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




DECEMBER 2014

South Australian Arid Lands Natural Resources Management Board

MARLA - OODNADATTA NRM DISTRICT WEED STRATEGY

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PAUL HODGES

DEWNR

DECEMBER 2014

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Photos front page: Jumping Cholla (F Bernhardt, Edithburgh); Mimosa Bush (E Fatchen, DEWNR); Coral Cactus (B Shepherd, Rural Solutions) and Athel Pine (B Shepherd, Rural Solutions).

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Table of Contents

Purpose of Strategy

It is intended that this strategy be used by the Marla - Oodnadatta 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 ten priority weeds.

The management actions outlined for each of the ten priority weeds are in line 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 distribution, possible threats and impacts and policy on each of the ten priority weeds and outlines current best practise control methods and surveying/monitoring activities.

Furthermore, it is recommended that the group review this strategy in five years to assess progress and update management actions where required.

Some of the plant species discussed in this strategy are valued amenity trees (e.g. Athel Pine) within station gardens, while others are generally undesirable plants (e.g. Cactus and Khaki Weed). Most of the weeds are currently at low densities, while others have infested large areas. All the plants dealt with in this strategy have a demonstrated ability to rapidly expand their distribution given favourable seasonal conditions. Managing current infestations and removing potential sources for new infestations 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 Marla - Oodnadatta NRM District group can develop pro-active weed management programs within their district for the long term protection of its environmental and productive assets.

The Marla - Oodnadatta NRM District

The Marla-Oodnadatta District covers an area of approximately 132,000 square kilometres in the north-west pastoral region of South Australia. The District is bounded by the Simpson Desert and Lake Eyre on the east, the Great Victoria Desert on the west and the Northern Territory border to the north. Clay pans, red sandhills, gibber, creek lines, floodplains, mesas, plateaus and weathered hills are all features of the District. The elevation ranges from 647metres above sea level at Mount Chandler in the north-west of the District to as much as 15 metres below sea level in parts of Lake Eyre.

Population density is extremely low with Coober Pedy, the major service centre for the District, the exception with a population of 3,500. The other largest towns in the District are Oodnadatta with a population of 230 and Marla with a population of 240.

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

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

Ongoing access and availability of ground and surface water are essential for human occupation, continued utilisation of the land's resources and the success of the pastoral industry. The best quality groundwater occurs in the main aquifer of the Great Artesian Basin (GAB). Due to the lower relief, the free flowing bores and mound springs occur in the eastern part of the District. Further to the west there is

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

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

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

The Marla - Oodnadatta 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 Marla - Oodnadatta NRM District Group as at September 2014 are:

Mark Fennell	Tony Williams
Caroline Thomas	Peter Watts
Christine Jones	Daryl Bell
Douglas Lillecrapp	Janet Walton (NRMO, DEWNR)
Tony Magor/Frank Lyman (DEWNR)	Mark Sutton (PIRSA)

Target Weeds

The weeds chosen as priorities for the Marla - Oodnadatta 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 realistic i.e. they are strategic control opportunities. An initial list of priority weeds were presented to the District Group from which the top ten priority weeds were selected.

Weed risk assessments have been undertaken by the SA Arid Lands NRM Board on each of the ten priority weeds. This process determines a weeds risk (low, medium or high) in a rangelands land system 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. Ten priority weeds included in the Marla - Oodnadatta NRM District Strategy, the management strategy and description of the management strategy for each weed.

NB Cactus species have different management strategies depending on each species risk.

Priority Weed	Management strategy	Description of management strategy for District
Annual Beardgrass *(Polypogon sp.)*	Manage sites	To maintain the overall economic, environmental and/or social value of key sites/assets through improved management of Annual Beardgrass. See page 10 for more details.
Athel Pine	Protect sites	To prevent spread of Athel Pine to key sites/assets of high economic, environmental and/or social value. See page 13 for more details.
Buffel Grass	Manage weed	To reduce the overall economic, environmental and/or social impacts of Buffel Grass through targeted management. See page 17 for more details.
Cactus *(Opuntia spp.)*	Contain spread or Destroy infestations (depending on species)	To prevent the spread of Opuntia spp. through control of all infestations. To significantly reduce the extent of Cylindropuntia spp. See page 20 for more details.
Date Palm	Protect sites	To prevent spread of Date Palms to key sites/assets of high economic, environmental and/or social value. See page 28 for more details.
Khaki Weed	Destroy infestations	To significantly reduce the extent of Khaki Weed. See page 31 for more details.
Mimosa Bush *(Acacia farnesiana or Vachellia farnesiana)*	Contain spread	To prevent ongoing spread through control of all infestations of Mimosa Bush. See page 34 for more details.
Neurada procumbens	Monitor	To detect any significant changes in Neurada procumbens weed risk and monitor the spread of the species and review any changes in weediness. See page 37 for more details.
Rubber Bush (Calotropis procera)	Monitor	To detect any significant changes in Rubber Bush weed risk and monitor the spread of the species and review any changes in weediness. See page 40 for more details.
Wards Weed (Carrichtera annua)	Manage sites	To maintain the overall economic, environmental and/or social value of key sites/assets through improved management of Wards Weed. See page 43 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

It is intended that this strategy be implemented over the next five years. In the fifth year it is suggested that the District Group review progress and update management targets and actions accordingly.

Suggested time frame:

Year	Activity
2014	Draft strategy reviewed by the Group and feedback incorporated into the Strategy Strategy endorsed by the group
2015	Implementation
2016	Implementation
2017	Implementation and review progress and update the strategy as required (and then every 3 years)
2018	Implementation

Target Weeds and their strategy

Annual Beardgrass

Common name(s): Annual Beardgrass, Rabbit-foot Grass

Scientific name: *Polypogon monspeliensis*

Plant description: Annual Beardgrass looks just like a rabbit's foot, stout and fuzzy.

The leaf blades are long, narrow, parallel sided, 50-200 mm long by 2-8 mm wide, flat, roughened on the veins and tapered to a fine point. Midrib is not prominent. Hairless.

Stems are single or in small tufts, erect or spreading 40-900 mm tall, branching near the base. 3-6 nodes. Often rough beneath the flower head. Rarely bent at the nodes. Hairless.

The flower heads are dense, cylindrical, (or sometimes somewhat lobed) softly bristly, spike like panicle, 10-160 mm long by 6-35 mm diameter with long, protruding awns. Closely divided, short branches. Pale green to yellowish white covered in fine bristles that give it a silvery appearance in the sun. Main axis and branch axes hairless but branches finely roughened. Spikelets fall complete and break off below the glumes with a very short remnant of stalk.

The spikelets contain one floret. The glumes both have awns that can be up to 10mm in length. The main body of the glumes and the floret is only about 1-2mm long without the awn. This annual likes wet disturbed ground.

Photo 1: Annual Beardgrass, (Photo wnmu.edu)

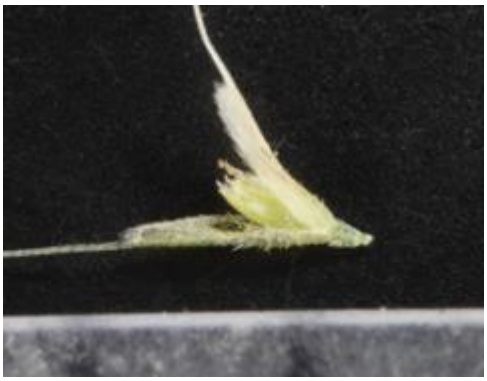

Photo 2: Annual Beardgrass - 5x macro of spikelet (Photo wnmu.edu)

Flowering: Spring

Origin: Europe, Asia and North Africa

When introduced: Unknown

Why introduced: Unknown

Threats and Impacts

Invasiveness	It is considered a high threat weed species in grassy wetland and brackish wetland communities. Therefore it is a problem species around mound springs. It is a coloniser of disturbed wetlands.
Impacts	Annual ryegrass toxicity (ARGT) is a threat associated with this species, mainly in south-east Australia. The plant itself isn't toxic but can host a bacterium, *Rathayibacter toxicus*, which causes Flood Plain Staggers that can kill stock.
Persistence	Plants go dormant when dry conditions occur but respond when moisture available.

Distribution

Current Australian distribution:	NSW, Vic, ACT, Tas, SA, Qld (southern & central), WA (southern) & NT (southern & northern).
Current South Australian distribution:	South-east, EP, Mt Lofty Ranges, Flinders and Mound Springs.
Current District distribution:	Some of the Mound Springs.
Potential distribution:	Mound Springs and wetland areas.

Policy

National Strategy:	Annual Beardgrass is not classified as a Weed of National Significance, therefore there is no National Strategy for this species.
State Policy:	No State policy exists for Annual Beardgrass.
SA Arid Lands NRM Policy:	The SAAL NRM regional management strategy for Annual Beardgrass is to MANAGE sites. Aim: To maintain the overall economic, environmental and/or social value of key sites/assets through improved management of Annual Beardgrass.
Marla - Oodnadatta NRM District management strategy	Marla - Oodnadatta NRM District management strategy for Annual Beardgrass is to MANAGE sites Aim: To maintain the overall economic, environmental and/or social value of key sites/assets through improved management of Annual Beardgrass.

Marla - Oodnadatta NRM District Strategy for management of Annual Beardgrass

Recommended Actions
Support land manager education in identification, monitoring and control of Annual Beardgrass.
Marla - Oodnadatta NRM District Group to encourage landholders to provide data on distribution of Annual Beardgrass in Marla - Oodnadatta NRM District to NRSAAL, so that it can be surveyed and mapped.
Marla - Oodnadatta NRM District group to provide input into identification of key sites for control of Annual Beardgrass infestations.
Marla - Oodnadatta NRM District group to assist in identifying and coordinating Annual Beardgrass control programs using integrated weed management (combination of recommended best practices), especially in areas where key sites are threatened.
Land managers are encouraged to monitor success, following control of Annual Beardgrass, 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
Foliar Spray			
Spot spraying with a knap sack or quad/ute mounted spray unit can be used Spray the entire plant with the recommended herbicide mix. No residual effect occurs, so follow up control will need to be carried out.	Whilst actively growing	Glyphosate bio (360g/L) e.g. Roundup Biactive®	500mL/100L water (DO NOT USE SURFACTANT)
Physical			
Ground can be cultivated in suitable areas before plant goes to seed.			

Surveys/ Monitoring

General method:	Keep an eye out for Annual Beardgrass during routine pastoral management activities, especially along drainage lines and around dams or springs, and record locations using a GPS or farm map.
Best time of year for surveys:	Mid-winter through to early summer.

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 3: Mature Athel Pine (Photo B Shepherd)

Photo 4: Athel Pine in riparian zones (Photo B Shepherd)

Photo 5: Pink-white flowers of Athel Pine (Photo B Shepherd)

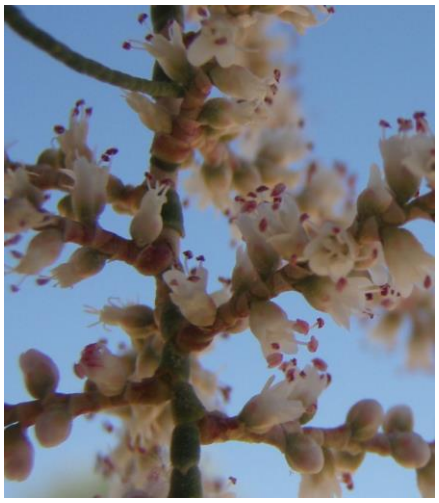

Photo 6: Athel Pine flowers (Photo B Shepherd)

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

Potential distribution:

Athel Pine 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.
Marla - Oodnadatta NRM District management strategy:	Marla - Oodnadatta 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.

Marla - Oodnadatta NRM District Strategy for management of Athel Pine

Recommended Actions
Support land manager education in identification, monitoring and control of Athel Pine.
Marla - Oodnadatta NRM District Group to encourage landholders to provide data on distribution of Athel Pine in Marla - Oodnadatta NRM District to NRSAAL, so that it can be surveyed and mapped.
Marla - Oodnadatta 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.
Land managers are required to undertake control of Athel Pine plants within 100m of rivers, creeks and waterholes.
Land managers are 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. Remove all cut material from moist environments to prevent root growth from tree sections.	Any time of year	Picloram (43 g/kg) e.g. *Vigilant® Herbicide Gel®*	Ready to use
		Triclopyr (600 g/L) e.g. *Garlon®*	35 ml/L mixed in diesel
		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 herbicide mix, to a height of between 250 – 750 mm above soil level.	Any time of year	Triclopyr (600 g/L) e.g. *Garlon®*	25 mls/L mixed in diesel
		Triclopyr (240 g/L) + Picloram (120 g/L) e.g. *Access®*	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 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 suitably sized bull dozer or loader.
Roots must be cut about 30-50 cm below the soil surface to reduce the incidence of regrowth. This is best done with a blade plough.
Branch and root fragments of Athel Pine can take root, therefore woody material must be moved out of creek lines and moist areas.
Re-growth after control is common and follow up foliar spray will be required.

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 7: Buffel Grass seed head (Photo B Shepherd)

Photo 8: Buffel Grass infestation (Photo B Shepherd)

Photo 9: 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 selective 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:	Large infestations throughout north-west of district. Infestations also reported around Coober Pedy and on gilgai tablelands (crab-holes).
Potential distribution:	Buffel Grass establishes readily and has the capacity to expand across a large proportion of northern to central South 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 uninfested with 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, based on the SA Buffel Grass Strategic Plan, is to MANAGE the impacts of Buffel Grass in the Marla-Oodnadatta NRM Region and CONTAIN SPREAD in the rest of the SAAL region

Marla - Oodnadatta NRM District Risk management strategy:	Marla - Oodnadatta NRM District management strategy is to MANAGE Buffel Grass Aim: To reduce the overall economic, environmental and/or social impacts through targeted management.

Marla - Oodnadatta NRM District Strategy for management of Buffel Grass

Recommended Actions
Support land manager education in identification, monitoring and control of Buffel Grass.
Marla - Oodnadatta NRM District Group to encourage landholders to provide data on distribution of Buffel Grass in Marla - Oodnadatta NRM District to NRSAAL, so that it can be surveyed and mapped.
Marla - Oodnadatta NRM District group to provide input into identification of key sites requiring control of Buffel Grass.
Marla - Oodnadatta 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 are 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 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. Follow up monitoring and spraying will be required around 4 weeks after the initial spray. Buffel Grass can quickly regenerate from seed and ongoing monitoring and control is required annually.	Between 1-3 weeks after summer rain	Glyphosate (360g/L) e.g. *Roundup*® + Flupropanate e.g. *Tussock*	300 mL + 1L / 100L water with a penetrant e.g. *Pulse*® It is also recommended that a dye is used with the herbicide mix to show which plants have and have not been sprayed.
Physical			
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. Any time of year.			

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 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 10: Coral Cactus (Photo B Shepherd)

Photo 11: Coral Cactus (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 12: Rope like appearance of Devil's Rope cactus (Photo J Pitt)

Photo 13: 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 imbricata*

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 14: Jumping Cholla plant (Photo R Holtkamp)

Photo 15: 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: 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 of Hudson Pear is wider towards the tip, 2–4.5 cm long.

Photo 16: Hudson Pear plant (Photo G Patrick)

Photo 17: Pink flowers of Hudson Pear (Photo brisbanetimes.com.au)

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

Photo 19: 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 20: Wheel Cactus (Photo J Pitt)

Photo 21: 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 22: Prickly Pear (Photo G. Patrick)

Photo 23: 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 and 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.

Other cacti species in the District are also invasive, 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 out-compete 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 East Pastoral - 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:

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

Potential distribution:

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.

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.

Marla - Oodnadatta NRM District management strategy:

To CONTAIN SPREAD of Opuntia spp.

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

To DESTROY INFESTATIONS of Cylindropuntia spp.

Aim: To significantly reduce the extent of Cylindropuntia spp. in the Marla – Oodnadatta NRM District.

Marla - Oodnadatta NRM District Strategy for management of Opuntia species

Recommended Actions
Support land manager education in identification, monitoring and control of Opuntia species.
Marla - Oodnadatta NRM District Group to encourage landholders to provide data on Opuntia infestations in Marla - Oodnadatta NRM District to NRSAAL, so that it can be surveyed and mapped.
Marla - Oodnadatta NRM District group to provide input into identification of key sites requiring control to significantly reduce density of all Opuntia species and protect key sites.
Marla - Oodnadatta NRM District to consider quarantine provisions around known occurrences of Coral Cactus, Engelmann's Prickly Pear, Hudson Pear and Jumping Cholla.
Land managers to undertake control of all Opuntia species in close proximity to key sites.
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.

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

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	Triclopyr (600g/L) e.g. *Garlon®*	33 ml/L water with Spray oil e.g. Hotwire® or 33 ml/L diesel
		Triclopyr (240g/L) + Picloram (120g/L) e.g. *Access®*	17 ml/L diesel
		Triclopyr (240g/L) + Picloram (120g/L) e.g. Grazon	50ml/10L water
	Apply in summer above 30º	*MSMA (800g/L MSMA) e.g. Daconate*	1 L/40L water
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.

Photo 24: Control of Coral Cactus using foliar spray
(Photo B Shepherd)

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

Date Palm

Common name(s): Date Palm

Scientific name: Phoenix dactylifera

Plant description: Plants male or female. Leaves often referred to as fronds, clustered at the top of the palm. Fruit about 2cm long, brown to dark orange when ripe, and around a large woody seed.

Distinguished by unbranched trunk covered with leaf bases, the base sometimes producing suckers and suckers also produced from roots; grey-green leaves 2.5-4m long with numerous leathery leaf segments (pinnae) folded upwards, leaf base remaining on trunk after leaf has been shed; fruit a single-seeded berry known as a date.

Photo 25: Date Palms at Dalhousie Springs NP (Photo ausemade.com.au).

Photo 26: Fruit (dates) on Date Palm (Photo weeds.org.au)

Flowering: Flowers late winter and spring

Origin: Probably northern Africa and/or south-western Asia

When introduced: 1870's probably by Afghan cameleers (although botanist, Baron Ferdinand Jakob Heinrich von Mueller claimed he introduced the Date Palm into central Australia about the same time)

Why introduced: Source of food in arid lands

Threats and Impacts

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

Impacts Date Palms are aggressive invaders of wetland habitats. They have the ability to grow in high densities, forming a continuous and dense canopy effectively excluding light, with the roots forming a dense mat that is both extensive and invasive.

Date Palms inhibit the establishment of endemic species beneath the canopy and compete with species already present. They've been shown to significantly reduce the biodiversity and heterogeneity of flying invertebrates. There's also evidence indicating that Date Palms are reducing diversity and abundance of soil nematodes.

Date Palms use substantial amounts of water thus reducing environmental flow – water use is estimated to be between 493L and 274L of water per day.

	Date Palms have the potential to threaten some wetland species along the spring tails including. They have impacted on and may have caused the localised extinction of several tree species in the spring complex. Date Palms also threaten mound spring ecology through altered fire regimes. Masses of dead fronds and a high oil content in living fronds result in high intensity fires that can kill endemic species, particularly where palms occur in dense clumps around or adjacent to Melaleuca or Eucalyptus trees. The exotic palms are rarely killed by wildfire. Burnt palms sprout green leaves from the crown of the trunk.
Persistence	Date Palms reach sexual maturity at about five years. The female plant blossoms once per year. Date Palms are pollinated by wind and one large inflorescence may embrace 6,000 to 10,000 flowers. On an individual tree there can be more than a dozen inflorescences. The palms live well over 100 years and can continue to produce fruit for a long time ensuring a large seed supply for recolonisation.

Distribution

Current Australian distribution:	Date Palms were introduced in Australia for their fruit and were widely planted in Australia and throughout much of northern South Australia. They are an environmental weed in the Pilbara region of Western Australia along the Fortescue River and further north at Lake Kunnanura. National Parks and Wildlife, Western Australia have removed an estimated one million Date Palms in an effort to save the endemic palm *Livistona alfredii.*
Current South Australian distribution:	Date Palms have been planted at a number of Great Artesian Basin Spring sites. They were planted at Dalhousie and have spread to 39 springs from the original planting. Palms planted at Old Nilpinna spring in northern South Australia are now spreading and their impacts are the cause of some concern. Date Palms have also been planted at Big Perry Springs, Freeling Springs, Wandillinna Springs and also near the Bubbler and Blanche Cup at Coward Springs Bore.
Current District distribution:	Same as SA distribution.
Potential distribution:	Date Palms rely on access to water. Therefore, less than 5% the SA Arid Lands is suitable for infestation.

Policy

National Strategy:	Date Palms are not classified as a Weed of National Significance, therefore there is no National Strategy for this species.
State Policy:	No State Policy exists for Date Palms.
SA Arid Lands NRM Policy:	The SAAL NRM regional management strategy for Date Palms is to PROTECT sites. Aim: To prevent spread of Date Palms to key sites/assets of high economic, environmental and/or social value.
Marla - Oodnadatta NRM District management strategy	Marla - Oodnadatta NRM District management strategy is to PROTECT sites from the spread of Date Palms. Aim: To prevent spread of Date Palms to key sites/assets of high economic, environmental and/or social value.

Marla - Oodnadatta NRM District Strategy for management of Date Palms

Recommended Actions

Support land manager education in identification, monitoring and control of Date Palms.

Marla - Oodnadatta NRM District Group to encourage landholders to provide data on distribution of Date Palms in Marla - Oodnadatta NRM District to NRSAAL, so that it can be surveyed and mapped.

Marla - Oodnadatta NRM District group to provide input into identification of key sites for control of Date Palms infestations.

Marla - Oodnadatta NRM District group to assist in identifying and coordinating Date Palms control programs using integrated weed management (combination of recommended best practices), especially in areas where key sites are threatened.

Land managers are encouraged to monitor success, following control of Date Palms, and carry out follow up control as necessary.

Best Practice Control

Control method and description

Physical

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

Surveys/ Monitoring

General method:	Look for Date Palms around springs and other permanent sources of water and record locations using a GPS or farm map.
Best time of year for surveys:	Anytime.

Khaki Weed

Common name(s): Khaki Weed

Scientific name: Alternanthera pungens

Plant description: Prostrate herb with perennial root system and annual above ground growth. Taproot often large, woody and deep-penetrating.

Stems shortly silky hairy. Leaves ovate to circular, hairless to sparsely hairy, margins entire; leaf stalk 0.2–1 cm long. Inflorescence ovoid, 6–10 mm wide.

Fruit 1–1.5 mm long. Seeds about 1 mm wide, brownish, globe-shaped. It forms carpets of sharp burrs that can injure people and animals.

Photo 27: Khaki Weed runners (Photo weeds.org.au)

Photo 28: Khaki Weed with burrs (Photo depi.vic.gov.au)

Flowering: March to April

Origin: Native of Brazil, Ecuador, Peru and Venezuela. It has become widely distributed through the temperate and tropical regions of the world.

When introduced: First recorded in NSW in 1898. First noticed around Alice Springs in 1957.

Why introduced: Unknown. Probably by accident on introduced stock.

Other information:

Threats and Impacts

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

Impacts Major weed of warm temperate and tropical areas around the world. Stock graze young plants. Widespread in wasteland, caravan parks, orchards and recreation areas. The sharp spiny fruit cause mechanical damage to the feet and mouths of stock and working animals when present in hay and pasture.

Khaki Weed is believed to be poisonous to animals and to cause skin ailment in cattle. It is not readily eaten but sometimes young plants are consumed by sheep, apparently without ill effect (Parsons & Cuthbertson 2001). It is also claimed to cause hay fever, asthma and dermatitis in some people.

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

Distribution

Current Australian distribution:

Khaki Weed occurs in all mainland states and territories. In New South Wales it occurs in towns in a broad band running north to south through the state and Australian Capital Territory, in coastal areas north of Sydney and also agricultural regions in the central and north-west of the state.

In Victoria and South Australia, Khaki Weed is confined to towns in the more arid areas (Parsons & Cuthbertson 2001).

In the Northern Territory, it occurs in the Darwin, Gulf, Katherine, Victoria River and Alice Springs districts (Miller & Schultz 1997).

Khaki Weed is widespread in Queensland particularly around towns in the south-east (Parsons & Cuthbertson 2001).

In Western Australia, Khaki Weed can be found in and around towns in the Kimberley and Pilbara regions and around Perth and other centres in the south-west (Spooner *et al.* 2007).

Current South Australian distribution:

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

Current District distribution:

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

Potential distribution:

Khaki Weed likes light soils and relies on summer rainfall, so providing these conditions are met, Khaki Weed can exist throughout mainland Australia.

Policy

National Strategy:

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

State Policy:

No losses to the amenity value of recreational land or pasture production due to Khaki Weed.

Objectives:

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

Implementation

- Biosecurity SA and NRM authorities to promote awareness of alert weeds including Khaki Weed.
- Landowners to report infestations to NRM authorities.
- NRM authorities to inspect camping grounds, ovals, roadhouses and roadside reserves for Khaki Weed.
- Landholders to destroy infestations growing on land they occupy.
- NRM authorities to ensure all infestations on public or private land are destroyed.
- NRM authorities to destroy infestations on road reserves as detected.

SA Arid Lands NRM Policy:

SAAL NRM regional management strategy for Khaki Weed is to PROTECT SITES.

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

Marla - Oodnadatta NRM District management strategy

Marla - Oodnadatta NRM District management strategy for Khaki Weed is to DESTROY INFESTATIONS.

Aim: To significantly reduce the extent of Khaki Weed in the Marla – Oodnadatta District.

Marla - Oodnadatta NRM District Strategy for management of Khaki Weed

Recommended Actions
Support land manager education in identification, monitoring and control of Khaki Weed.
Marla - Oodnadatta NRM District Group to encourage landholders to provide data on distribution of Khaki Weed in Marla - Oodnadatta NRM District to NRSAAL, so that it can be surveyed and mapped.
Marla - Oodnadatta NRM District group to provide input into identification of key sites for control of Khaki Weed infestations.
Marla - Oodnadatta NRM District group to assist in identifying and coordinating Khaki Weed control programs using integrated weed management (combination of recommended best practices), especially in areas where key sites are threatened.
Land managers encouraged to control Khaki Weed whenever found.
Land managers are encouraged to monitor success, following control of Khaki Weed, 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
Foliar Spray			
Spot spraying with a knap sack or quad/ute mounted spray unit can be used Spray the entire plant with the recommended herbicide mix. Soil residual. Do not use near desirable vegetation or in waterways.	Anytime	2,4-D (300g/L) + picloram (75g/L) e.g. Tordon® 75-D	650ml/100L water
Spot spraying with a knap sack or quad/ute mounted spray unit can be used Spray the entire plant with the recommended herbicide mix Non-selective, avoid contact with desirable plants. Won't kill the root system, ongoing treatment required.	Whilst plant actively growing	Glyphosate (450g/L) e.g. Roundup®	1L/100L water
Fallow. Boom spray. DO NOT treat weeds which are beyond the rosette stage. Use higher rate on large weeds. DO NOT HARVEST, GRAZE OR CUT FOR STOCK FOOD FOR 7 DAYS AFTER APPLICATION.	Apply when weeds have at least 3-5 true leaves and are actively growing.	Dicamba (500g/L) Kamba 500®	320-560ml/ha
Physical			
Individual plants may be grubbed. Ensure the complete removal of the tuber and root system. Dig beside the root 100mm down or more. Destroy any burrs found.			

Surveys/ Monitoring

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

Mimosa Bush

Common name(s): Mimosa Bush

Scientific name: *Acacia farnesiana synonym Vachellia farnesiana*

Plant description: Spreading shrub mostly less than 3 m high (rarely a small tree to 7 m high). Bark smooth or fissured, grey-brown. Seedpod almost cylindrical, thick, straight to curved, 4–6 cm long, 0.9–1.2 cm wide, pithy inside between seeds, not opening at maturity. Seeds black, oblique to transverse in the pod.

Distinguished by young stems with raised corky areas (lenticels) through which gas is exchanged; straight spines 1–2.5 cm long at base of leaves; mature leaves bi-pinnate, leaf axis 2–6 cm long, green, pinnae in 3–7 pairs, leaflets 4–9 mm long, 1–2 mm wide in 8–20 pairs; a small gland is usually found on the leaf stalk; heads of 40–80 flowers, 1–3 per leaf axil, golden yellow, globular; fruit maturing black and remaining on plant.

Photo 29: Golden flowers and bipinnate leaves of the Mimosa Bush (Photo: Emily Fatchen, DEWNR)

Photo 30: Seed pod and thorns of the Mimosa Bush (Photo: Emily Fatchen, DEWNR)

Photo 31: Mimosa Bush south of Susan's Dam, Peake (Photo: Rob Murphy, DEWNR)

Photo 32: Mimosa Bush seeds and pod (Photo: LRT, North West Weeds, NSW)

Flowering: Autumn to early summer

Origin: Central and South America

When introduced: Naturalised in Australia – thought to have been introduced prior to European settlement

Why introduced: Unknown

Threats and Impacts

Invasiveness

Mimosa Bush can spread readily and grow quickly. It often forms thorny thickets. Seeds sprout readily and plants grow rapidly. It does well in dry localities and on loamy or sandy soils, forming thickets and spreading along watercourses.

Seeds are primarily dispersed when livestock and feral animals eat the fruit and pass the seeds intact. Seeds may also be dispersed along water courses, when they are flowing.

Impacts

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

Persistence

Mimosa Bush withstands drought well, is readily eaten by stock, and has good regrowth after grazing. This species reproduces by seed, and also produces suckers when its above-ground parts are damaged.

Apart from chemical control, there are no other effective means of controlling this species. This is a very real problem on organic properties.

Distribution

Current Australian distribution:

Widespread throughout northern Australia (though absent from extreme north), north-eastern S.A. and the North Coast to western N.S.W. as far S as Jerilderie

Current South Australian distribution:

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

Current District distribution:

Mimosa Bush is currently found in the Neales-Peake catchment.

Potential distribution:

Watercourses and disturbed roadsides across the northern half of the State.

Policy

National Strategy:

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

State Policy:

No State policy exists for Mimosa.

SA Arid Lands NRM Policy:

The SAAL NRM regional management strategy for Mimosa is to CONTAIN SPREAD.

Aim: To prevent ongoing spread through control of all infestations.

Marla - Oodnadatta NRM District management strategy:

The Marla - Oodnadatta NRM District management strategy for Mimosa is to CONTAIN SPREAD

Aim: To prevent ongoing spread through control of all infestations of Mimosa in the Marla - Oodnadatta NRM District.

Marla - Oodnadatta NRM District Strategy for management of Mimosa Bush

Recommended Actions
Support land manager education in identification, monitoring and control of Mimosa Bush.
Marla - Oodnadatta NRM District Group to encourage landholders to provide data on distribution of Mimosa Bush in Marla - Oodnadatta NRM District to NRSAAL, so that it can be surveyed and mapped.
Marla - Oodnadatta NRM District group to provide input into identification of key sites requiring control of Mimosa Bush.
Marla - Oodnadatta NRM District group to assist in identifying and coordinating Mimosa Bush control programs using integrated weed management (combination of recommended best practices), especially in areas where key sites are threatened.
Land managers are encouraged to monitor success, following control of Mimosa Bush, 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			
Cut trunk off horizontally as close to the ground as possible. Immediately, within 15 seconds, swab cut surface with herbicide mixture.	Any time of year	Triclopyr (240 g/L) + Picloram (120 g/L) e.g. *Access*®	17 ml/L diesel (solvent included in chemical – Liquid Hydrocarbon 389g/L)
Basal bark			
For stems up to 5 cm diameter, carefully spray completely around base of plant to a height of 30 cm above ground level. Thoroughly spray into all crevices. Larger trees may be controlled by spraying to a greater height, up to 100 cm above ground level.	Autumn, when plants are actively growing and soil moisture is good (providing summer rains have occurred).	Triclopyr (240 g/L) + Picloram (120 g/L) e.g. *Access*®	17 ml/L diesel (solvent included in chemical – Liquid Hydrocarbon 389g/L)
Foliar spray			
There are no herbicides registered for use in SA.			
Physical			
Useful for very large trees, dense infestations and broad scale germination 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. Branch and root fragments of Mimosa 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. Subject to fire restrictions, controlled burning (minimum 2 subsequent burns) can also be effective.			

Surveys/ Monitoring

General method:	Keep an eye out for Mimosa Bush during routine pastoral management activities, especially along roadsides and drainage lines, and record locations using a GPS or farm map.
Best time of year for surveys:	Autumn to early summer when plants are flowering.

Neurada procumbens

Common name(s): Neurada

Scientific name: *Neurada procumbens*

Plant description: A distinctive low-lying annual herb that is adapted to dry, sandy environments, spreading up to 1m in diameter. Stems are branching and lie flat on the ground with dense hairs that give a woolly appearance. Neurada also has an obvious tap root.

Leaves are a distinctive blue-green colour and are lobed, covered in fine hairs and reach 6-25mm in length. They are borne on woody stems that radiate from the base of the plant.

Flowers are inconspicuous, usually solitary, small, generally off-white in colour and have five petals.

The fruit is star shaped, smooth on the underside but has spines on the upper surface that become sharp when dry. The fruit turns hard and woody at maturity.

Photo 33: Neurada procumbens with flowers and seed (immature) (Photo: lrm.nt.gov.au)

Photo 34: Neurada procumbens prickly seeds (Photo: lrm.nt.gov.au)

Flowering: Within 2-4 weeks after rain

Origin: Native to arid regions of Africa, India and the Middle East.

When introduced: First identified in Australia in 2000 in north-west corner of Simpson Desert

Why introduced: Unknown

Threats and Impacts

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

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

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

Distribution

Current Australian distribution:	North-west corner of the Simpson Desert and in some campgrounds in southern Central Australia in Northern Territory. Far north of South Australia.
Current South Australian distribution:	Simpson Desert and other scattered populations in northern South Australia.
Current District distribution:	Simpson Desert and Witjira National Park.
Potential distribution:	Across the SA Arid Lands, especially in the sandy dunefields in the north of the State. Also a threat throughout Central Australia.

Policy

National Strategy:	*Neurada procumbens* is not classified as a Weed of National Significance, therefore there is no national strategy for this species.
State Policy:	No State policy exists for *Neurada procumbens.*
SA Arid Lands NRM Policy:	SAAL NRM regional management strategy for *Neurada procumbens* is to MONITOR for any changes in the species weed risk. Aim: To detect any significant changes in *Neurada procumbens* weed risk and monitor the spread of the species and review any changes in weediness.
Marla - Oodnadatta NRM District management strategy:	Marla - Oodnadatta NRM District management strategy for *Neurada procumbens* is to MONITOR for any changes in the species weed risk. Aim: To detect any significant changes in *Neurada procumbens* weed risk and monitor the spread of the species and review any changes in weediness.

Marla - Oodnadatta NRM District Strategy for management of *Neurada procumbens*

Recommended Actions
Support land manager education in identification, monitoring and control of *Neurada procumbens*.
Marla - Oodnadatta NRM District Group to encourage landholders to provide data on distribution of *Neurada procumbens* in Marla - Oodnadatta NRM District to NRSAAL, so that it can be surveyed and mapped.
Monitor distributions of *Neurada procumbens* in Marla - Oodnadatta NRM District over time (through the use of surveillance and mapping) and advise NR SAAL, if species weediness increases.
Marla - Oodnadatta NRM District group to assist in identifying and coordinating *Neurada procumbens* control programs, using current best practice, if the need arises.
Monitor campgrounds for the emergence of *Neurada procumbens* and destroy if found.

Best Practice Control

Control method and description	Best time to control	Active ingredients and example trade names	Herbicide rates and carrier
Foliar Spray			
There are no herbicides registered for use in SA.			
Physical			
Hand pulling or grubbing using a mattock/hoe.	Seedling stage		
If you locate a plant with mature seeds, collect seeds and burn them (e.g. campfire).	Mature plants		

Surveys/ Monitoring

General method:	Keep an eye out for *Neurada procumbens* during routine pastoral management activities, especially along roadsides and on sandy ground, and record locations using a GPS or farm map. Also keep an eye out for it if using campgrounds in the far north of SA or Central Australia.
Best time of year for surveys:	Within 2 months after rainfall event.

Rubber Bush

Common name(s): Rubber Bush, Calotrope, Kapock Tree

Scientific name: Calotropis procera

Plant description: Shrub or small tree to 4 m high. Stems with soft thick corky bark. Leaves grey-green, 5–20 cm long, 4–15 cm wide, lower leaf surface densely covered in short white hairs; base of leaf heart-shaped and stem-clasping; on leaf stalk to 0.4 cm long. Fruit a grey-green pod, splitting to release seeds. Seeds numerous, ovate, flattened, brown, ending in a tuft of white silky hairs.

Distinguished by milky latex; leaves ovate, thickened, opposite with each successive pair at right angles to the previous pair, hair-like glands at base of leaf; flowers with sepals 7–8 mm long; corolla 2–3 cm wide, white with purple tips internally; fruit ovoid, inflated, 8–12 cm long and almost as wide.

Photo 35: Rubber Bush in flower (Photo nretas.nt.gov.au)

Photo 36: Rubber Bush (Photo nretas.nt.gov.au)

Flowering: Winter

Origin: Native to tropical Africa and Asia

When introduced: In the early 1900s.

Why introduced: It was probably introduced to Australia as a garden plant, or in the packaging of camel saddles brought from India.

Other information: Rubber Bush is most abundant on disturbed sandy sites such as dunes, periodically flooded areas (sandy water courses/river flats), roadsides and sparsely vegetated arid and semi-arid grassland.

Threats and Impacts

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

Impacts Reduces grazing potential, water access and hinders mustering. Very toxic to humans and cattle. Can form dense thickets which compete with native plant species and transform the make-up of grassland plant communities (Smith 2002).

Persistence	Mainly spread by seed that is transported by wind and water but also locally by suckering from the roots. Seed may also be dispersed in mud sticking to animals and vehicles (Parsons & Cuthbertson 2001).

Distribution

Current Australian distribution:	Rubber Bush is widespread in northern Australia from tropical monsoon areas with annual rainfall over 1000mm,, south to arid areas with average rainfall as low as 150mm. Found in WA, NT, Qld and northern SA.
Current South Australian distribution:	Rubber Bush has been found in the Marla, Stony Plains and Great Victoria Desert regions.
Current District distribution:	Rubber Bush has been found in the Marla, Stony Plains and Great Victoria Desert regions.
Potential distribution:	This species could potentially inhabit the northern half of Australia, especially in sandy areas and flood-out zones. In SA, potential distribution could include the sandy areas throughout the Marla – Oodnadatta and Marree – Innamincka NRM Regions.

Policy

National Strategy:	Rubber Bush is not classified as a Weed of National Significance, therefore there is no National Strategy for this species.
State Policy:	No State policy exists for Rubber Bush.
SA Arid Lands NRM Policy:	SAAL NRM regional management strategy for Rubber Bush is to MONITOR for any changes in the species weed risk. Aim: To detect any significant changes in Rubber Bush weed risk and monitor the spread of the species and review any changes in weediness.
Marla - Oodnadatta NRM District management strategy	Marla - Oodnadatta NRM District management strategy for Rubber Bush is to MONITOR for any changes in the species weed risk. Aim: To detect any significant changes in Rubber Bush weed risk and monitor the spread of the species and review any changes in weediness.

Marla - Oodnadatta NRM District Strategy for management of Rubber Bush

Recommended Actions
Support land manager education in identification, monitoring and control of Rubber Bush.
Marla - Oodnadatta NRM District Group to encourage landholders to provide data on distribution of Rubber Bush in Marla - Oodnadatta NRM District to NRSAAL, so that it can be surveyed and mapped.
Monitor distributions of Rubber Bush in Marla - Oodnadatta NRM District over time (through the use of surveillance and mapping) and advise NR SAAL, if species weediness increases.
Marla - Oodnadatta NRM District group to assist in identifying and coordinating Rubber Bush control programs, using current best practice, if the need arises.
Land managers encouraged to control Rubber Bush, where key sites are threatened.
Land managers are encouraged to monitor success, following control of Rubber Bush, and carry out follow up control as necessary.

Best Practice Control

Control method and description
Foliar Spray
No herbicide currently registered for use in SA.
Cut stump
No herbicide currently registered for use in SA.
Basal bark
No herbicide currently registered for use in SA.
Physical
Roots are large and spongy; new plants quickly grow from the large taproot if cut off at ground level. Machinery capable of cutting plants off 10 to 20 cm below ground (such as blade ploughs or cutter bars) can cause high kill rates. However, with mechanical disturbance large scale seedling regrowth should be expected afterwards.

Surveys/ Monitoring

General method:	Keep an eye out for Rubber Bush during routine pastoral management activities, especially along drainage lines, and record locations using a GPS or farm map.
Best time of year for surveys:	Winter through to late spring.

Ward's Weed

Common name(s): Ward's Weed

Scientific name: Carrichtera annua

Plant description: Erect annual herb to 40 (rarely to 60) cm high. Plants branched mostly from the base. Leaves pinnately lobed and to 10 cm long. Fruit opening at maturity to release seeds; containing 3–4 seeds per chamber of lower segment; on a stalk about 3 mm long. Seeds globe-shaped, 1–1.5mm long, compressed, dark brown. (Weeds Australia – Weed Identification)

Photo 37: Ward's Weed (Photo David Albrecht, Biosecurity Queensland)

Photo 38: Ward's Weed in flower (Photo Rob and Fiona Richardson, Biosecurity Queensland)

Flowering: Winter and spring

Origin: Native of northern Africa, Asia (Mediterranean to Iran) and southern Europe.

When introduced: In the early 1900s at Port Pirie.

Why introduced: Accidentally, probably in agricultural seed.

Threats and Impacts

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

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

Persistence Ward's Weed can produce 30,000 seeds/m^2 annually. This species has two distinct seed banks – a pod seed bank, where seed is held in pods on dead plants between growing seasons and a soil seed bank, where the seed is dropped and a sticky coating on the seed helps it adhere to the soil (Cooke et. Al., 2003). The two types of seed bank gives the species the best chance of prevailing the following season. Persistence is also aided by the low palatability of the plant.

Distribution

Current Australian distribution: Ward's Weed is found across southern Australia in WA, SA, NSW and Vic. Ward's Weed is well-suited to areas with winter-dominated rainfall and mild winter temperatures and calcareous soils. (Cooke et. Al., 2003)

Current South Australian distribution: Wards Weed is found mainly in the southern half of SA. It is also quite widespread in the North East Pastoral, North Flinders, Kingoonya and Gawler Ranges Districts of the SA Arid Lands. There are some minor incursions in the north of the State.

Current District distribution: Ward's Weed incursions have been reported around Coober Pedy and in isolated patches along the Stuart Highway and Adelaide to Alice Springs rail corridor.

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

Policy

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

State Policy: No State policy exists for Ward's Weed.

SA Arid Lands NRM Policy: SAAL NRM regional management strategy for Ward's Weed is LIMITED ACTION

Aim: Ward's Weed would only be targeted for coordinated control in the management area if its local presence makes it likely to spread to land uses where it ranks as a higher priority.

Marla - Oodnadatta NRM District management strategy Marla - Oodnadatta NRM District management strategy for Ward's Weed is to MANAGE SITES

Aim: To maintain the overall economic, environmental and/or social value of key sites/assets through improved management of Wards Weed.

Marla - Oodnadatta NRM District Strategy for management of Ward's Weed

Recommended Actions
Support land manager education in identification, monitoring and control of Ward's Weed.
Marla - Oodnadatta NRM District Group to encourage landholders to provide data on distribution of Ward's Weed in Marla - Oodnadatta NRM District to NRSAAL, so that it can be surveyed and mapped.
Marla - Oodnadatta NRM District group to provide input into identification of key sites requiring control of Ward's Weed.
Marla - Oodnadatta NRM District group to assist in identifying and coordinating Ward's Weed control programs using integrated weed management (combination of recommended best practices), especially in areas where key sites are threatened.
Land managers are encouraged to monitor success, following control of Ward's Weed, 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
Foliar Spray			
Lower rate for seedlings and higher rate for plants over 10cm tall. Always add Glyphosate at the recommended label rates. Weeds must be actively growing and not under stress from low moisture, frost, cold, disease or water logging. If grazing has occurred, allow regrowth to 6-8cm before spraying and use the higher rate.	Autumn to spring	2,4-D (300g/L) e.g. 2,4-D IPA 300 + Glyphosate (450g/L) e.g. Glyphosate CT	1.2L – 1.8L + 1L/100L water+ penetrant e.g. Pulse®
Physical			
Manual removal is effective but must be done at least every 8-10 weeks. Once pods are formed, seed will often mature even if the plant has been uprooted. Soil disturbance often leads to a flush of seedlings. Due to being unpalatable, grazing is not really a feasible means of controlling Wards Weed.			

Surveys/ Monitoring

General method: Keep an eye out for Wards Weed during routine pastoral management activities and record locations using a GPS or farm map.

Best time of year for surveys: Winter through to late spring.

Appendix 1 – Alert Weeds

The weeds identified in this section have not been sighted in the Marla – Oodnadatta 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 Marla – Oodnadatta District please contact Natural Resources SA Arid Lands immediately and report the location. The Coober Pedy Office is located at Unit 7a, Lot 24/25 Hutchinson St. Contact details are: Ph. 8672 3648. Alternatively you can contact the Sustainable Landscapes Officer on 8648 5194 or 0417 738 498.

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 39: African Rue plant (Photo B. Shepherd)

Photo 40: African Rue flowers (Photo 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 and colic and also 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:

There are no known infestations of African Rue in the Marla - Oodnadatta District.

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. Potential distribution is possible in areas with annual average rainfall of 175mm and 350mm.

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:

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.
North East Pastoral NRM District management strategy:	Marla - Oodnadatta NRM District management strategy is ALERT for African Rue Aim: Entry into the region should be prevented – any African Rue found during monitoring should be reported and destroyed.

Marla - Oodnadatta NRM District Strategy for management of African Rue

Recommended Actions
Support land manager education in identification, monitoring and control of African Rue.
Occurrences of African Rue in Marla - Oodnadatta NRM District to be surveyed, mapped and reported to NR SAAL immediately.
Identify current distributions of African Rue in neighbouring NRM regions/districts and ascertain possible pathways of entry into Marla - Oodnadatta NRM District.
Destruction of all infestations, as they are detected, aiming for local eradication.
Land managers are 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 prevented within Marla - Oodnadatta NRM District.

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. 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. Increasing competition from native plants, by reducing grazing pressure from stock, rabbits and kangaroos in areas where African Rue is present will provide long term suppression and reduce its proliferation.	When actively growing, before flower.	Glyphosate (450g/L) e.g. Roundup®	1L/100L water + penetrant e.g. Pulse®
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:	Any time of year and especially 2-3 weeks after rainfall.

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 41: Innocent Weed plant (Photo A Harvey)

Photo 42: 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* species. 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 doesn't establish well in pastures, particularly when there are competitive pasture species present. 'Burrs' lying on the soil surface don't 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 dry land areas and in urban areas.

Current District distribution:

There are no known infestations of Innocent Weed in the Marla - Oodnadatta 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 the further spread of Innocent Weed distribution within susceptible land uses throughout SA.

Objectives:

- Destroy high priority infestations of Innocent Weed including incursions in previously uninfested areas.
- Contain all established infestations.
- Prevent the reinfestation of areas cleared of Innocent Weed.

Implementation:

- NRM authorities to ensure all infestations on roadsides, public or private land are contained.
- NRM authorities to monitor areas identified as high risk for stock, produce and vehicle contamination. Examples may include parking bays, campgrounds, stock sale yards and roadhouses.
- NRM authorities to ensure compliance by landholders of restriction of movement of contaminated produce, livestock, and vehicles from infested areas.

SA Arid Lands NRM Policy:

SAAL NRM regional management strategy for Innocent Weed is to MONITOR for any changes in the species weed risk.

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

Marla - Oodnadatta NRM District management strategy:	Marla - Oodnadatta NRM District management strategy is ALERT for Innocent Weed Aim: Entry into the region should be prevented – any Innocent Weed found through monitoring should be reported and destroyed.

Marla - Oodnadatta 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 Marla - Oodnadatta 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 Marla - Oodnadatta 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 Marla - Oodnadatta 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. Within 1 week after rain, prior to seed set, grub the plant(s) out of the ground.	Within 1 week after summer rain		

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.

Noogoora Burr

Common name(s): Noogoora Burr

Scientific name: Xanthium strumarium sp. agg.

Plant description: A single or multi stemmed herb growing up to 2m high. Its stems are hairy but without spines.

The leaves are broad-ovate to triangular, 50-150mm wide, 3 or 5 lobed, with a lobed base and toothed margins. The upper leaf surface is darker green than the under surface and prominently 3-veined with purplish veins. The leaf stalk (petiole) is 20-120 mm long (modified from Cross et al., unpublished).

The flowers are unisexual with separate male and female flowers on the same plant. The cream or creamy green male flowers are clustered at the end of the branches, or in the upper leaf axils while the yellowish green to brown female flower heads occur in the leaf junctions.

The burrs are ellipsoid, 15-25 mm long, with glandular & non-glandular hairs, covered with numerous hooked spines and with 2 longer stout and straight spines (or 'beaks'). Two seeds formed in each burr, one larger than the other (modified from Cross et al., unpublished).

Photo 43: Noogoora Burr with seed pods (Photo depi.vic.gov.au)

Photo 44: Dry Noogoora Burrs' on plant (Photo lrm.nt.gov.au)

Flowering: Seeds may germinate in response to late spring/summer rain. Flowering occurs from mid-summer to autumn with burrs forming from February to May.

Origin: North America

When introduced: 1860's into Australia. Recorded in South Australia in 1916 and eradicated, but reinfested in 1959 when large numbers or sheep were imported that had Noogoora Burr in their wool.

Why introduced: Probably introduced to Australia at Noogoora station, in Queensland, in the 1860's as a contaminant of cotton seed.

Other information: Noogoora Burr, Xanthium strumarium is a group of species including X. occidentale (Noogoora Burr) and X. californicum (Californian burr). Both weeds are annual plants that have been introduced from North America. They are very similar in appearance and ecology and can be described together.

Threats and Impacts

Invasiveness

Large dense infestations are dependent on periodic wet summers. The seed must be in good contact with water to germinate. Low temperatures are lethal to Noogoora Burr.

Noogoora Burr is dispersed by burrs attached to stock, and also along watercourses by floodwaters. To establish it requires a year with summer rains to provide adequate water to break seed dormancy.

Impacts

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

Although Noogoora Burr seedlings are poisonous, the main toxin (carboxyatratyloside) is found only in the cotyledons. Cases of stock poisoning are very rare in Australia.

Noogoora Burr competes strongly with pastures due to its extensive root system and rapid growth.

Persistence

In SA, most infestations of the Noogoora Burr group have been eradicated easily. This is probably due to unsuitable environments or by controlling the few plants surviving after many dry years.

There are few areas of SA suitable for Noogoora Burrs to persist. In the pastoral lands, these areas are often the most productive, as they are the accumulation areas for runoff.

There are 2 seed in each burr and the upper one germinates in the following season while the lower one remains dormant for 2 or more years. It has several types of dormancy (enforced, innate and induced) making control difficult.

Distribution

Current Australian distribution:

Noogoora Burr is widespread throughout most parts of New South Wales and Queensland, extending across into the Northern Territory, particularly around the Katherine, Daly Waters and Darwin regions and also the river systems flowing into the Gulf of Carpentaria. A few collections have been recorded from around the Alice Springs region. It also has a scattered distribution through northern Victoria and eastern South Australia, particularly around the Murray River and some tributaries. A few infestations have been recorded from the Kimberley region and the Perth region of Western Australia. One infestation was recorded in Tasmania but has since been eradicated (Parsons & Cuthbertson 1992; AVH 2007).

Current South Australian distribution:

Two species of the Xanthium strumarium complex are known to occur in SA.

The Californian burr (Xanthium californicum) is distributed along the River Murray from the Victorian border to Swan Reach, with occasional plants and small patches downstream from Swan Reach. It is also established on the Gawler River.

The true Noogoora Burr (Xanthium occidentale) is also found with Californian burr adjacent to the River Murray from Lyrup ferry upstream to the Victorian/NSW border. Other areas include 5500 ha at Kallioota Swamp on Lake Torrens, small isolated infestations along the Coopers Creek system, and in the Mingary-Cockburn area.

Occasional plants are found throughout the state, especially adjacent to dams, waterholes, saleyards, transport depots and stock holding areas.

Current District distribution:

There are no known populations of Noogoora Burr in the Marla – Oodnadatta District.

Potential distribution

In South Australia, suitable habitats are restricted to wetlands adjacent rivers, some flood irrigation areas, drains, creeks and flood outs, which may be inundated during summer.

Policy

National Strategy: Noogoora Burr is not classified as a Weed of National Significance, therefore there is no national strategy for this species.

State Policy: For Grazing Rangelands the State Policy is to Monitor.

Under the *Natural Resources Management Act*, 2004:

- Prohibiting entry to area of Noogoora Burr.
- Prohibiting movement of Noogoora Burr on public roads.
- Prohibiting sale of Noogoora Burr, or produce or goods carrying Noogoora Burr.
- Requiring notification of Noogoora Burr infestations to NRM authorities.
- Requiring landholders to control Noogoora Burr on their properties.
- Allowing recovery of control costs on adjoining road reserves of Noogoora Burr.

SA Arid Lands NRM Policy: SAAL NRM regional management strategy for Noogoora Burr is to MONITOR for any changes in the species weed risk.

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

Marla - Oodnadatta NRM District management strategy Marla - Oodnadatta NRM District management strategy for Noogoora Burr is ALERT

Aim: Entry into the region should be prevented – any Noogoora Burr found through monitoring should be reported and destroyed.

Marla - Oodnadatta NRM District Strategy for management of Noogoora Burr

Recommended Actions

Support land manager education in identification, monitoring and control of Noogoora Burr.

Occurrences of Noogoora Burr in Marla - Oodnadatta NRM District to be surveyed, mapped and reported to NR SAAL immediately.

Identify current distributions of Noogoora Burr in neighbouring NRM regions/districts and ascertain possible pathways of entry in to Marla - Oodnadatta NRM District.

Destruction of all infestations, as they are detected, aiming for local eradication.

Land managers are encouraged to monitor success, following control of Noogoora Burr, and carry out follow up control as necessary.

Sale and movement of Noogoora Burr to be prevented within Marla - Oodnadatta 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			
Spot spray - Hormone type treatment – use with caution near sensitive crops. Refer to drift warnings on label. Spray seedlings only.	When actively growing and before flower and burr formation.	2,4-D amine (625g/L) e.g. 2,4-D Amine 625	17-22ml/10L water + Surfactant e.g. Pulse®
Spot spray – **Do not add surfactants** if using near aquatic areas. Suitable for use near waterways – refer to label. Non-selective, avoid contact with desirable plants.	When actively growing and before flower and burr formation.	Glyphosate bioactive (360g/kg) e.g. Roundup Biactive®	1L/100L water

Control method and description	Best time to control	Active ingredients and example trade names	Herbicide rates and carrier
Boom spray - Non-selective, avoid contact with desirable plants. Fallow or prior to planting a crop or pasture.	When actively growing and before flower and burr formation.	Glyphosate (450g/L) e.g. Roundup®	1.5-2.5L/ha + Surfactant e.g. Pulse®
Spot spray - Non-selective, avoid contact with desirable plants. Soil active herbicide, may damage desirable vegetation.	When actively growing and before flower and burr formation.	Glyphosate (450g/L) + metsulfuron-methyl (600g/L) e.g. Roundup® + Ally	1L + 7g/100L water + Surfactant e.g. Pulse®
Spot spray - Hormone type treatment – use with caution near sensitive crops. Refer to drift warnings on label. Grass pastures. Use higher rate on late flowering or larger plants.	When actively growing and before flower and burr formation.	MCPA (340g/L) + dicamba (80g/L) e.g. Banvil®M	190-270ml/100L water
Physical			
Seedlings and individual plants can often be pulled up by hand (In large infestations this may not be practical). Manual hoeing or slashing should occur before burr formation. Plants with burrs should be collected and burned.			

Surveys/ Monitoring

General method: Keep an eye out for Noogoora Burr during routine pastoral management activities, especially along drainage lines, and record locations using a GPS or farm map.

Best time of year for surveys: Summer through to late autumn, especially after summer rains.

Parkinsonia

Common name(s): Parkinsonia

Scientific name: *Parkinsonia aculeate*

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 45: Parkinsonia tree (Photo B Shepherd)

Photo 46: The bright yellow flowers of Parkinsonia (Photo B Shepherd)

Photo 47: 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.

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 Ranges, around Woomera and Port Augusta. All these occurrences are small populations (2-10 plants). Historically there have been more occurrences recorded within gardens, however all of these have been successfully controlled.

Current District distribution: There are no known populations of Parkinsonia in the Marla – Oodnadatta District.

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

Policy

National Strategy: Parkinsonia is a Weed of National Significance (WONS). The National Strategy states: 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 Parkinsonia is to CONTAIN SPREAD.

Aim: To prevent spread through control of all infestations.

Marla - Oodnadatta NRM District management strategy:	Marla - Oodnadatta 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.

Marla - Oodnadatta 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 Marla - Oodnadatta NRM District.

Infestations of all Parkinsonia in the Marla - Oodnadatta 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 Marla - Oodnadatta 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 1.5m 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

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.

Prickly Acacia

Common name(s): Prickly Acacia

Scientific name: *Acacia nilotica*

Plant description: Prickly Acacia is a deep-rooted thorny shrub or small tree that usually grows to 5 m but occasionally to 10 m. The tree has an umbrella-shaped canopy and is usually single-stemmed but may be multi-stemmed at the base, particularly if damaged by fire or frost.

Bark on the saplings often has an orange and/or green tinge. Mature trees have a rough, brown to black bark. The tree has a very deep taproot and several branching lateral roots close to the soil surface.

Leaves are finely divided and fern-like with pairs of stout thorns growing at the base.

The flowers, which are ball-shaped, golden-yellow and about 1 cm across, grow on the stems with two to six flowers per group. The grey-green pods are a very good distinguishing feature—they are flat, 6–25 cm long, with narrow constrictions between the seeds. They usually contain 8–15 brown, rounded seeds with a very hard seed coat.

Photo 48: Prickly Acacia beside creek in Northeast South Australia (Photo: DEWNR)

Photo 49: Prickly Acacia seed pods are distinctly constricted between seeds (Photo: DAFF, Qld)

Photo 50: Flowers with spines protruding from base (Photo: DAFF, Qld)

Photo 51: Prickly Acacia in full fruit near Hughenden, Qld (Photo: Weed Management Guide, CRC)

Flowering: Autumn and winter

Origin: Southern Asia Minor to Burma

When introduced: Introduced to Queensland in 1890's

Why introduced: Shade and fodder

Other information: During a good season one tree can produce 175,000 seeds.

Threats and Impacts

Invasiveness

Prickly Acacia can spread readily and grow quickly. It often forms thorny thickets. Seeds sprout readily and plants grow rapidly. It does well in dry localities and on loamy or sandy soils, forming thickets and spreading along watercourses.

Seeds are primarily dispersed when livestock and feral animals eat the fruit and pass the seeds intact. Seeds may also be dispersed along water courses, when they are flowing.

Impacts

The thorny thickets cause considerable nuisance during mustering and can also hinder stock access to water. Infestations can drastically alter the ecological balance of grasslands and threaten biodiversity. The thorns may also cause eye injuries to stock and native fauna. The thickets may provide harbour for rabbits. Biodiversity issues exist with native species being out-competed and becoming displaced.

Persistence

Prickly Acacia withstands drought well, is readily eaten by stock, and has good regrowth after grazing. It reproduces by seed, and also produces suckers when its above-ground parts are damaged. The hard coating on the seeds allows them to persist in the environment for a long time and they don't all germinate at the same time.

Distribution

Current Australian distribution:

Over 6.6 million ha of arid and semi-arid land in central and western Queensland is infested with Prickly Acacia. Smaller infestations have also been found in central eastern Queensland, the Barkly Tablelands and Arnhem Land in NT, north-east SA and the south-eastern Kimberley Ranges in WA.

Current South Australian distribution:

Recorded infestation on Cordillo Downs that was initially treated in 2010.

Current District distribution:

There are no known infestations of Prickly Acacia in the Marla – Oodnadatta District.

Potential distribution:

Prickly Acacia has the potential to invade most of northern Australia, including the majority of Queensland and the Northern Territory and a significant area of Western Australia. The Channel Country in north-eastern South Australia is also potentially at risk.

Policy

National Strategy:

Prickly Acacia is a weed of national significance (WONS). The National Strategy states: Prickly Acacia is eradicated outside of core infestations within Queensland and national impacts reduced to a minimum.

State Policy:

To protect the northern rangelands and their native vegetation from invasion by Prickly Acacia.

Under the *Natural Resources Management Act*, 2004:

- Prohibiting sale of Prickly Acacia or of goods contaminated with the plant (Statewide); and
- Landowners are required to destroy the plant on their properties (SA Arid Lands NRM region).

SA Arid Lands NRM Policy:	SAAL NRM regional management strategy for Prickly Acacia is to DESTROY INFESTATIONS Aim: To significantly reduce the extent of Prickly Acacia in the SA Arid Lands.
Marla - Oodnadatta NRM District management strategy:	Marla - Oodnadatta NRM District management strategy for Prickly Acacia is ALERT Aim: Entry into the region should be prevented – any Prickly Acacia found through monitoring should be reported and destroyed.

Marla - Oodnadatta NRM District Strategy for management of Prickly Acacia

Recommended Actions
Support land manager education in identification, monitoring and control of Prickly Acacia.
Identify current distributions of Prickly Acacia in neighbouring NRM regions/districts and ascertain possible pathways of entry into Marla - Oodnadatta NRM District.
Infestations of all Prickly Acacia in the Marla - Oodnadatta 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 Prickly Acacia, and carry out follow up control as necessary.
Sale and movement of Prickly Acacia to be prevented within Marla - Oodnadatta NRM District.
Must not grow.

Best Practice Control

Control method and description	**Best time to control**	**Active ingredients and example trade names**	**Herbicide rates and carrier**
Cut stump			
Cut trunk off horizontally as close to the ground as possible. Immediately, within 15 seconds, swab cut surface with herbicide mixture. On organic properties, where scattered trees are not near water, tree guards, made from star droppers and chicken wire, can be put around each stump. Barbed wire can be threaded through the top of tree guards to prevent any access (by cattle) to the treated stump.	Any time of year	Triclopyr (240 g/L) + Picloram (120 g/L) e.g. *Access*®	17 ml/L diesel (solvent included in chemical – Liquid Hydrocarbon 389g/L)
Basal bark			
For stems up to 10 cm basal diameter, carefully spray completely around base of plant to a height of 30 cm above ground level. Thoroughly spray into all crevices. Larger trees may be controlled by spraying to a greater height, up to 100 cm above ground level.	Autumn, when plants are actively growing (providing summer rains have occurred).	Triclopyr (240 g/L) + Picloram (120 g/L) e.g. *Access*®	17 ml/L diesel (solvent included in chemical – Liquid Hydrocarbon 389g/L)
Foliar spray			
Useful when plants are smaller than 2 m. Spray the entire plant with the recommended herbicide mix.	Any time of year – best when actively growing.	Triclopyr (600 g/L) e.g. *Garlon*®	16 to 32 mls/10L 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 suitably sized bull dozer or loader.
Roots must be cut about 30-50 cm below the soil surface to reduce the incidence of regrowth. This is best done with a blade plough.
Branch and root fragments of Prickly Acacia can take root, therefore woody material must be moved out of creek lines and moist areas.
Ongoing inspections and hand-pulling of seedlings will additionally be required, where recruitment is occurring, until the seedbank is exhausted.
Subject to fire restrictions, controlled burning (minimum 2 subsequent burns) can also be effective.

Surveys/ Monitoring

General method:	Keep an eye out for Prickly Acacia during routine pastoral management activities, especially along drainage lines, and record locations using a GPS or farm map.
Best time of year for surveys:	Autumn to winter, when plants are flowering.

Appendix 2 – Other weeds of interest

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

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

Photo 53: 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 no known populations of Onion Weed in the Marla – Oodnadatta 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 is currently being 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.
Marla - Oodnadatta NRM District management strategy	Marla - Oodnadatta 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.

Marla - Oodnadatta 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 Marla - Oodnadatta 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 incursions in the Marla - Oodnadatta 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

Saffron Thistle

Common name(s): Saffron Thistle

Scientific name: *Carthamus lanatus Linnaeus*

Plant description: Erect annual thistle to 1 (rarely to 1.5) m high. Stems ribbed, branched above, hairless to downy. Leaves variable; basal leaves in a rosette, lanceolate, initially with few lobes but older leaves more dissected, to 20 cm long and to 5 cm wide; stem leaves to 11 cm long and to 5 cm wide, usually hairless but some plants with hairy leaves, base stem-clasping and not on a leaf stalk. Seeds ovoid, grey-brown.

Distinguished by stems round in cross-section; leaves lanceolate and similar bracts around flower heads, deeply toothed with lobes ending in spines; all flowers within heads tubular and yellow; seeds 4–6 mm long, about 3 mm wide, hairless, 4-angled, apex with linear scales to 1 cm long.

Yellow flowers in solitary heads to 2 cm wide surrounded by spiny bracts (involucral bracts) to 5 cm long. Heads made up of small flowers (florets) to 3 cm long.

Photo 54: Saffron Thistle in head (Photo depi.vic.gov.au)

Photo 55: Saffron Thistle rosette (Photo depi.vic.gov.au)

Flowering: Late spring to autumn

Origin: Southern Europe and Mediterranean to central Asia

When introduced: 1860 into SA

Why introduced: Unknown

Other information:

Threats and Impacts

Invasiveness Saffron Thistle often grows on disturbed sites of low fertility in areas receiving 300 to 600 mm of annual rainfall. It tolerates low nutrient concentrations better than any other thistle. Establishment is most likely in areas that have been over grazed or affected by drought (Parsons & Cuthbertson 2001).

Spread by seed. Matures with cereal crops and seed is harvested with the grain (can be spread in hay bales). Hardy weed of cultivation that displaces more useful species in poor pasture.

Impacts	Arguably the most widespread thistle in Australia. Only considered an important weed in Australia. The spines contaminate wool, and make handling contaminated sheep painful. In dense patches restricts stock movement.
Persistence	Seed buried in the soil can survive for over 10 years but rarely germinates at depths below 5 cm. Most seed germinates within 3 years of release but the seed has complex dormancy characteristics.

Distribution

Current Australian distribution:	ACT, NSW, Southern NT, Southern QLD, SA, VIC, Southern WA and small areas on pastoral land in Tasmania.
Current South Australian distribution:	Eyre Peninsula, Murray Mallee, Yorke Peninsula, Mid-North, Riverland, Flinders Ranges, South East and a few patches along Stuart Highway in northern SA.
Current District distribution:	A few patches along Stuart Highway around Marla Bore.
Potential distribution:	In areas where average annual rainfall is below 300mm Saffron Thistle is unlikely to spread. More of a problem in southern and eastern Australia.

Policy

National Strategy:	Saffron Thistle is not classified as a Weed of National Significance, therefore there is no National Strategy for this species.
State Policy:	Saffron Thistle is not declared, and no sections of the Natural Resources Management Act, 2004 apply to it.
SA Arid Lands NRM Policy:	SAAL NRM regional management strategy for Saffron Thistle is LIMITED ACTION Aim: Saffron Thistle would only be targeted for coordinated control in the management area if its local presence makes it likely to spread to land uses where it ranks as a higher priority.
Marla - Oodnadatta NRM District management strategy	Marla - Oodnadatta NRM District management strategy for Saffron Thistle is LIMITED ACTION Aim: Saffron Thistle would only be targeted for coordinated control in the management area if its local presence makes it likely to spread to land uses where it ranks as a higher priority.

Marla - Oodnadatta NRM District Strategy for management of Saffron Thistle

Recommended Actions
Support land manager education in identification and monitoring of Saffron Thistle.
Occurrences of Saffron Thistle in Marla - Oodnadatta NRM District to be surveyed, mapped and reported to NR SA Arid Lands.
Land managers may use physical recommendations outlined below to address any Saffron Thistle incursions in the Marla - Oodnadatta 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			
Spot spraying with a knap sack or quad/ute mounted spray unit can be used Spray the entire plant with the recommended herbicide mix.	While actively growing	Glyphosate (450g/L) e.g. Roundup®	1L/100L water + Surfactant e.g. Pulse®
Hormone type treatment – use with caution near sensitive crops. Refer to drift warnings on label. Pastures and non-cropping areas. Spray young plants.	On plants up to budding stage.	2,4-D Amine (625g/L) e.g. 2,4-D Amine 625	Check label
Physical			
Slashing can be effective if done before flowering and repeated as necessary.			

Surveys/ Monitoring

General method: Keep an eye out for Saffron Thistle during routine pastoral management activities and record locations using a GPS or farm map.

Best time of year for surveys: Late spring through to late autumn.

Thornapple

Common name(s): Common Thornapple

Scientific name: Datura stramonium

Plant description: Annual herb to 1.5 m high. Leaves 8–36 cm long, ovate to rhombic, margins deeply lobed, lobe margins coarsely toothed to undulate. Capsule ovoid, 2–4.5 cm long.

Distinguished by hairless or sparsely hairy stems; white to lavender flowers, 6–10 cm long, stigma below to above anthers; erect spiny capsule, with over 100 spines of variable length, on a straight stalk; seeds black or grey, pitted, 2.5–4.5 mm long.

Trumpet-shaped and 5-lobed, surrounded at base by sepals 3–5.5 cm long.

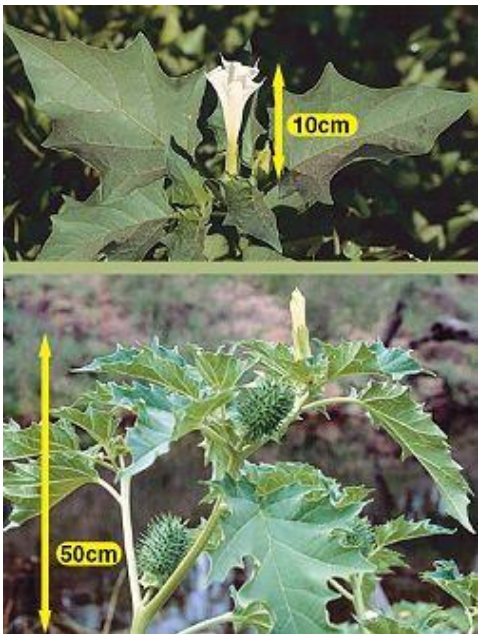

Photo 56: (above) Thornapple in flower, (below) Thornapple in fruit (Photo weeds.org.au)

Flowering: Spring through autumn

Origin: Probably native of the USA and Mexico.

When introduced: Introduced to Australia in early 1800s.

Why introduced: Accidently as a contaminant of agricultural seeds.

Threats and Impacts

Invasiveness Weed of disturbed areas and and along creek beds in semi-arid native pastures.

Impacts All parts of the plant, particularly seeds, are toxic to livestock and humans. Rank smell and bitter taste usually deter stock from grazing plants. The plant known as *Datura tatula* is a purple flowered form of *Datura stramonium*.

Persistence Up to 30,000 seeds have been recorded from one plant. Seeds may remain dormant for many years.

Distribution

Current Australian distribution:	Naturalised in all States in Australia.
Current South Australian distribution:	Mt Lofty Ranges, lower Eyre Peninsula, Fleurieu Peninsula, North East Pastoral, Flinders and Gammon Ranges. Outliers along Stuart Highway. I
Current District distribution:	Coober Pedy township and few patches along Stuart Highway.
Potential distribution:	Already naturalised in many areas of Australia. Mainly establishes in disturbed ground.

Policy

National Strategy:	Common Thornapple is not classified as a Weed of National Significance, therefore there is no National Strategy for this species.
State Policy:	Common Thornapple is not declared, and no sections of the Natural Resources Management Act, 2004 apply to it.
SA Arid Lands NRM Policy:	SAAL NRM regional management strategy for Common Thornapple is LIMITED ACTION Aim: 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.
Marla - Oodnadatta NRM District management strategy	Marla - Oodnadatta NRM District management strategy for Common Thornapple is LIMITED ACTION Aim: 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.

Marla - Oodnadatta NRM District Strategy for management of Common Thornapple

Recommended Actions
Support land manager education in identification and monitoring of Common Thornapple.
Occurrences of Common Thornapple in Marla - Oodnadatta NRM District to be surveyed, mapped and reported to NR SA Arid Lands.
Land managers may use physical recommendations outlined below to address any Common Thornapple incursions in the Marla - Oodnadatta NRM District.

Best Practice Control

Control method and description
Foliar Spray
No herbicide currently registered for use in SA.
Physical
Mechanical removal of Common Thornapple is effective for small infestations. May be grubbed out.

Surveys/ Monitoring

General method:	Keep an eye out for Common Thornapple during routine pastoral management activities, especially along drainage lines, and record locations using a GPS or farm map.
Best time of year for surveys:	Late spring through to late autumn.

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