

## Evidence on Listing Eligibility and Conservation Actions 2017

### *Livistona mariae* subsp. *mariae* (F.Muell.) (Central Australian Cabbage Palm)

**Current EPBC Act status:** Vulnerable

**Current TPWC Act status:** Endangered (B1ab(iii)+B2ab(iii))

**Proposed Action:** Change of status

**Nominated Status:** Endangered (B1ab(iii) + B2ab(iii))

#### **Taxonomy**

Scientific name:	<i>Livistona mariae</i> subsp. <i>mariae</i> (F.Muell.)		
Common name:	Red Cabbage Palm, Palm Valley Palm, Central Australian Cabbage Palm		
Family name:	ARECACEAE	Fauna <input type="checkbox"/>	Flora <input checked="" type="checkbox"/>

A paper by Kondo et al (2012) proposed the abolition of the subspecies *L.m.mariae* and *L.m.rigida* into the single species *L. mariae*. This is not the current treatment used by the Northern Territory Herbarium, where the subspecies are retained. If no subspecific differentiation is recognised, the Central Australian form should be treated as an isolated population as there are clear morphological differences between the two, as well as the extreme geographic disjunction and hence genetic isolation.

#### **Species Information**

##### **Description**

*Livistona mariae* subsp. *mariae* (Dowe & Jones 2004) is a tall fan palm to 25-30 m high. The trunk is 30-40 cm diameter: the base having prominent petiole stubs and the upper parts being smooth grey. Leaves: 30-50 in a dense crown, glossy above and waxy below with marginal thorns. New juveniles leaves are tinged red. Flower spikes with sprigs of greenish-cream flowers. Fruit is black, globose and 1-seeded.

##### **Distribution**

*Livistona mariae* subsp. *mariae* is endemic to the southern region of the Northern Territory (NT). It is the only palm occurring in central Australia, and is separated by c. 1 000 km from any other member of the genus. This species has a highly restricted distribution and is characterised by a few closely distributed, small concentrations.

This palm is wholly restricted to the MacDonnell Ranges Bioregion where it is confined to a small portion of the Finke River and its tributaries within a latitudinal range of 35 km and a longitudinal range of 20 km. The extent of occurrence is 275 km<sup>2</sup> and the species occupies an area of less than 50 ha, within an AOO of 40 km<sup>2</sup> (based on 2 km x 2 km grids).

Most of the population occurs in one concentration within Finke Gorge National Park. There are three other occurrences on neighbouring unreserved tenure: two are on Ntaria Aboriginal Land Trust (one to the north of and the other to the west of the park boundary) and the other is at Running Waters on Henbury pastoral station, south of the park. *Livistona mariae* subsp. *mariae* is deemed to occur at four locations given that the potential for primary threatening processes (refer to *Threats* below) to rapidly affect the species in a single event is restricted to each of the separate occurrences mentioned above.

## Adequacy of Survey

Adult palms are easily spotted and identified, including from the air, so the distribution of the population is well described. The population has been sampled on three occasions (1987, 1992, 2008) providing time series data on population size and age-structure. Fourteen permanent plots have been established across the reserved population and population and habitat monitoring is ongoing (see Appendix A).

## Relevant Biology/Ecology

Flowering: May, September, May–December.

Fruiting: May–March.

Three specific habitat requirements are currently known for *L. mariae* subsp. *mariae*:

- permanent ground water discharge;
- protection from flood water scouring; and
- infrequent fire exposure.

This species is concentrated along the Palm Valley gorge floors that are continuously fed by bicarbonate-rich spring waters. The shallow ground water originates from the vast supply of water moving slowly through the Hermannsburg Sandstone formation (Wisconsin *et al.* 2004). The restriction of *L. mariae* subsp. *mariae* to this habitat likely relates to its shallow fibrous root system, forcing its reliance on the presence of a permanent shallow water supply over a continuous area (Latz 1975). While this species also occurs along the sandy beds and banks of the Finke River, it is less closely associated with these habitats possibly because establishing plants are periodically removed by flood waters.

Seeds of the species are probably dispersed by stream flow (Orscheg & Parsons 1996 cited in Kondo *et al.* 2012). Given that the entire *L. mariae* subsp. *mariae* population is confined to a small portion of the Finke River and its tributaries, it is considered that there is sufficient capacity for seed dispersal and genetic exchange throughout the population and, therefore, there are no geographically distinct subpopulations.

The stands are known to have experienced wildfire at least three times in recorded history, but at widely-spaced intervals. Prior to the introduction of Buffel Grass and Couch Grass, frond debris would have been the principal fuel source and this would have been slow-to-accumulate. Existing data suggest high post-fire survivorship in adults and saplings, but seedling and juvenile responses are unknown. It is not known if this species is capable of surviving short-interval, high severity fire.

Population census data indicate that the population has increased in density between 1973 and 2008. These data also show, however, that stand density and structure is highly variable among locations; with some experiencing severe limits on stand replacement.

## Threats

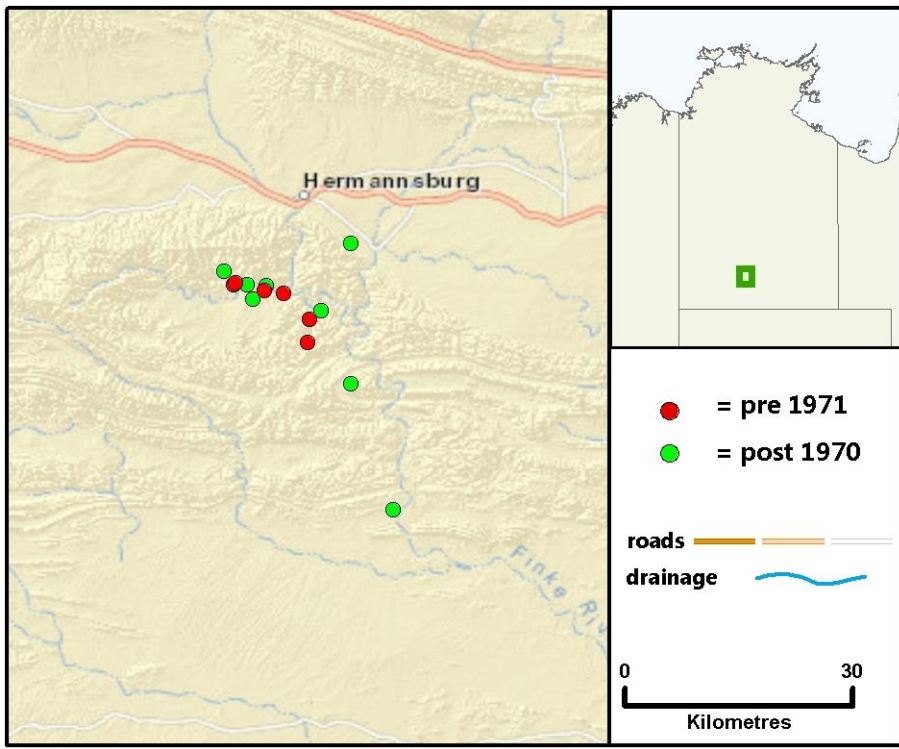
Threat <i>(describe the threat and how it impacts on the species. Specify if the threat is past, current or potential)</i>	Extent <i>(give details of impact on whole species or specific subpopulations)</i>	Potential Impact <i>(what is the level of threat to the conservation of the species)</i>
Resource competition from invasive grasses <i>Cenchrus ciliaris</i> (Buffel Grass) and <i>Cynodon dactylon</i> (Couch Grass) may result in palm recruitment failure. Both grasses form dense stands that dramatically alter microhabitat conditions. The Palm Valley site is badly infested with both Couch and Buffel Grass and the Running Waters site is infested with Couch Grass. Buffel Grass is present at the northern off-park sites. (current and future)	Current threat to entire population.	Medium-High

Increased fire risk as a result of the invasion of Buffel Grass and Couch Grass into its core habitat areas. Both of these invasive species produce large amounts of plant biomass which, when dried, represents a significant increase in site fuel load. This shift may increase the frequency and intensity of fire regimes beyond threshold levels for palm persistence. (current and future)	Current threat to entire population.	Medium-High
Feral horses and cattle are causing habitat degradation at Running Waters. The other off park locations are also potentially threatened by introduced large herbivores including horses, donkeys, cattle and camels. (current)	Varying level of threat across sites; most serious at Running Waters; probably manageable in the larger concentrations on park.	Low-Medium
Visitor impacts: Seedling trampling and other aspects of site degradation such as track erosion, and the spread of weeds and pathogens are potential threats (current)  <i>Livistona mariae</i> subsp. <i>mariae</i> is a prime tourist attraction at Palm Valley and, under current arrangements, palms in this area are directly exposed to visitor impacts. Seedling trampling and other aspects of site degradation such as track erosion, and the spread of weeds and pathogens are potential threats.	Most impact at Palm Valley, but this is the largest concentration of the species (>50%)	Medium-High
Changed hydrology through water extraction (future)  Current ground water usage and small-scale future developments at Palm Valley are considered sustainable (Wischusen et al. 2004). However a more intensive water extraction program may threaten the palm and other groundwater-dependent species in the future.	Potential threats in the future to whole population	unknown
Changed hydrology through climate change (future)  Climate change represents a future threat given its potential to disrupt reproductive output and germination and to decrease adult vigour and survival. Additionally, climate change in Central Australia may cause more sporadic and heavier rainfall events. Severe flooding from these events poses a potential threat to <i>L. mariae</i> subsp. <i>mariae</i> given that this species is unlikely be able to withstand the full force of flood waters.	Potential threats in the future to whole population	unknown

### Summary of IUCN attributes<sup>1</sup>

EOO	275 km <sup>2</sup>	AOO	40 km <sup>2</sup> (2x2km grid method).	Generation length	unknown
No. locations	4	Severely fragmented?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Unknown <input type="checkbox"/>
No. subpopulations	1	No. mature individuals	2087		
Percentage global population within Australia	100%				
Percentage population decline over 10 years or 3 generations					

<sup>1</sup> Refer to [Guidelines for using the IUCN Red List Categories and Criteria](#) for definitions.



## Assessment of available information in relation to the listing Criteria

### Criterion A. Population size reduction (reduction in total numbers)

Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4

	Critically Endangered Very severe reduction	Endangered Severe reduction	Vulnerable Substantial reduction
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3, A4	≥ 80%	≥ 50%	≥ 30%
A1	Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.		
A2	Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not have ceased OR may not be understood OR may not be reversible.		
A3	Population reduction, projected or suspected to be met in the future (up to a maximum of 100 years) [(a) cannot be used for A3]		
A4	An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.		
	based on any of the following		
	(a) direct observation [except A3]		
	(b) an index of abundance appropriate to the taxon		
	(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat		
	(d) actual or potential levels of exploitation		
	(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites		

### Evidence:

There are several concentrations of *L. mariae* subsp. *mariae* plants, most are small. The total wild count in 1987 was approximately 12,000 plants, of which, the great majority were seedlings (PWSNT unpublished data, from Nano 2008). The greatest concentration of *Livistona* palms occurs at Palm Valley (Finke Gorge NP). In 1987 it was estimated to contain 1280 adult plants. The second largest concentration occurs in Little Palm Creek. Census data from 1987 indicate that there were close to 600 adult plants present (PWCNT unpublished data). A comparison of survey data from 1992 and then 2007/2008 with the 1987 estimate showed that the adult population has remained stable over that time period (C. Nano unpublished data). Other concentrations to the north and south of Palm Valley have between 2 and 100 mature plants (Nano 2008).

Based on the evidence presented above, *Livistona mariae* subsp. *mariae* is not eligible for listing under this criterion.

### Criterion B. Geographic distribution as indicators for either extent of occurrence AND/OR area of occupancy

	Critically Endangered Very restricted	Endangered Restricted	Vulnerable Limited
B1. Extent of occurrence (EOO)	< 100 km <sup>2</sup>	< 5,000 km <sup>2</sup>	< 20,000 km <sup>2</sup>
B2. Area of occupancy (AOO)	< 10 km <sup>2</sup>	< 500 km <sup>2</sup>	< 2,000 km <sup>2</sup>
AND at least 2 of the following 3 conditions indicating distribution is precarious for survival:			
(a) Severely fragmented OR Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals			
(c) Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals			

**Evidence:**

*Livistona mariae* subsp. *mariae* is endemic to the southern region of the Northern Territory (NT). It is the only palm occurring in central Australia, and is separated by c. 1 000 km from any other member of the genus. This species has a highly restricted distribution and is characterised by a few concentrations of relatively small numbers of individuals.

This palm is wholly restricted to the MacDonnell Ranges Bioregion where it is confined to a small portion of the Finke River and its tributaries. The extent of occurrence is 275 km<sup>2</sup> and the species occupies an area of less than 50 ha /0.05 km<sup>2</sup>. AOO is 40 km<sup>2</sup>, based on 2 km x 2 km grids. The known locations of *Livistona mariae* subsp. *mariae* all fall within a latitudinal range of 35 km and a longitudinal range of 20 km.

*Livistona mariae* subsp. *mariae* faces several threats. The invasive Buffel Grass *Cenchrus ciliaris* and Couch Grass *Cynodon dactylon* are present at all known locations of *L. mariae* subsp. *mariae* and are competitors for nutrients, light and space, particularly with seedlings, potentially resulting in palm recruitment failure. The increase in fuel load associated with these invasive grasses may shift the frequency and intensity of fire regimes beyond threshold levels for palm persistence (Nano *et al* 2012). Other potential threats include grazing and damage by large feral herbivores (horses and cattle), site degradation associated with tourism, inbreeding depression, reduced ground-water flow should a more intensive water extraction program eventuate, and possible severe flooding from extreme rain events under climate change (Nano *et al* 2012). Recent studies indicate that trampling and disturbance of river banks by horses and cattle are leading to bank erosion and loss of mature palms, as well as severe changes in siltation, river profiles and vegetation.

Based on the evidence presented above, *Livistona mariae* subsp. *mariae* is eligible for listing as Endangered (B1ab(iii)+2ab(iii)) under this criterion as its EOO 275 km<sup>2</sup>, AOO is 40 km<sup>2</sup>, it is known from fewer than 5 locations, and there is a continuing decline in habitat quality associated with invasive grasses and cattle and feral horse impacts.

Criterion C. Population size and decline			
	Critically Endangered Very low	Endangered Low	Vulnerable Limited
Estimated number of mature individuals	< 250	< 2,500	< 10,000
AND either (C1) or (C2) is true			
C1 An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future)	Very high rate 25% in 3 years or 1 generation (whichever is longer)	High rate 20% in 5 years or 2 generation (whichever is longer)	Substantial rate 10% in 10 years or 3 generations (whichever is longer)
C2 An observed, estimated, projected or inferred continuing decline AND its geographic distribution is precarious for its survival based on at least 1 of the following 3 conditions:			
(a) (i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
(a) (ii) % of mature individuals in one subpopulation =	90 – 100%	95 – 100%	100%
(b) Extreme fluctuations in the number of mature individuals			

**Evidence:**

The total wild count in 1987 was approximately 12,000 plants, of which, the great majority were seedlings (PWSNT unpublished data, from Nano 2008). The greatest concentration of *Livistona* palms occurs at Palm Valley (Finke Gorge NP). In 1987 this concentration was estimated to contain 1280 adult plants. The second largest concentration occurs in Little Palm Creek. Census data from 1987 indicate that there were close to 600 adult plants present (PWCNT unpublished data). A comparison of survey data from 1992 and then 2007/2008 with the 1987 estimate showed that the adult population has remained stable over that time

period (C. Nano unpublished data). Other concentrations to the north and south of Palm Valley have between 2 and 100 mature plants (Nano 2008).

Based on the evidence presented above, *Livistona mariae* subsp. *mariae* is not eligible for listing under this criterion.

Criterion D. Number of mature individuals			
	Critically Endangered Extremely low	Endangered Very Low	Vulnerable Low
D. Number of mature individuals	< 50	< 250	< 1,000
D2. <i>Only applies to the VU category</i> Restricted area of occupancy or number of locations with a plausible future threat that could drive the taxon to CR or EX in a very short time.	-	-	D2. Typically: AOO < 20 km <sup>2</sup> or number of locations ≤ 5

**Evidence:**

This palm is wholly restricted to the MacDonnell Ranges Bioregion where it is confined to a small portion of the Finke River and its tributaries. The extent of occurrence EOO is 275 km<sup>2</sup> and the AOO is 40 km<sup>2</sup>, based on 2 km x 2 km grids. Within this, the species actually occupies an area of less than 50 ha /0.05 km<sup>2</sup>. The known locations of *Livistona mariae* subsp. *mariae* all fall within a latitudinal range of 35 km and a longitudinal range of 20 km.

Based on the evidence presented above, *Livistona mariae* subsp. *mariae* is not eligible for listing as threatened under this criterion.

Criterion E. Quantitative Analysis			
	Critically Endangered Immediate future	Endangered Near future	Vulnerable Medium-term future
Indicating the probability of extinction in the wild to be:	≥ 50% in 10 years or 3 generations, whichever is longer (100 years max.)	≥ 20% in 20 years or 5 generations, whichever is longer (100 years max.)	≥ 10% in 100 years

**Evidence:**

There are insufficient quantitative data available to assess the species against this criterion.

**Summary**

*Livistona mariae* subsp. *mariae* is eligible for listing at Endangered (B1 + B2 ab(iii)) as it has an EOO is 275 km<sup>2</sup>, and AOO is 40 km<sup>2</sup>(based on 2 km x 2 km grid), it is known from fewer than 5 locations, and there is a continuing decline in habitat quality associated with invasive grasses.

## Management and Recovery

Is there a Recovery Plan (RP) or Conservation Management Plan operational for the species?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
<p><i>List all relevant recovery or management plans (including draft, in-preparation, out-of-date, national and State/Territory recovery plans, recovery plans for other species or ecological communities, or other management plans that may benefit or be relevant to the nominated species).</i></p> <ul style="list-style-type: none"> <li>Nano, C. (2008). <i>National Recovery Plan for the Central Australian Cabbage Palm Livistona mariae</i> subsp. <i>mariae</i>. Northern Territory: Department of Natural Resources, Environment, The Arts and Sport</li> </ul>		
<p><i>List current management or research actions, if any, that are being undertaken that benefit the conservation of the species.</i></p> <ul style="list-style-type: none"> <li>Population monitoring at 14 permanent plots (Appendix A)</li> <li>Experimental control of invasive grasses in Palm Valley and Little Palm Creek</li> <li>Investigation of erosion, siltation and palm loss at Running Waters</li> <li>Reduced numbers of feral herbivores in areas with palms</li> </ul>		
<p><i>List further recommended management or research actions, if any, that would benefit the conservation of the species.</i></p> <ul style="list-style-type: none"> <li>Maintain or increase habitat quality and extent;</li> <li>Understand critical biological attributes including the fire response, life history characteristics, flowering and fruiting phenology, and population dynamics;</li> <li>Implement exsitu conservation measures that ensure the long-term reservation of representative samples of this species' genetic diversity;</li> <li>Understand connectivity and mode of seed dispersal to guide seed collection protocols;</li> <li>Indigenous people are actively engaged in the recovery planning process;</li> <li>Inform and involve the community and stakeholders in the recovery plan process;</li> <li>Determine the optimum fire regime for the species' long term survival;</li> <li>Examine the role of climate (rainfall, drought, and temperature) on fecundity;</li> <li>Tag and track seedling emergence and survival to determine the influence of microhabitat constraints and other factors affecting recruitment;</li> <li>Determine the extent to which Buffel Grass and Couch Grass limit seedling establishment and survival; and</li> <li>Determine the extent and impacts of altered hydrology associated with the development of erosional channels.</li> </ul>		
<p><i>Further comment.</i></p> <p>Dramatic improvement to stand health and habitat quality occurred following the feral horse removal program in 1986 by the Northern Territory Government.</p>		



## Consistency with CAM Memorandum of Understanding

<b>Consistent with Schedule 1, item 2.7 (h) and 2.8 of the Common Assessment Method Memorandum of Understanding, it is confirmed that:</b>	
<ul style="list-style-type: none"> <li>this assessment meets the standard of evidence required by the Common Assessment Method to document the eligibility of the species under the IUCN criteria;</li> </ul>	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
<b>Comments:</b>	
<ul style="list-style-type: none"> <li>surveys of the species were adequate to inform the assessment;</li> </ul>	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
<b>Comments:</b>	See section above under <b>Distribution</b>
<ul style="list-style-type: none"> <li>the conclusion of the assessment remains current and that any further information that may have become available since the assessment was completed supports or is consistent with the conclusion of the assessment.</li> </ul>	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
<b>Comments:</b>	

<b>Nomination prepared by:</b>	
<b>Contact details:</b>	
<b>Date submitted:</b>	21 December 2016
<i>If the nomination has been refereed or reviewed by experts, please provide their names and contact details:</i>	

## References cited in the advice

- Dowe, J.L. & Jones, D.L. (2004) Nomenclatural changes for two Australian species of *Livistona* R.Br. (Arecaceae). *Austrobaileya* 6(4): 980
- Kondo, T., Crisp, M. D., Linde, C., Bowman, D. M. J. S., Kawamura, K., Kaneko, S. & Isagi, Y. (2012) Not an ancient relic: the endemic *Livistona* palms of arid central Australia could have been introduced by humans. *Proceedings of the Royal Society B* 279, 2652-2661.
- Nano, C. (2008) National Recovery Plan for the Central Australian Cabbage Palm *Livistona mariae* subsp. *mariae*. Department of Natural Resources, Environment, The Arts and Sport, Northern Territory.
- White, M., Albrecht, D., Duguid, A., Latz, P., and Hamilton, M. (2000). Plant species and sites of botanical significance in the southern bioregions of the Northern Territory. Volume 1: significant vascular plants. A report to the Australian Heritage Commission. (Arid Lands Environment Centre, Alice Springs.)
- Wischusen, J.D.H., Fifield, L.K., and Cresswell, R.G. (2004). Hydrogeology of Palm Valley, central Australia; a Pleistocene flora refuge? *Journal of Hydrogeology* 293, 20-46.

Summary of subpopulation information (detailed information to be provided in the relevant sections of the form)						
Site, Location or subpopulation (include coordinates)	Land tenure	Survey information: Date of survey and No. mature individuals	Area of subpopulations	Site / habitat Condition	Threats (note if past, present or future)	Specific management actions
Palm Valley	National Park	2008: 1247 ( $\geq$ 3m tall)	0.067 km <sup>2</sup>	Poor and declining	Changed hydrology: channelling of sheet flow into narrow erosional gullies Heavy Buffel Grass and Couch Grass invasions Direct exposure to visitor impacts. Seedling trampling and other aspects of site degradation such as track erosion, and the spread of weeds and pathogens are potential threats.	Survey bank profile and quantify erosion threat Control Buffel Grass and Couch Grass Maintain interpretive signage
Little Palm Creek	National Park	2008: 557 ( $\geq$ 3m tall)	0.036 km <sup>2</sup>	Good relative to PV	Presently light infestation of Buffel Grass and Couch Grass. High likelihood of increasing threat through time.	Maintain low visitation rate Monitor threat level and direction over time.
Finke River	National Park	2007: 203 ( $\geq$ 3m tall)	0.1 km <sup>2</sup>			Control Buffel Grass and Couch Grass
Running Waters	Conservation covenant on pastoral lease	2016: 18 adults	0.06 km <sup>2</sup>	Very poor and declining	Couch Grass Feral horses and cattle degrading banks. Erosion / changed hydrology	Remove feral horses and control cattle access
NTARIA ABORIGINAL LAND TRUST South	ALT	2008: 51 ( $\geq$ 3m tall)	0.01 km <sup>2</sup>	Presumed poor	Feral horse damage	Quantify threat level and limit horse access if necessary
NTARIA ABORIGINAL LAND TRUST North		2007: 11 adults	0.01 km <sup>2</sup>	Presumed poor	Feral horse damage	Quantify threat level and limit horse access if necessary