks following rainfall, look for a large clumpy grass with often purple or black seed heads.

Cactus species

The major species weed species of Cactus in South Australia are Coral Cactus (*Austrocylindropuntia* cylindrica), Devil's Rope cactus (*Cylindropuntia imbricata*), Drooping Prickly Pear (*Opuntia vulgaris/monacantha*) [not discussed], Hudson Pear (*Cylindropuntia rosea*), Jumping Cholla (*Cylindropuntia prolifera*), Engelmann's Prickly Pear (*Opuntia engelmannii*), Prickly Pear (*Opuntia stricta*) and Wheel Cactus (*Opuntia robusta*).

Common name(s): **Coral Cactus**

Scientific name: *Cylindropuntia fulgida var. mamillata*

Plant description: Cactus, 1-1.5 m high (occasionally 3 m).

Upper segments are smooth greyish to dark green, 6-70 cm long x 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 diameter.

Fruit of Coral Cactus is yellow-green, spiny, barrel shaped.

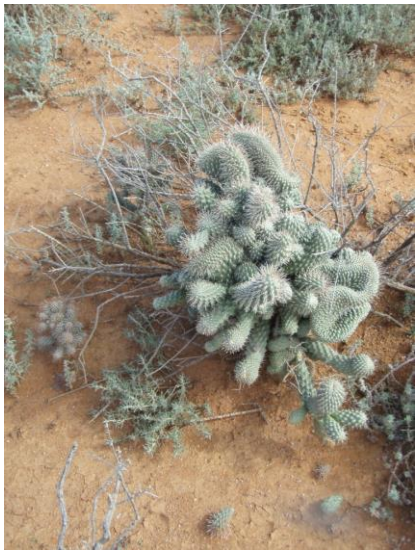


Photo 12: Coral Cactus plant (Photo B Shepherd)

Photo 13: Mature Coral Cactus plant (Photo B Shepherd)

Flowering: late spring - summer

Origin: Ecuador and Peru

When introduced: Unknown

Why introduced: unknown

Other information: Floodwaters may damage plants, and also disperse segments resulting in new infestations.

Common name(s): **Devil's Rope cactus**

Scientific name: *Cylindropuntia imbricata*

Plant description: Cactus, 1-2 m high (occasionally 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 diameter, purple or purplish-red.

The fruit of Devil's Rope cactus is usually spineless, barrel shaped and matures to a yellow colour.

Photo 14: Rope like appearance of Devil's Rope cactus (Photo J Pitt)

Photo 15: Purple flowers of Devil's Rope cactus (Photo J Pitt)

Flowering: late spring - summer
Origin: Southern USA and Mexico
When introduced: unknown
Why introduced: As an ornamental garden plant
Other information: Previously called *Opuntia imbricate*

Common name(s): **Jumping Cholla**
Scientific name: *Cylindropuntia prolifera*

Cactus 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.

Flowers rose to magenta, to 4 cm diameter.

Fruit 2–4 cm long, 2–3 cm wide, spineless occasionally in short chains.

Photo 16: Jumping Cholla plant (Photo R Holtkamp)

Photo 17: Magenta flower of Jumping Cholla (Photo R Holtkamp)

Flowering: spring–early summer
Origin: USA and Mexico
When introduced: 1993 (1st record in NSW)
Why introduced: unknown

Common name(s): **Hudson Pear**
Scientific name: *Cylindropuntia rosea*
Plant description: ***Cylindropuntia rosea*** **(Hudson Pear)** – much branched Cactus, 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. Pink flowers to 5 cm diameter. The fruit is wider towards the tip, 2 - 4.5 cm long.

Photo 18: Hudson Pear cactus (Photo G Patrick)

Photo 19: Pink flowers of Hudson Pear

Flowering: late spring and summer
Origin: Mexico
When introduced: 1960s
Why introduced: As an ornamental garden plant

Common name(s): **Engelmann's Prickly Pear**
Scientific name: *Opuntia engelmannii*
Plant description: Cactus, 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.

The fruit is pear to barrel shaped, spiny, and maturing to reddish-purple.

Photo 20: Engelmann's Prickly Pear (Photo B Shepherd)

Photo 21: Oval to circular segments of Engelmann's Prickly Pear (Photo B Shepherd)

Flowering: unknown
Origin: Mexico and USA
When introduced: unknown
Why introduced: Unknown

Common name(s): **Wheel cactus**
Scientific name: *Opuntia robusta*
Plant description: Cactus, 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 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.

The fruit is pink to purple, barrel shaped to 8 cm long and 6cm diameter.

Photo 22: Wheel Cactus plants (Photo J Pitt)

Photo 23: Oval to circular segments of Wheel Cactus (Photo J Pitt)

Flowering: Unknown

Origin: Mexico

When introduced: unknown

Why introduced: As an ornamental or botanical curiosity

Other information: The native habitat of Wheel Cactus is rare and endangered and is listed on the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

Common name(s): **Prickly Pear**

Scientific name: *Opuntia stricta*

Plant description: Cactus, 0.5-1m tall, 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

The pear shaped fruit is smooth and purple at maturity.

Photo 24: Prickly Pear plant (Photo G. Patrick)

Photo 25: Yellow flowers of Prickly Pear (Photo T Bowman)

Photo 25: Yellow flowers of Prickly Pear (Photo T. Bowman)

Flowering: Summer

Origin: Drier tropical and sub-tropical America

When introduced: prior to 1839

Why introduced: As an ornamental garden plant or for use as food for cochineal insects which were used to produce dye for soldiers' coats.

Other information: Plants may still establish from segments of Prickly Pear following disposal of garden waste unless buried to a depth of greater than 1 metre

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.

Distribution

Current Australian distribution:

Cacti species are common throughout Australia, both in gardens and as naturalised plants. In most states one or several Cactus species are declared weeds.

Current South Australian 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 South Australia, 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 Coral Cactus and Jumping Cholla in northern South Australia and that others exist possibly in abandoned gardens or around ruins.

Hudson Pear occurs near Port Augusta and Whyalla.

Current District distribution:

Prickly Pear, Wheel Cactus and Engelmann's Prickly Pear are present in the Gawler Ranges District.

Wheel Cactus and Engelmann's Prickly Pear occur in the far eastern portions of the district while Prickly Pear occurs throughout the district. There are no known occurrences of Coral cactus and Jumping Cholla. There was a report of Hudson Pear, south of Iron Knob, close to the district.

Potential distribution:

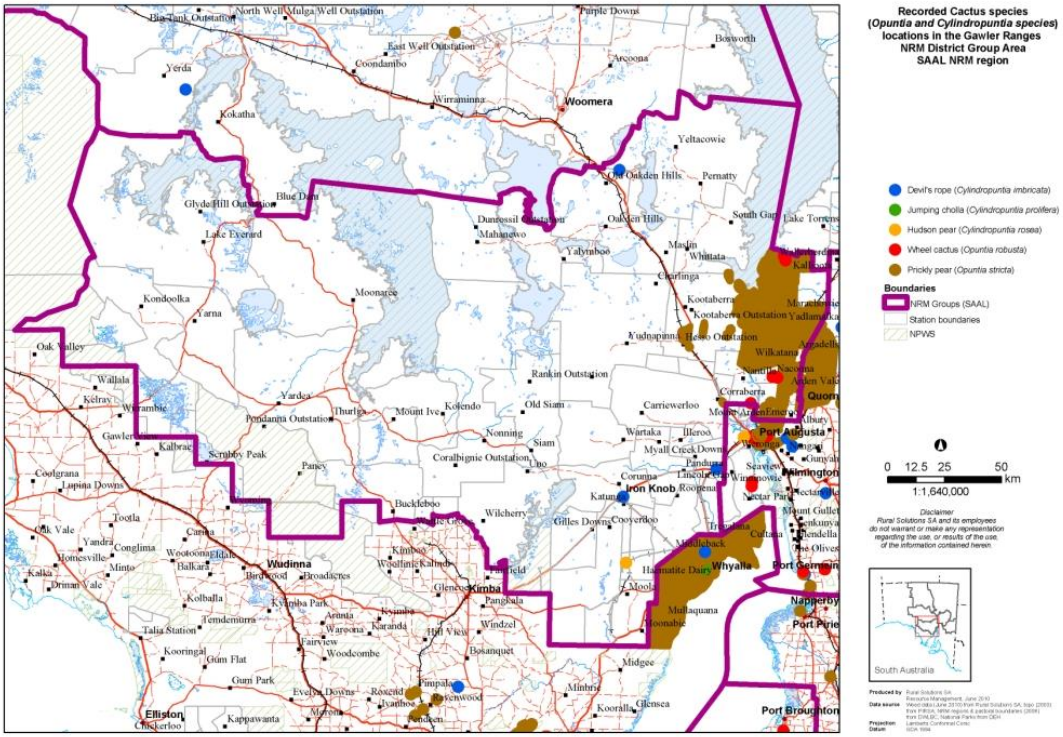
Cacti species have the potential to establish across most of the arid and semi-arid areas of South Australia.

Policy

National Strategy:

Opuntia (Cacti) species are classified as Weeds of National Significance. The Strategic Plan aims to deliver the following goals and objectives:

- New infestations are prevented from establishing.
- Established infestations are under strategic management.
- Greater capability and commitment to manage opuntioid cacti.



Map 5. Recorded Cactus species locations in the Gawler Ranges NRM District. Distributions of Engelmann's Prickly Pear are not shown on the map as locations of plants where previously thought to be Wheel Cactus.
*Note: Weed distribution data is incomplete.

State Policy:

To prevent Opuntia[1] species from competing with more desirable plants and restricting access in the pastoral areas of the State.

Under the *Natural Resources Management Act*, 2004:

- Prohibiting movement of Opuntia species on public roads and entry into SA;
- Prohibiting sale of Opuntia species or their seeds, or contaminated material;
- Requiring landowners to destroy Opuntia species on their properties; and
- Allowing recovery of costs of Opuntia species control on road reserves.

SA Arid Lands NRM Policy:

The SAAL NRM regional management strategy for Opuntia species is to CONTAIN SPREAD

Aim: To prevent the spread of Opuntia through control of all infestations.

The SAAL NRM regional management strategy for Cylindropuntia species is to DESTROY INFESTATIONS

Aim: To significantly reduce the extent of Cylindropuntia spp. in the SA Arid Lands.

[1] The author of this report interpret '*Opuntia* species' to collectively refer to the weedy Cactus species including *Austrocylindropuntia*, *Cylindropuntia* and *Opuntia.*

Gawler Ranges NRM District management strategy:	Gawler Ranges NRM District management strategy is to CONTAIN SPREAD of Prickly Pear, Engelmann's Prickly Pear and Wheel Cactus Aim: To prevent the spread of Prickly Pear, Engelmann's Prickly Pear and Wheel Cactus through control of all infestations. Gawler Ranges NRM District management strategy is to DESTROY INFESTATIONS of Devil's Rope Cactus, Hudson Pear, Jumping Cholla and Coral Cactus. Aim: To significantly reduce the extent and/or prevent entry of Devil's Rope Cactus, Hudson Pear, Jumping Cholla and Coral Cactus into Gawler Ranges NRM District through destruction of known infestations.

Gawler Ranges NRM District Strategy for management of Opuntia species

Recommended Actions
Support land manager education in identification, monitoring and control of Opuntia species.
Gawler Ranges NRM District Group to encourage landholders to provide data on Opuntia infestations in Gawler Ranges NRM District to NRSAAL, so that it can be surveyed and mapped.
Gawler Ranges NRM District group to provide input into identification of key sites requiring control of Opuntia species.
Gawler Ranges NRM District group to assist in identifying and coordinating Opuntia control programs using integrated weed management (combination of recommended best practices), especially in areas where key sites are threatened.
Land managers encouraged to undertake control of all Opuntia species infestations.
Land managers encouraged to monitor success, following control of Opuntia, and carry out follow up control as necessary.
Sale and movement of all Opuntia species to be restricted within SAAL NRM Region.

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	**Best time to control**	**Active ingredient and example herbicide**	**Herbicide rates and carrier**
Foliar spray			
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.	Triclopyr (600g/L) e.g. *Garlon*®	300 ml/L in 10 litres water with 100 mls Spray oil e.g. Hotwire® **or** 134 ml/L in 10 litres diesel
		Triclopyr (240g/L) + Picloram (120g/L) e.g. *Access*®	167 ml/L in 10 litres diesel only
		Triclopyr (240g/L) + Picloram (120g/L) e.g. Grazon	50ml/10 L water only
	Apply in summer above 30^{o}	*MSMA (800g/L MSMA) e.g. Daconate*	1 L/40 L water

Control method and description	Best time to control	Active ingredient and example herbicide	Herbicide rates and carrier
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. 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.	Any time of year	Glyphosate e.g. *Roundup*®	Inject 2-4ml of neat Glyphosate into each stem or every 4th pad.
Biological			
Cochineal scale (Dactylopius spp.) may be used as a biological control for various Opuntia and Cylindropuntia species including Engelmann's Prickly Pear, Hudson pear, Prickly pear, Wheel Cactus and Devil's rope. The scale appears as small white cotton wool spots across the cactus pads. Juvenile and adult females 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.			
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. 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. Note: Do not burn on days of high fire danger.			

Surveys/ Monitoring

General method: 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.

Best time of year for surveys: Any time of year

Fountain Grass

Common name(s): Fountain Grass

Scientific name: *Pennisetum setaceum*

Plant description: Fountain Grass is a densely tufted perennial grass 25-90cm high,

Leaves; long narrow leaf blade to 3.5cm wide & 60 cm long, with small forward directed teeth on leaf margins and the upper surface

Flower heads resemble pink to purple bottle brushes 6-30cm long with flowering stems over 1 metre tall.

Photo 26: Fountain Grass seed head (Declared Plants of Australia)

Photo 27: Fountain Grass infestation (Photo B Shepherd)

Photo 28: Fountain Grass plant (Declared Plants of Australia)

Flowering: Late Spring to mid Winter

Origin: Native to Africa and south western Asia

When introduced: Unknown

Why introduced: Ornamental purposes,

Other information: Can withstand heavy grazing and is a drought tolerant introduced grass species in Australia.

Threats and Impacts

Invasiveness

Fountain Grass is easily distributed by wind, water, stock and machinery. It is a highly aggressive, fire-adapted coloniser that readily out-competes native plants and rapidly re-establishes after burning.

Impacts

Fountain Grass competes and displaces with 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. Fountain Grass aids fire by increasing the intensity and frequency of natural fire regimes to the point of removing competing shrubs and trees.

Persistence

Fountain Grass can live for up to 20 years. Seeds may be viable in the soil for up to six years or longer.

Distribution

Current Australian distribution:

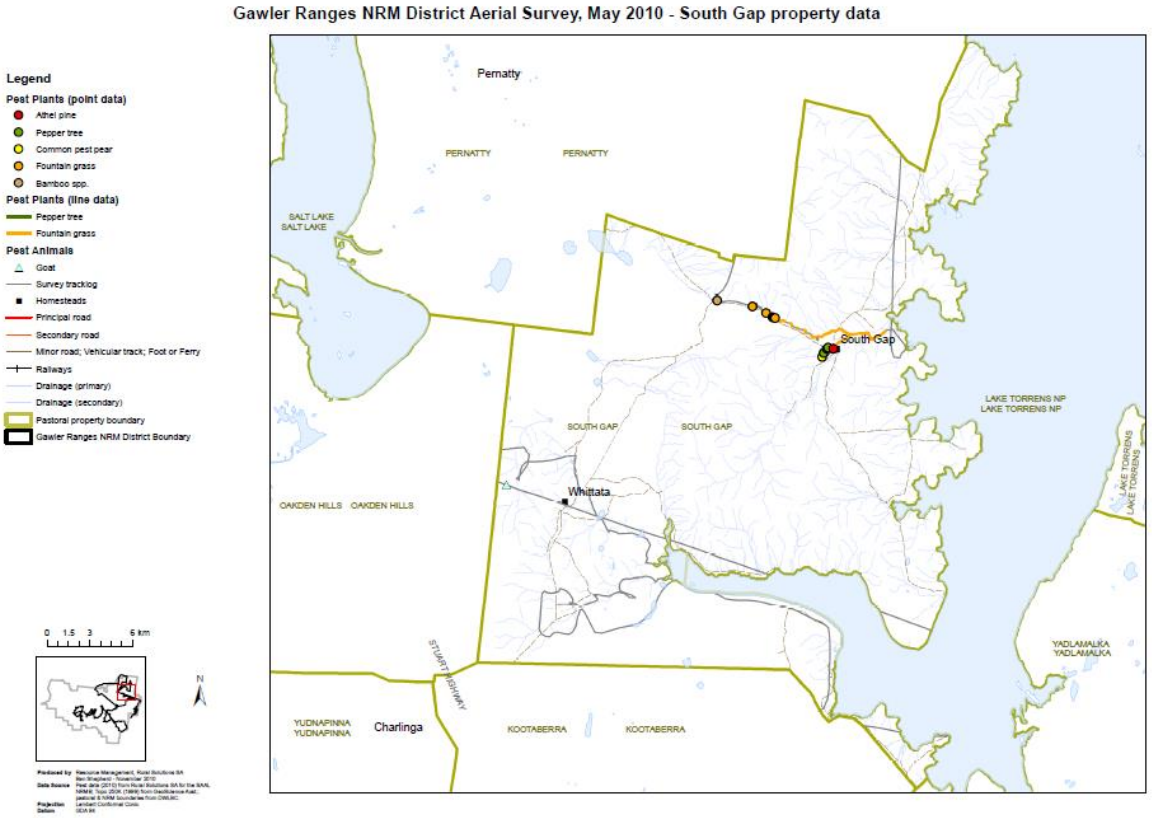
Fountain Grass is present in all states throughout Australia. It was (and continues to be) widely planted as a garden ornamental plant. In is often seen in urban areas and adjacent roadsides.

Current South Australian distribution:

Many urban environments have Fountain Grass populations where they have either been deliberately planted or have escaped into adjacent roadsides and parklands.

Current District distribution:

A significant infestation (approximately 11.5 km long) of Fountain Grass (*Pennisetum setaceum*) within a creek line on South Gap Station between South Gap Dam, South Gap Homestead and Lake Torrens was mapped.



Map 6. Recorded Fountain Grass locations in the Gawler Ranges NRM District.

*Note: Weed distribution data is incomplete.

Potential distribution:	Fountain Grass has been found as far north as Cape York and as far south as southern Tasmania, indicating it can tolerate a wide variety of conditions. It establishes readily and has the capacity to expand across a large proportion of Australia.

Policy

National Strategy:	Fountain Grass is not classified as a Weed of National Significance, therefore there is no National Strategy for this species.
State Policy:	The State NRM Council has recommended to Minister Hunter that he declare Fountain Grass and adopt the draft policy that went to public consultation in 2014. So it is currently under consideration as a declared species under the *Natural Resources Management Act,* 2004.
SA Arid Lands NRM Policy:	The SAAL NRM Board management strategy is to MONITOR sites for the spread of Fountain Grass Aim: To detect any significant changes in the species weed risk & monitor the spread of Fountain Grass and review any perceived changes in weediness.
Gawler Ranges NRM District Risk management strategy:	Gawler Ranges NRM District management strategy is to MONITOR sites for the spread of Fountain Grass Aim: To detect any significant changes in the species weed risk & monitor the spread of Fountain Grass and review any perceived changes in weediness.

Gawler Ranges NRM District Strategy for management of Fountain Grass

Recommended Actions
Support land manager education in identification, monitoring and control of Fountain Grass.
Gawler Ranges NRM District Group to encourage landholders to provide data on distribution of Fountain Grass in Gawler Ranges NRM District to NRSAAL, so that it can be surveyed and mapped.
Gawler Ranges NRM District group to provide input into identification of key sites requiring control of Fountain Grass.
Gawler Ranges NRM District group to assist in identifying and coordinating Fountain Grass control programs using integrated weed management (combination of recommended best practices), especially in areas where key sites are threatened.
Land managers encouraged to undertake control of Fountain Grass.
Land managers encouraged to monitor success, following control of Fountain Grass, and carry out follow up control as necessary.
Introductions and movement of Fountain Grass are to be restricted within SAAL NRM Region.

Best Practice Control

Control method and description	**Best time to control**	**Active ingredients and example trade names**	**Herbicide rates and carrier**
Foliar Spray			
Spray all sides of the entire plant. Ensure the entire plant is covered in the herbicide mix. Spot spraying with a knap sack or quad/ute mounted spray unit can be used for scattered occurrences. Boom spray can be used for dense infestations where no native vegetation exists between Fountain Grass plants. Follow up monitoring and spraying will be required around 4 weeks after the initial spray.	In Spring to autumn	Glyphosate (360g/L) e.g. *Roundup*® Flupropanate e.g. *Tussock*	1 Litre Plus 300 mL/ 100 Litres water with a penetrant e.g. *Pulse*® It is also advised that a dye is used with the herbicide mix to show which plants have been sprayed.

Control method and description	Best time to control	Active ingredients and example trade names	Herbicide rates and carrier
Fountain Grass can quickly regenerate from seed and ongoing monitoring and control is required annually.			
Physical			
Burning dried-out Fountain Grass allows for better control from chemical spraying when plant re-shoots after rain (e.g. better coverage of new foliage).			
Grubbing can be used for isolated occurrences or small infestations.			
Dig the entire plant out of the ground.			
Ongoing monitoring and follow up hand pulling/grubbing will be required annually.			

Surveys/ Monitoring

General method:	Keep an eye out for Fountain Grass during routine pastoral management activities and record locations using a GPS. Especially look in areas adjacent to roads where the soil has been disturbed.
Best time of year for surveys:	In the weeks following rainfall, look for a large clumpy grass with often purple or black seed heads.

Mesquite

Common name(s): Mesquite

Scientific name: *Prosopis* species

Plant description: Mesquites 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.

Seed pods (up to 20 cm long) are generally straight or slightly curved, and resemble a string of beads.

Photo 29: Mature Mesquite tree (Photo B Shepherd)

Photo 30: Fern like leaves of Mesquite (Photo B Shepherd)

Photo 31: Greenish-yellow flowers of Mesquite (Photo B Shepherd)

Flowering: Spring to early summer

Origin: USA and Mexico

When introduced: 1900

Why introduced: As ornamental, fodder and shade trees

Other information: There are some 44 species of *Prosopis*, only a few have been introduced to Australia.

Threats and Impacts

Invasiveness The South Australian occurrences of Mesquite 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 South Australian 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 South Australia 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.

Distribution

Current Australian distribution:

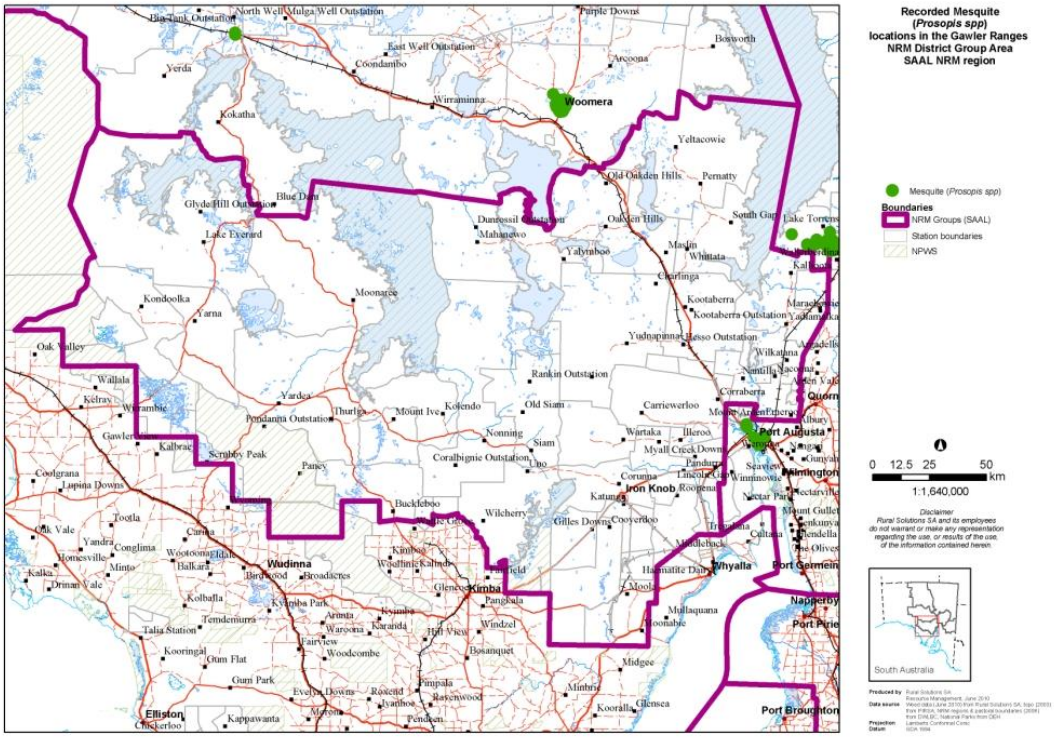
Mesquite occurs in every mainland state. In the semi-arid and arid areas of Queensland and Western Australia Mesquite has infested large tracks of pastoral country.

Current South Australian distribution:

Mesquite was infrequently planted in gardens around South Australia. There are four known naturalised populations of Mesquite in northern South Australia, in the eastern districts around Cockburn, around Woomera, on the south eastern side of Lake Torrens and another near Port Augusta. All Mesquite populations are demonstrating vigorous regenerating. These are being actively and successfully suppressed.

Current District distribution:

There are no current records of Mesquite in the Gawler Ranges NRM district however there have been historic records in the District and the populations at Woomera, Port Augusta and on the south eastern side of Lake Torrens occur close to the district.



Map 7. Recorded Mesquite locations in the Gawler Ranges NRM District.

*Note: Weed distribution data is incomplete.

Potential distribution:

Mesquites combination of a long life cycle, ability to survive droughts, 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.

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 *Natural Resources Management Act*, 2004:

- Prohibiting entry of Mesquite into SA and movement on public roads.
- Prohibiting sale of Mesquite or contaminated material.
- Requiring landholders to notify NRM authority of Mesquite infestations.
- Requiring landholders to destroy Mesquite on their properties.
- Allowing NRM authorities to recover costs for roadside control of Mesquite.

It is legislated that, in all parts of South Australia:

- Landholders have the responsibility to destroy Mesquite on their land.
- Landholders have the responsibility to notify NRM authority of Mesquite infestations.
- Landholders have the responsibility to notify NRM authority of Mesquite infestations.
- Landholders have the responsibility to notify NRM authority of Mesquite infestations.
- NRM authorities have the responsibility to destroy Mesquite on road reserves, and may recover the cost of this work from the adjoining landholders.

SA Arid Lands NRM Policy: The SAAL NRM regional management strategy for Mesquite is to DESTROY infestations.

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

Gawler Ranges NRM District management strategy Gawler Ranges NRM District management strategy is to DESTROY Mesquite infestations.

Aim: To significantly reduce the extent of Mesquite in Gawler Ranges NRM District.

Gawler Ranges NRM District Strategy for management of Mesquite

Recommended Actions
Support land manager education in identification, monitoring and control of Mesquite
Gawler Ranges NRM District Group to encourage landholders to report any infestations of Mesquite they detect in Gawler Ranges NRM District to NRSAAL, so that it can be surveyed, mapped and control sites monitored.
Destruction of all Mesquite from the Gawler Ranges NRM District including removal of cultivated plants.
Land managers encouraged to monitor success, following control of Mesquite, and carry out follow up control as necessary.
Gawler Ranges NRM District to consider quarantine provisions around known occurrences of Mesquite.
Sale and movement of Mesquite to be prevented within SAAL NRM Region.

Best Practice Control

Control method and description	Best time to control	Active ingredients and example trade names	Herbicide rates and carrier
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, from the ground up to a height of between 500 - 750mm. For seedlings spray the entire plant.	Most of the year assuming the plant is not stressed. Most effective when actively growing.	Triclopyr (240 g/L) + Picloram (120 g/L) e.g. *Access*®	17 mls/L mixed in diesel
Foliar Spray			
Best for seedlings & regrowth of previously treated areas on plants under 1.5 mt height Spray the entire plant	Best time to spray is when plants are actively growing and soil moisture is good.	Triclopyr 300g/l plus Picloram (salt) 100g/l e.g. *Grazon*®	350 mL/100 L water. Add a 100% concentrate non-ionic surfactant e.g. BS 1000 at 100mL/100L
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	Triclopyr (240 g/L) + Picloram (120 g/L) e.g. *Access*®	17 mls/L mixed in diesel
Physical			
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. 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.			

Surveys/ Monitoring

General method:	Keep an eye out for Mesquite during routine pastoral management activities and record locations using a GPS.
Best time of year for surveys:	Any time of year, look for fern like leaves, long yellow flower heads and the (sometimes) bright light green leaves.

Pepper Tree

Common name(s): Pepper Tree

Scientific name: *Schinus molle*

Plant description: A large evergreen tree to 12 m tall and 5-10 m wide. Leaves are divided into 15-41 alternatively arranged, shiny leaflets (to 4 cm long). Leaves are aromatic and sticky when crushed.

Small white flowers hang in long sprays, are followed by spherical shiny pink fruit (4-6 mm across).

Photo 32: Pepper Trees (Photo B Shepherd)

Photo 33: Immature fruit (Photo B Shepherd)

Photo 34: Mature pink fruit (Photo B Shepherd)

Flowering: All year round

Origin: South America

When introduced: 1870-1880 (listed for sale in nursery catalogues)

Why introduced: For shade

Other information: All *Schinus* species leaves and fruit are poisonous to livestock and possibly humans

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.

Distribution

Current Australian distribution:

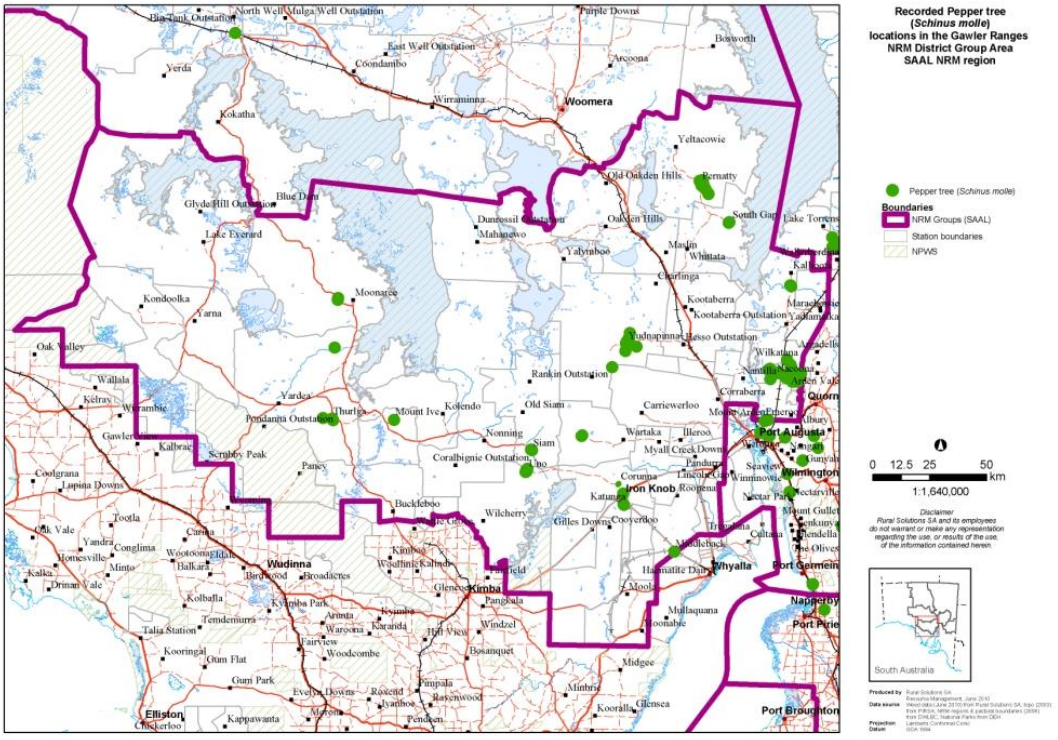
Pepper Trees are favoured garden plants throughout Australia and there ability to withstand dry conditions makes them well suited as garden and shade plantings in arid and semi-arid areas.

Current South Australian distribution:

Pepper Trees are 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.

Current District distribution:

Pepper Trees are planted at most station houses throughout the Gawler Ranges NRM district and there are some locations where it they have naturalised along adjacent creek lines. There are significant infestations of Pepper Trees in the eastern areas of the district in creek lines north of Port Augusta.



Map 8. Recorded Pepper Tree/s locations in the Gawler Ranges NRM District.

*Note: Weed distribution data is incomplete.

Potential distribution:

Pepper Trees have demonstrated their ability to establish in many of the semi-arid drainage lines and swampy areas of South Australia.

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 *Natural Resources Management Act,* 2004, (therefore there is no South Australian policy).
SA Arid Lands NRM Policy:	The SAAL NRM Board currently management strategy 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.
Gawler Ranges NRM District management strategy:	Gawler Ranges NRM District management strategy 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.

Gawler Ranges NRM District Strategy for management of Pepper Trees

Recommended Actions
Support land manager education in identification, monitoring and control of Pepper Trees.
Gawler Ranges NRM District Group to encourage landholders to provide data on distribution of Pepper Trees in Gawler Ranges NRM District to NRSAAL, so that they can be surveyed and mapped.
Gawler Ranges NRM District group to provide input into identification of high priority areas such as significant rivers, creeks and waterholes and coordinate control programs to protect identified priority sites.
Gawler Ranges NRM District group to assist where possible in identifying and coordinating Pepper Tree control programs.
Land managers encouraged to control naturalised Pepper Trees, and control cultivated Pepper Trees where key sites are threatened.
Land managers encouraged to monitor success, following control of Pepper Trees, and carry out follow up control as necessary.

Best Practice Control

Control method and description	**Best time to control**	**Active ingredients and example trade names**	**Herbicide rates and carrier**
Cut Stump			
Useful for medium to large 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	Triclopyr (240 g/L) + Picloram (120 g/L) e.g. *Garlon*® or *Access*®	17 mls/L mixed in diesel
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, from the ground up to a height of between 500 – 750 mm. For seedlings spray the entire plant.	Any time of the year assuming the plant is not stressed. Most effective when actively growing	Triclopyr (240 g/L) + Picloram (120 g/L) e.g. *Garlon*® or *Access*®	17 mls/L mixed in diesel
Physical			
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. Summer or when plants are stressed e.g. during drought conditions.			

Surveys/ Monitoring

General method:	Keep an eye out for naturalised Pepper Trees during routine pastoral management activities and record locations using a GPS
Best time of year for surveys:	Anytime of year, look for the distinctive bi pinnate leaves and the overall light green colour of the plant

Appendix 1 – Alert Weeds

The weeds identified in this section have not been sighted in the Gawler Ranges District. However, there have been infestations of them in neighbouring District(s) and the threat they pose are significant. They are included here to provide a reference for identification.

If you discover any of these plants in the Gawler Ranges District please contact Natural Resources SA Arid Lands (Ph. 8648 5300) immediately and report the location. Alternatively you can contact the Sustainable Landscapes Officer on 8648 5194 or 0417 738 498.

Innocent Weed

Common name(s): Innocent Weed/Spiny Burr-grass

Scientific name: *Cenchrus longispinus* and *Cenchrus incertus*

Plant description: ***Cenchrus longispinus*** **(Innocent Weed)** - annual grass to 70 cm. Leaves narrow 1-6 mm wide, 3-15 cm long, with a reddish or purplish tinge.

Seed head has 8-18 'burrs', 3-12 mm across, with 40-70 sharp spines (3.5-7 mm long). 'Burrs' are reddish or purplish-green when young but mature to a straw colour or brown. The 'burrs' are on stalks 1-5 mm long.

Seeds are egg shaped, 2-4 mm long, 2-3 mm wide

Photo 35: Innocent Weed plant (Photo A Harvey)

Photo 36: Innocent Weed seed heads (Photo A Harvey)

Cenchrus incertus **(Spiny Burr-grass)** - annual and occasionally perennial grass to 60 cm tall. Leaves narrow 2-8mm wide to 2-20 cm long.

The seed-head has up to 40 'burrs', 3-10 mm across, with 8-45 sharp spines (2-5 mm long). 'Burrs' are purplish-green when young but mature to a straw colour or brown.

Seeds are egg shaped, 2-4 mm long, 2-3 mm wide

Flowering: Summer and autumn

Origin: North and Central America

When introduced: 1886

Why introduced: Unknown

Other information: *Cenchrus longispinus* and *Cenchrus incertus* can be confused with each other and other *Cenchrus* sp. Species are distinguished by their 'burrs'.

Threats and Impacts

Invasiveness Innocent Weed is readily spread by dispersal of its 'burrs' (which contain the plants' seeds), as they attach to animals, vehicles and clothing. 'Burrs' may also be distributed by water and contaminated agricultural produce, especially hay.

A weed of disturbed sites such as waste areas, roadside, pastures and cultivation areas.

Seedlings have been known to establish from seed deeply buried (to 25 cm) in sandy soils.

Impacts Innocent Weed can become tangled in wool, as a result wool is devalued and animals are more difficult to handle. The 'burrs' may also cause ulcers in the mouths of grazing animals.

Persistence Innocent Weed does not establish well in pastures, particularly when there are competitive pasture species present. 'Burrs' lying on the soil surface do not readily germinate (due to low moisture and also inhibiting effect of light), but buried seeds germinate more easily, requiring ongoing control.

Distribution

Current Australian distribution: Innocent Weed is widespread throughout the Murray Mallee and irrigated areas along the Murray River of both Victoria and South Australia. It is common in coastal Queensland and is found in small isolated areas of the Northern Territory and Western Australia.

Current South Australian distribution: In South Australia, it has been found on the Eyre Peninsula, northern pastoral and agricultural districts, and in isolated patches of the South East. Major infestations are in the Riverland irrigation areas, the Northern Murray Mallee dryland areas and in urban areas.

Current District distribution: There are no known records of Innocent Weed in the Gawler Ranges District.

Potential distribution: Innocent Weed has the potential to establish throughout most of the semi-arid areas of South Australia.

Policy

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

State Policy: To prevent Innocent Weed being introduced to areas free of the plant especially urban areas, areas with sandy soils and irrigation areas.

Under the Natural Resources Management Act, 2004:

- Prohibiting movement of Innocent Weed on public roads.
- Prohibiting sale of Innocent Weed or produce or goods carrying the plant.
- Requiring land owners to control Innocent Weed on their properties.
- Allowing recovery of costs of roadside control of Innocent Weed.
- Requiring notification of Innocent Weed infestations to NRM authority.

SA Arid Lands NRM Policy:	The SAAL NRM Board management strategy is to MONITOR sites for the spread of Innocent Weed. Aim: To detect any significant changes in the species weed risk & monitor the spread of Innocent Weed and review any perceived changes in weediness.
Gawler Ranges NRM District management strategy:	Gawler Ranges NRM District management strategy is ALERT for Innocent Weed Aim: Entry into the region should be prevented – any found should be reported and destroyed.

Gawler Ranges NRM District Strategy for management of Innocent Weed

Recommended Actions
Support land manager education in identification, monitoring and control of Innocent Weed.
Occurrences of Innocent Weed in Gawler Ranges NRM District to be surveyed, mapped and reported to NR SAAL immediately.
Identify current distributions of Innocent Weed in neighbouring NRM regions/districts and ascertain possible pathways of entry into Gawler Ranges NRM District.
Destruction of all infestations, as they are detected, aiming for local eradication.
Land managers are encouraged to monitor success, following control of Innocent Weed, and carry out follow up control as necessary.
Sale and movement of Innocent Weed to be prevented within Gawler Ranges NRM District.

Best Practice Control

Control method and description	**Best time to control**	**Active ingredients and example trade names**	**Herbicide rates and carrier**
Foliar Spray			
Useful on all plants Spray the entire plant with the recommended herbicide mixture when it is actively growing and before seed set, i.e. within the first week after summer rainfall.	Within 1 week after summer rain	Glyphosate (360g/L) e.g. *Roundup*®	10 ml/1L water with penetrant e.g. *Pulse*®
Physical			
Isolated occurrences of Innocent Weed can be easily grubbed out of the ground. Grub the plant(s) out of the ground within one week after rain, prior to seed set.			

Surveys/ Monitoring

General method:	Keep an eye out for Innocent Weed during routine pastoral management activities, especially around stock yards.
Best time of year for surveys:	Immediately after summer rainfall.

Parkinsonia

Common name(s): Parkinsonia

Scientific name: *Parkinsonia aculeata*

Plant 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. 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.

Photo 37: Parkinsonia tree (Photo B Shepherd)

Photo 38: The bright yellow flowers of Parkinsonia (Photo B Shepherd)

Photo 39: Pods of Parkinsonia (Photo B Shepherd)

Flowering: Summer to early autumn

Origin: Central America

When introduced: 1890s and early 1900s

Why introduced: As a shade and ornamental shrub

Other information: Parkinsonia has the potential to invade more than three quarters of mainland Australia.

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.

Distribution

Current 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 Queensland, central and northern Northern Territory and the Kimberly and Pilbara regions of Western Australia.

Current South Australian distribution: Within northern South Australia there are 3 current locations where Parkinsonia has naturalised – near Leigh creek in northern Flinders Rangers, 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.

Current District distribution: To date there are no records of Parkinsonia within the Gawler Ranges NRM District. However, naturalised occurrences near Woomera are close to the district boundary.

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

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 *Natural Resources Management Act*, 2004:

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

SA Arid Lands NRM Policy:	The SAAL NRM regional management strategy for is to PROTECT sites. Aim: To prevent spread of Parkinsonia to key sites/assets of high economic, environmental and/or social value.
Gawler Ranges NRM District management strategy:	Gawler Ranges NRM District management strategy for Parkinsonia is ALERT Aim: Entry into the region should be prevented – any Parkinsonia found through monitoring should be reported and destroyed.

Gawler Ranges NRM District Strategy for management of Parkinsonia

Recommended Actions
Support land manager education in identification, monitoring and control of Parkinsonia.
Identify current distributions of Parkinsonia in neighbouring NRM regions/districts and ascertain possible pathways of entry into Gawler Ranges NRM District.
Infestations of all Parkinsonia in the Gawler Ranges NRM District to be surveyed, mapped and reported to NR SAAL immediately.
Destruction of all infestations as they are identified, aiming for local eradication.
Land managers are encouraged to monitor success, following control of Parkinsonia, and carry out follow up control as necessary.
Sale and movement of Parkinsonia to be prevented within Gawler Ranges NRM District.

Best Practice Control

Control method and description	**Best time to control**	**Active ingredients and example trade names**	**Herbicide rates and carrier**
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, from the ground up to a height of between 500 - 750mm. For seedlings spray the entire plant.	Most of the year assuming the plant is not stressed. Most effective when actively growing.	Triclopyr (240 g/L) + Picloram (120 g/L) e.g. *Access*®	17 mls/L mixed in diesel
Foliar Spray			
Best for seedlings & regrowth of previously treated areas on plants under 1.5 mt height Spray the entire plant	Best time to spray is when plants are actively growing and soil moisture is good.	Triclopyr 300g/l plus Picloram (salt) 100g/l e.g. *Grazon*®	350 mL/100 L water. Add a 100% concentrate non-ionic surfactant e.g. BS 1000 at 100mL/100L
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	Triclopyr (240 g/L) + Picloram (120 g/L) e.g. *Access*®	17 mls/L mixed in diesel

Physical
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.
Branch and root fragments of Parkinsonia 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.

Surveys/ Monitoring

General method:	Keep an eye out for Parkinsonia during routine pastoral management activities and record locations using a GPS.
Best time of year for surveys:	Any time of year, look for the distinctive small leaves and the overall bright light green colour of the plant.

Appendix 2 – Other weeds of interest

The weeds in this section are not considered priority weeds by the Gawler Ranges NRM District Group and are not a part of the list for the District Weed Strategy. However, they are included in this appendix for identification and control purposes for local landholders and other stakeholders.

Carrion Flower

Common name(s): Carrion Flower

Scientific name: *Orbea variegata*

Plant description: Succulent which grows as a dense clump of 4-angled toothed stems from 30 to 150mm high, forming a mat up to 2m across.

The species is quite variable, particularly the plant colour. When growing in the sun it is dark red-purple with cream tips, but can range to extremes of yellow and orange or a whitish, lime-green when growing in the shade.

The large attractive flower has yellow petals with dark red spots. Seed pods are banana-shaped but vary greatly in size from 10 to 20mm wide and 80 to 160mm long.

The seeds are about 5mm long and are attached to a long (20 to 60mm) silky pappus which can wrap itself around a shade providing plant. Although the large pappus makes the seed easily dispersed by wind, observations indicate that the seed is very easily disconnected from the pappus with the slightest of pressure. For this reason it is often moved only a short distance.

Photo 40: Carrion Flower plant (Photo: DEWNR)

Photo 41: Carrion Flower bloom (Photo: www.thinkaholic.com)

Flowering: Late summer to autumn.

Origin: Native of South Africa

When introduced: The first specimen in Australia was sent to the SA State Herbarium from Adelaide in 1967. The first specimen in the Whyalla District sent to the SA State Herbarium was collected in 1981.

Why introduced: As an ornamental.

Other information: The plant gets its common name from the smell of dead meat its flower generates, which attracts flies.

Threats and Impacts

Invasiveness Carrion flower produces large capsules containing numerous seeds. These bear long silky hairs that enable dispersal by wind dispersal and also tend to guide the

seeds to sheltered germination sites by tangling in shrubs. However, there is evidence that seed viability is low in the introduced populations.

It has spread gradually from plantings in towns and settlements, and significant populations were first noted on the rocky hills within Whyalla. Spread into shrub-lands is more likely to occur in years with above-average summer rainfall that allows germination and establishment to occur.

Impacts

Carrion flower is most likely to affect saltbush and bluebush shrub-lands in the semi-arid zone where it can build up large populations in the shelter of the shrubs.

It appears to limit water availability by direct competition and possibly decreasing rainfall penetration through the soil, causing decreased growth and reduced health of the saltbush.

The presence of carrion flower also reduced both the biomass and germinable soil seed bank of annual plants in this habitat.

Persistence

Due to the lack of an effective control method, persistence of naturalised populations appears to be high.

The plant is commonly grown in pots and rockeries throughout the southern rangelands and other dry rural areas as a hardy low-care perennial. It is not available in the nursery trade but is usually obtained by gift or informal sale.

Distribution

Current Australian distribution:

Carrion Flower has become naturalised in southern Queensland, at Kalgoorlie in Western Australia, in north-eastern New South Wales and in SA.

Current South Australian distribution:

The main infestations of Carrion Flower are on Eyre Peninsula around Whyalla and Iron Baron, extending to Port Augusta. An outlying infestation was found on the cliffs at Marino in suburban Adelaide.

Current District distribution:

There are unconfirmed reports of Carrion Flower around Iron Baron in the south-east area of the Gawler Ranges District.

Potential distribution

Carrion flower is native to a warm semi-arid climate with fairly reliable summer rainfall and winter drought, and has a dormant period during winter. Growth and flowering occur during spring to summer while water is available. It requires partial shade from permanent vegetation or rock outcrops during summer, and good drainage.

In South Australia, its potential range as a weed is limited to the semi-arid pastoral areas of South Australia. It has found a niche in the Whyalla region where significant summer rainfall occurs. The timing of rainfall may play an important role in determining its spread into other rangeland areas. It is speculated that Carrion Flower has the potential to spread further into the chenopod shrub lands during years of particularly high summer rainfall.

Policy

National Strategy:

Carrion Flower is not classified as a Weed of National Significance, therefore there is no national strategy for this species.

State Policy:

Carrion Flower is a Declared Plant under the Natural Resources Management Act 2004.

The policy states the desired outcome, ""Impacts of carrion flower on native vegetation in the semi-arid zone minimised."

The policy states, "The movement or transport of the plant on a public road by itself or as a contaminant, its entry to South Australia, or the sale by itself or as a contaminant are prohibited."

Objectives are listed as:

- Minimise further spread of Carrion Flower into the southern rangelands.
- Prevent further planting of Carrion Flower.

SA Arid Lands NRM Policy:	SAAL NRM regional management strategy for Carrion Flower is to MONITOR its spread. Aim: To detect any significant changes in the species weed risk & monitor the spread of Carrion Flower and review any perceived changes in weediness.
Gawler Ranges NRM District management strategy	SAAL NRM regional management strategy for Carrion Flower is to MONITOR its spread. Aim: To detect any significant changes in the species weed risk & monitor the spread of Carrion Flower and review any perceived changes in weediness.

Gawler Ranges NRM District Strategy for management of Carrion Flower

Recommended Actions

Support land manager education in identification and monitoring of Carrion Flower.

Occurrences of Carrion Flower in Gawler Ranges NRM District to be surveyed, mapped and reported to NR SA Arid Lands.

Land managers may use control methods outlined below to address any Carrion Flower infestations in the Gawler Ranges NRM District.

Best Practice Control

Control method and description	Best time to control	Active ingredients and example trade names	Herbicide rates and carrier
Chemical			
Spot spray Saturate all parts of plant. Non selective, avoid contact with desirable plants. Add Pulse® penetrant and spray oil. Conservation areas, bushland and other non-crop areas.	July-Oct	Glyphosate (450g/L) e.g. *Roundup CT*® + surfactant e.g. Pulse® + spray oil	1L/100L
Brush Apply by brush or weed wand to all parts of plant. Add Pulse® penetrant and spray oil. Conservation areas, bushland and other non-crop areas.	July-Oct	Glyphosate (450g/L) e.g. *Roundup CT*® + surfactant e.g. Pulse® + spray oil	1L/100L
Physical			
Hand-pull all stems. Compost or burn. This technique is only suitable for small infestations.			

Surveys/ Monitoring

General method:	Keep an eye out for Carrion Flower during routine pastoral management activities and record locations using a GPS or farm map.
Best time of year for surveys:	Anytime but flowering summer to autumn.

Onion Weed

Common name(s): Onion Weed

Scientific name: *Asphodelus fistulosus*

Plant description: Onion Weed is a hairless, tufted herb with hollow, somewhat succulent cylindrical leaves that are 180-400 mm long. The erect flowering stem is also hollow and may be up to 600 mm tall and branched with many small flowers. The flowers have 6 white (or pinkish) petals, 7-12 mm long and each petal has a brownish or purplish central stripe. There are 6 stamens with dark brown anthers and a slender style which is minutely 3-lobed at the tip. It looks like an onion but has no bulb and no onion odour.

Photo 42: Onion Weed (Photo bellarinelandcare.org.au)

Photo 43: Onion Weed in flower (Photo flickr.com/photos/10770266@N04)

Flowering: June to November

Origin: Native from southern Europe to India

When introduced: First recorded in Melbourne in 1857 and Adelaide 1858.

Why introduced: Probably as an ornamental.

Other information: Tends to occur in disturbed or overgrazed areas.

Threats and Impacts

Invasiveness

Onion Weed has a high rate of seed production typical of opportunist plants that breed rapidly to occupy vacant ground. Seed is shed at the beginning of summer and remains dormant for a few months, but 95-100% is ready to germinate by the following autumn break. It normally falls close to the parent plant, but in drought years can be carried in wind-blown soil, and uprooted plants will roll along scattering seed. Long range dispersal depends on human influence, by movement in contaminated seed, fodder or machinery.

As the unimproved pastures of the savannah (grassy woodland) zone degenerated under grazing, Onion Weed was one of the weeds that replaced the native perennial tussock grasses. It is now the dominant plant in some areas of marginal crop land, wasteland and stony or sandy calcareous soils. It is a very conspicuous pioneer plant on bare sandy soils and rapidly occupies paddocks where the pasture has become sparse, leading to a perception that it was a cause

of the pasture's decline.

Impacts

Since Onion Weed is highly unpalatable, heavy grazing by stock and rabbits can remove the competing pasture plants and allow it to dominate in some areas of marginal crop land, wasteland and stony or sandy calcareous soils.

Onion Weed doesn't invade undisturbed mallee vegetation due to the competition from the root systems of established trees and shrubs. It does not compete effectively with vigorous pasture, and can't dominate where sustainable farming systems are practised. Overcropping or overgrazing may let it dominate by lowering fertility and degrading natural pastures. Low soil nitrogen is a critical factor that prevent other plants growing on areas dominated by Onion Weed.

Persistence

Onion Weed has a shallow fibrous root system without rhizomes or bulbs. It can store some reserves in the enlarged leaf bases and becomes a perennial when it can obtain sufficient water to persist over summer; but because it allocates a large proportion of its resources to seed production it survives as an annual in drier areas. Some seed remains viable in the soil for at least one year, but it does not form a long-lived seed bank. It therefore changes in abundance much more rapidly than annual weeds with a large seed bank such as salvation Jane.

However, It can germinate at any time of the year. It can also re-shoot from fragments spread by cultivation. The flower stems and some leaves die with the onset of summer and produce new leaves and stems from the base of the plant in the following autumn. Once established it is tolerant to drought.

Distribution

Current Australian distribution:

It is now naturalised in all Australian States and Territories. It is found predominantly on sandy soils in the 250-400 mm winter-rainfall areas but extends north through the pastoral zone to about 22ºS. Growth occurs over a wide range of temperatures.

Current South Australian distribution:

Its range in SA includes areas with sandy soils in the agricultural zone, the southern part of the pastoral zone, and coastal areas.

Current District distribution:

There are numerous populations of Onion Weed in the Gawler Ranges District.

Potential distribution

Areas at threat include overgrazed or disturbed areas. It prefers low fertility sands, gravels and alkaline soils.

Policy

National Strategy:

Onion Weed is not classified as a Weed of National Significance, therefore there is no national strategy for this species.

State Policy:

Onion Weed has been removed from the Natural Resources Management Act 2004.

The current policy states that, "No NRM Board has a current management plan to enforce control of Onion Weed , or finds it necessary to use any of their powers under the Act to manage this plant in their region. Any control actions needed on properties are carried out at the discretion of land owners."

The policy also states, "Onion Weed is not an economic problem for primary production and sustainable land use in areas where it is established. The actual problems of these lands are low fertility and overgrazing."

SA Arid Lands NRM Policy:

SAAL NRM regional management strategy for Onion Weed is LIMITED ACTION

Aim: Onion 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.
Gawler Ranges NRM District management strategy	Gawler Ranges NRM District management strategy for Onion Weed is LIMITED ACTION Aim: Onion 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.

Gawler Ranges NRM District Strategy for management of Onion Weed

Recommended Actions
Support land manager education in identification and monitoring of Onion Weed.
Occurrences of Onion Weed in Gawler Ranges NRM District to be surveyed, mapped and reported to NR SA Arid Lands.
Land managers may use control methods outlined below to address any Onion Weed infestations in the Gawler Ranges NRM District.

Best Practice Control

Control method and description
Foliar spray
Economically unviable. There is no selective herbicide treatment that is effective against Onion Weed. A range of non-selective herbicides have been used to control Onion Weed on roadside reserves. These are all too expensive for broad-acre treatments on land of low value, which precludes their use in the pastoral zone where even a sustained reduction in grazing pressure may be ruled out by economic considerations.
Physical
Control in pasture depends on improved management, rabbit control, application of fertilisers and pasture seeding. These four actions will directly improve production; Onion Weed control will be a side-effect. Just as an increase in Onion Weed density is a symptom of pasture decline, pasture recovery will be indicated by its disappearance.

Surveys/ Monitoring

General method:	Keep an eye out for Onion Weed during routine pastoral management activities and record locations using a GPS or farm map.
Best time of year for surveys:	Winter to Summer

Salvation Jane

Common name(s): Salvation Jane

Scientific name: *Echium plantagineum*

Plant description: Erect annual herb to 600mm (rarely to 1200mm) high. Stems one to several. Stems and leaves hairy with coarse hairs and sometimes shorter soft hairs. Leaves oval to lanceolate; dark green, basal leaves, in a rosette, to 200mm long, with a short stalk; stem leaves reducing in size towards flowers.

Flowers are purple, tubular, 20-30mm long with 5 petals. They grow in clusters. Flowers are unevenly lobed; stamens with filaments much longer than anthers, 2 stamens longer than the others and projecting past the flower tube. Fruit consists of 4 tuberculate three-sided nutlets (but not all develop).

The plant has a fleshy taproot with smaller laterals.

Photo 44: Salvation Jane rosette (Photo: Weeds of Australia – Biosecurity Queensland)

Photo 45: Salvation Jane in flower (Photo: flickr.com)

Flowering: Mainly late winter to early summer.

Origin: Native of the Mediterranean region across to Portugal.

When introduced: Introduced as an ornamental in the 1850's and first noticed as naturalised in Blanchetown in 1870.

Why introduced: As an ornamental.

Other information: Annual weed of pastures. It is an opportunist on disturbed ground or in degraded native vegetation.

Threats and Impacts

Invasiveness Large quantities of seed are produced in dry, single-seeded fruits that have no adaptations for dispersal by wind. They have a rough surface that enables them to cling to fleeces and fur of animals. They have little ability to move rapidly and unaided between properties, but are spread in contaminated hay or grain, and are also dispersed when swallowed by grazing sheep and later dropped in uninfested pasture.

Germination occurs in several cohorts after heavy rains in late summer and autumn. Growth is rapid under favourable moisture and temperature conditions. Salvation Jane flowers and seeds in spring, usually dying in summer. In high rainfall habitats some rosettes may survive into a second year, giving an extended flowering season.

Salvation Jane has a limited ability to establish among dense herbaceous vegetation and is favoured by ground bared by disturbance, grazing or fire. The

plant grows through the winter as a rosette of leaves pressed to the ground, becoming a more effective competitor as it increases in size.

Impacts

Salvation Jane is avoided by stock as long as more palatable forage is present. This means it readily becomes dominant in permanent pastures subjected to heavy grazing pressure even though it is a poor competitor under other conditions. In rotational crop/pasture systems and on horticultural land it is less competitive and reaches medium densities. It encroaches into native vegetation along tracks and may temporarily spread out to wider areas in response to disturbance or grazing pressure by rabbits.

In poorly managed pastures on steep slopes, salvation Jane may reduce soil stability when it forms high density stands over winter and leaves no other vegetation to hold the soil when it dies off in summer.

Salvation Jane contains pyrrolizidine alkaloids, which are cumulative toxic to livestock and can cause fatal liver damage, especially in horses and pigs. However, it can be used as fodder for sheep in the shorter term. The stiff hairs of salvation Jane irritate the udders of dairy cows, and it can be a cause of allergies in humans.

Persistence

Some intractable infestations occur on steep slopes and other sites inaccessible for herbicide spraying.

The elimination of salvation Jane from a property may require careful management of grazing over many years, or pasture renovation. The technique of spray grazing, using low rates of phenoxy-acid herbicides to make the weed more palatable to sheep, is also used. Seed can survive 20 years or longer in the soil.

Control in the rangelands and marginal farming areas is limited by the high cost of herbicides and application in relation to land values.

Distribution

Current Australian distribution:

It is widely naturalised in all States of Australia, however it is more common in the southern part of the country.

Current South Australian distribution:

It is widespread in the Central, South East (northern part), Murray Mallee, Yorke Peninsula and northern agricultural regions. It is very common in the Flinders Ranges. It is scattered in the southern part of the South East and around the Gawler Ranges. It is found in isolated roadside and paddock infestations on Eyre Peninsula.

Current District distribution:

There are scattered populations of Salvation Jane in the Gawler Ranges District.

Potential distribution

Distribution of salvation Jane is limited by high temperatures and low rainfall in the northern part of the State, and it is estimated that 30% of the rangelands are suitable for it. In the south its potential range includes 75% of the perennial pasture zone and 50% of the rotational cropping zone, where it is limited by alkaline soils and competition from other weeds in areas of high rainfall.

Policy

National Strategy:

Salvation Jane is not classified as a Weed of National Significance, therefore there is no national strategy for this species.

State Policy:

Salvation Jane is a Declared Plant under the Natural Resources Management Act 2004.

The current policy states that, “Salvation Jane or Paterson’s curse is an annual weed of pastures, and less often of rotational broadacre crop/pasture systems. It is an opportunist that temporarily occupies disturbed ground or degraded native vegetation. It contains pyrrolizidine alkaloids, which are cumulative toxins to livestock and can cause fatal

	liver damage, especially in horses. However, it can be used as fodder for sheep in the short term. The policy states, "The movement or transport of the plant on a public road, by itself or as a contaminant, or its sale by itself or as a contaminant, is prohibited." Objectives are listed as: • Spread of salvation Jane to clean properties prevented. • Existing populations of Salvation Jane contained within their current limits. • Reduction in density of Salvation Jane populations by improved management and biological control.
SA Arid Lands NRM Policy:	SAAL NRM regional management strategy for Salvation Jane is MANAGE SITES Aim: To reduce the overall economic, environmental and/or social impacts of Salvation Jane through targeted management.
Gawler Ranges NRM District management strategy	Gawler Ranges NRM District management strategy for Salvation Jane is MANAGE SITES Aim: To reduce the overall economic, environmental and/or social impacts of Salvation Jane through targeted management.

Gawler Ranges NRM District Strategy for management of Salvation Jane

Recommended Actions

Support land manager education in identification and monitoring of Salvation Jane.

Occurrences of Salvation Jane in Gawler Ranges NRM District to be surveyed, mapped and reported to NR SA Arid Lands.

Land managers may use control methods outlined below to address any Salvation Jane infestations in the Gawler Ranges NRM District.

Best Practice Control

Control method and description	Best time to control	Active ingredients and example trade names	Herbicide rates and carrier
Foliar Spray			
Boom spray Hormone type treatment – Use with caution near sensitive crops. Refer to drift warnings on the label. Pastures. Seek advice.	March-May	2,4-D Amine (625g/L) using Spray-Graze. e.g. 2,4-D Amine 625	560ml/ha
Spot spray Adult plants. Non-selective, avoid contact with desirable plants. Soil active herbicide, may damage desirable vegetation.	Sept – April When actively growing and before seed set.	Glyphosate (450g/L) e.g. *Roundup*® + Metsulfuron-methyl (600g/L) e.g. Ally® + surfactant e.g. Pulse®	800ml + 10g/100L
Non-selective, avoid contact with desirable plants.	Sept – April When actively growing and before seed set.	Glyphosate (450g/L) e.g. *Roundup*®	1L/100L
Physical			
Grub out, cut or pull all plants. If plants are flowering collect and burn them to ensure seeds do not continue to mature and add to the seedbank in the soil. Ongoing monitoring and follow up hand pulling/grubbing will be required annually. Mowing/slashing in pastures can be used to reduce the flowering and seeding of Salvation Jane, by cutting it prior to flowering. Slashing must be carried out repeatedly to prevent flowering and seeding.			

Biological
A program has been under way since the early 1970's to identify and establish a successful biocontrol for Salvation Jane. The following agents have been released with varying degrees of success: Pollen Beetle (*Meligethes planiusculus*), Leaf-mining Moth (*Dialectica scalariella*), Crown Weevil (*Mogulones larvatus*), Flea Beetle (*Longitarsus echii*) and Root Weevil (*Mogulones geographicus*). They are all considered effective suppression agents. However, the most encouraging results have come from the Crown Weevil (*Mogulones larvatus),* cited by CSIRO as, "…often killing the weed outright on a large scale, at a number of sites in NSW, Vic and SA."

Surveys/ Monitoring

General method:	Keep an eye out for Salvation Jane during routine pastoral management activities and record locations using a GPS or farm map.
Best time of year for surveys:	Winter to Summer

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