

Wabma Kadarbu Mound Springs Conservation Park

Management Plan 2017

Wabma Kadarbu Mound Springs (kutha ngarrawa) are like a living pulse that provides life for everything in this vast landscape.



Government of South Australia
Department of Environment,
Water and Natural Resources



National Parks
South Australia

Minister's foreword



Wabma Kadarbu Mound Springs Conservation Park protects a cultural landscape of profound significance to the Arabana people. Especially important is a network of mound springs that upwell from the Great Artesian Basin.

These arid land oases sustain life in the desert, supporting the living culture of the Arabana people and a range of endemic plant and animal species of conservation significance.

The mound springs provided crucial water supplies for early European explorers and settlers, and were instrumental in determining the routes of the Australian Overland Telegraph line and Ghan railway. Reminders of this nineteenth century exploration are still evident and remain central to the character of the park.

The park has been cooperatively managed by Arabana people and the South Australian Government since 2012. The Arabana Parks Advisory Committee have provided invaluable assistance in the development of this management plan.

I commend the community groups and scientific researchers who have made a significant contribution to the conservation and understanding of these unique mound springs over many years.

It is with much pleasure that I formally adopt the Wabma Kadarbu Mound Springs Conservation Park Management Plan under section 38 of the *National Parks and Wildlife Act 1972*.

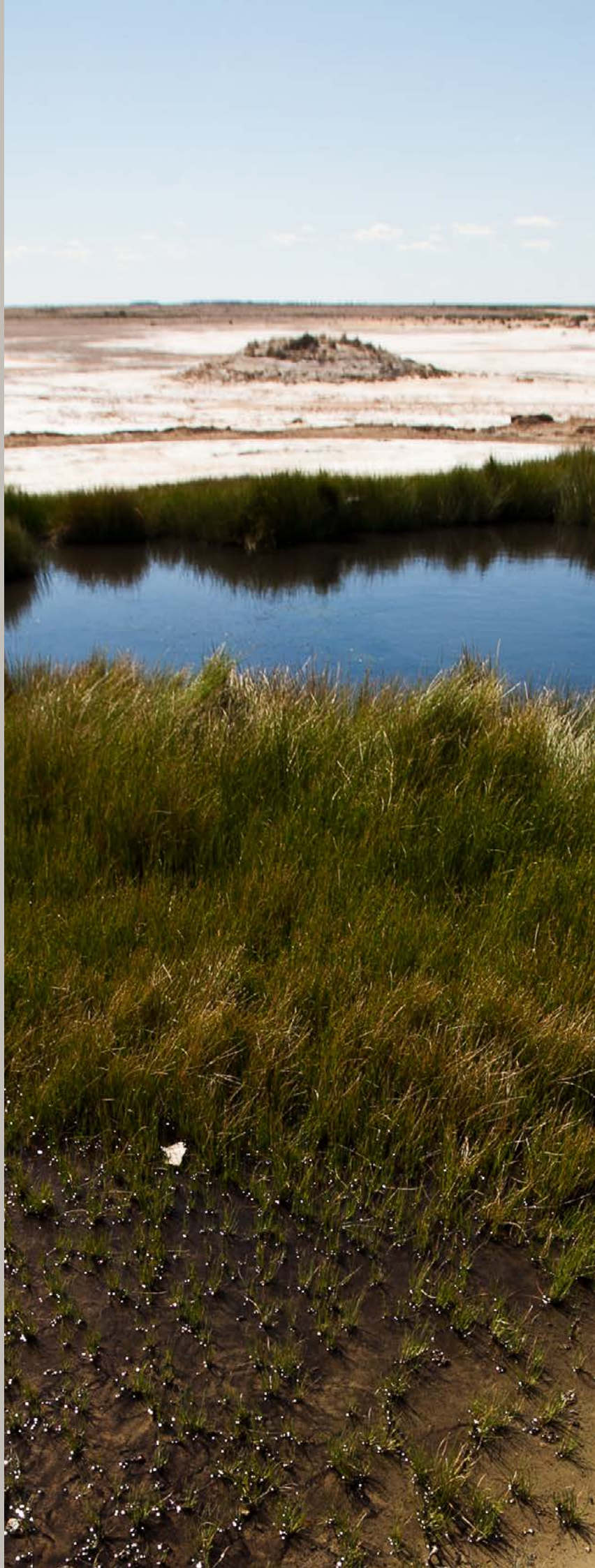
A handwritten signature in black ink, appearing to read 'I. Hunter'.

The Hon Ian Hunter MLC

Minister for Sustainability, Environment and Conservation

Cultural Sensitivity Warning

Aboriginal people are warned that this publication may contain culturally sensitive material





Developing this plan

This plan was developed with advice from the Arabana Parks Advisory Committee. This group comprises the traditional owners – the Arabana people, and representatives of the South Australian Government. The Friends of Mound Springs and a number of other people have provided valuable assistance in the development of this plan.

This plan is based on an earlier Healthy Country Planning project that was undertaken in a partnership between Arabana Aboriginal Corporation, the Department of Environment, Water and Natural Resources and The Nature Conservancy Australia. The *Arabana Wadlhu Ngurrku-Ku (For Healthy Country) Plan* has been a key foundation document in developing this management plan.

Arabana language is used throughout this plan to foster a greater understanding of this area’s cultural significance. Guidance for the pronunciation of some Arabana language, including that which is used within this plan, is provided in Appendix 1.

‘Arru urkari (hello everyone), Arabana Parks Advisory Committee has a vision which has driven the development of this plan. Wabma Kadarbu Mound Springs are important to a wide range of people for a wide range of reasons; cultural, historical and natural. By sharing these interests and passions there is a wider understanding and appreciation of this place which improves our ability to care for it. Ngarrawa (the mound springs) are like a living pulse that provides life for everything.

Everyone working together for the benefit of all Australia looking after these places, cultural heritage is part of the park- I hope they’ll take it seriously.’

Aaron Stuart - Arabana Person, 2014.

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Directions for management

This management plan for Wabma Kadarbu Mound Springs Conservation Park has been developed to support the Arabana people in their role as custodians of this ancient landscape. It sets directions, objectives and strategies for the long term management and protection of the park. As required under the objectives of the *National Parks and Wildlife Act 1972*, the park will be managed primarily for conservation and appropriate visitor use, appreciation and enjoyment. Grazing, as well as petroleum and mining activities, are not allowed within the park.

The native title rights of the Arabana people were formally recognised in 2012. The Arabana Parks Advisory Committee was established in 2013 to facilitate cooperative management of the park by the Arabana people, together with the South Australian Government. This partnership empowers the continued custodianship of Country by Arabana people. It will also help to sustain the stories that have passed responsibilities for the management of Country to the current generation of Arabana people.

Arabana are strongly connected to kutha ngarrawa (mound springs) by Ularaka. Ularaka encompasses all that is Arabana; their dreaming, knowledge, stories, songs, ceremonies, and traditions that underpin the identity of Arabana people. It gives life today, and connects Arabana people to each other and to the Country over which they hold responsibilities and rights.

Management will focus on the protection of kutha ngarrawa. This will involve preventing localised disturbance, managing unnatural ecological change and minimising the effects of broad scale changes to the kutha (water) that sustains them. The kutha ngarrawa within the park are influenced by water and land management practices within the Great Artesian Basin, as well as the drainage and groundwater processes that extend far beyond the park boundaries into New South Wales, Queensland and the Northern Territory.

This plan is guided by the *Arabana Wadlhu Ngurrku-Ku (For Healthy Country) Plan*. Management will draw on traditional knowledge and accumulated research undertaken to better understand groundwater, hydrogeology, aquatic biology, water use and land management within the Great Artesian Basin. This will include the National Water Commission research project and the associated report: *Allocating water and maintaining springs in the Great Artesian Basin* (National Water Commission 2013).

Management directions for the park will also be consistent with a number of other plans, strategies and agreements which have been developed to achieve integrated land and water management across the Lake Eyre Basin.

As a destination for visitors, the park will help to develop a greater appreciation of park values by communicating the kutha ngarrawa story including their cultural and conservation significance, their fragility, and by helping to illustrate the delicate balance of the Great Artesian Basin.

The Wabma Kadarbu Mound Springs Conservation Park Management Plan is the first management plan for the park. It meets the requirement for the completion of a park management plan as specified in section 38 of the *National Parks and Wildlife Act 1972*. This plan is adopted subject to the native title rights and interests of the Arabana people. All implementation activities will be undertaken in accordance with the relevant provisions of the *Native Title Act 1993*.







Park significance and purpose

The long term protection of Wabma Kadarbu Mound Springs Conservation Park begins by understanding its significance and purpose. The park (12,016 ha) is situated adjacent to the Oodnadatta Track, 498 kilometres north of Port Augusta (Figure 1).

Arabana people live in and travel through these arid lands. For generations, they have relied on kutha ngarrawa (mound springs) for kutha (water), food and other resources. Traditional Ularaka (all that is Arabana) and responsibility stories flow through this Wadlhu Ngurrku-ku (Healthy Country). Each kutha ngarrawa holds special significance as a part of an 'all of Country' story.

This story is about custodianship of the land and its features. The park was proclaimed to conserve some of the most culturally and scientifically significant kutha ngarrawa in the Great Artesian Basin. Ngarrawa are important cultural sites. They continue to be fundamental to Ularaka, and central to the stories that cross and weave through Country.

While there are over 5,000 mounds springs in South Australia, many of these have been altered over time. The park is significant in that it is one of very few locations within the Lake Eyre Basin where a complex of mound springs has been protected and can be studied as a naturally functioning ecosystem.

Fourteen fauna and five flora species that are listed as rare or threatened under the *National Parks and Wildlife Act 1972* have been recorded in the park. The park also contains several spiders, snails and other invertebrate species, some of which are new to science and only found within specific ngarrawa. In recognition of their significance and sensitivity, the wetland

communities dependent on the kutha of the Great Artesian Basin are also listed as endangered under the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The park contributes to the unique tourism appeal of outback South Australia as one of a series of stop-off points on the Oodnadatta Track. It also provides an important opportunity to communicate to visitors the ongoing relationship of the Arabana people with their Country, the significance of arid zone biodiversity and the relationship between people and the Great Artesian and Lake Eyre Basins.

It is difficult to argue against the Great Artesian Basin mound springs' position as one of the biologically special places in the world. In addition to the geological and hydrogeological features of the springs, the isolation and long-term stability of the environment have contributed to the creation of nature's evolutionary jewels. Many species remain to be discovered and documented. In addition to high biodiversity, the area is also a natural laboratory for theoretical ecological concepts to be tested and validated against real world data.

Travis Gotch, National Water Commission (2013)

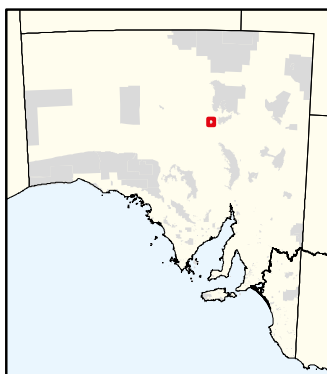
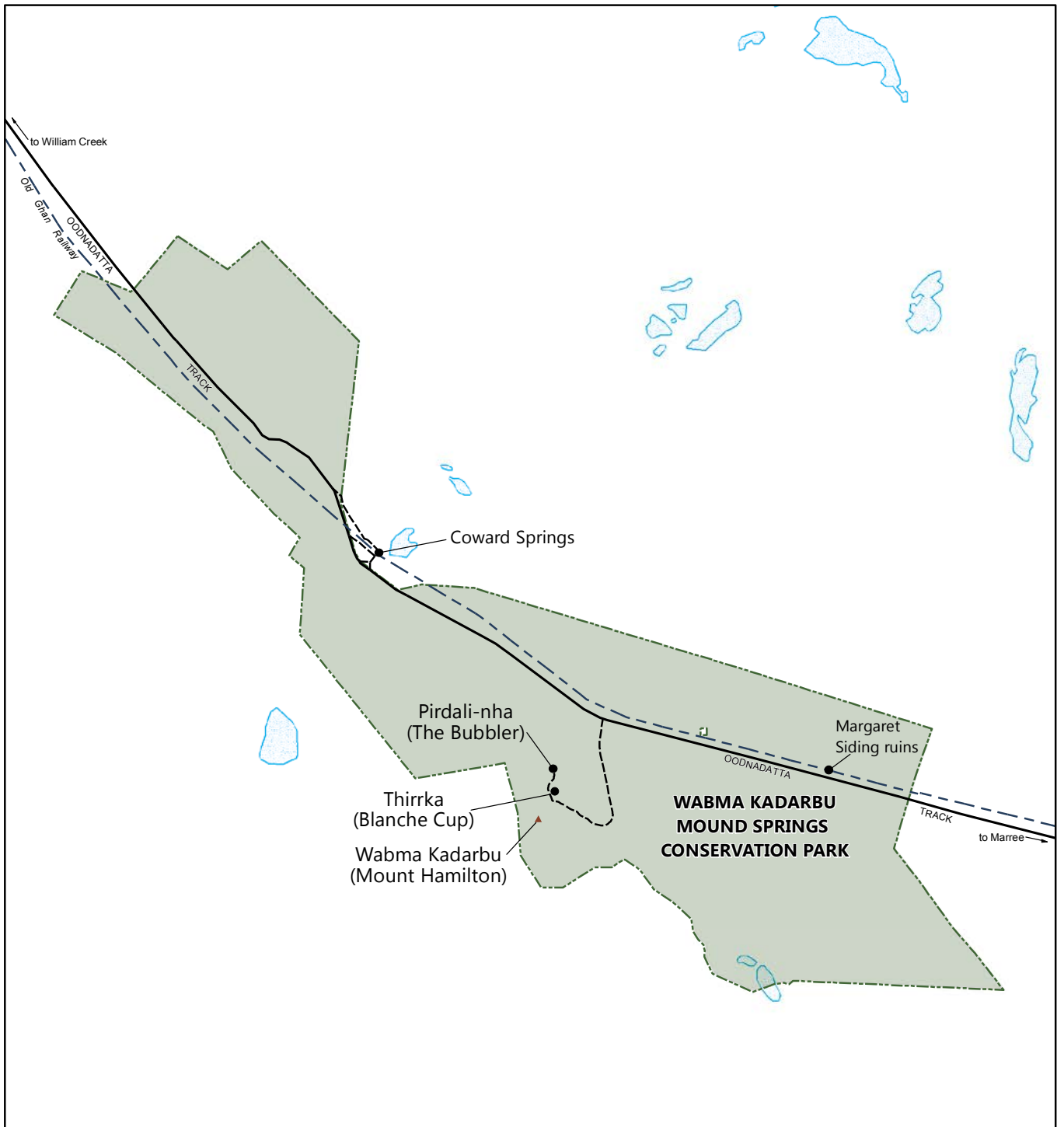
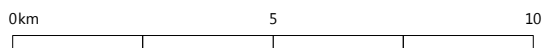







Figure 1

Wabma Kadarbu Mound Springs Conservation Park



LEGEND

-  Mainly dry lake and watercourse
-  Dismantled railway
-  Unsealed road
-  Vehicular track
-  Wabma Kadarbu Mound Springs Conservation Park



The Great Artesian Basin and mound springs

The Great Artesian Basin is the largest groundwater basin in Australia (and one of the largest in the world). Underlying 22% of the Australian continent, it spans Queensland, New South Wales, the Northern Territory and South Australia. The basin is fed by groundwater recharge, the majority of which occurs along the Great Dividing Range on the east coast of Australia.

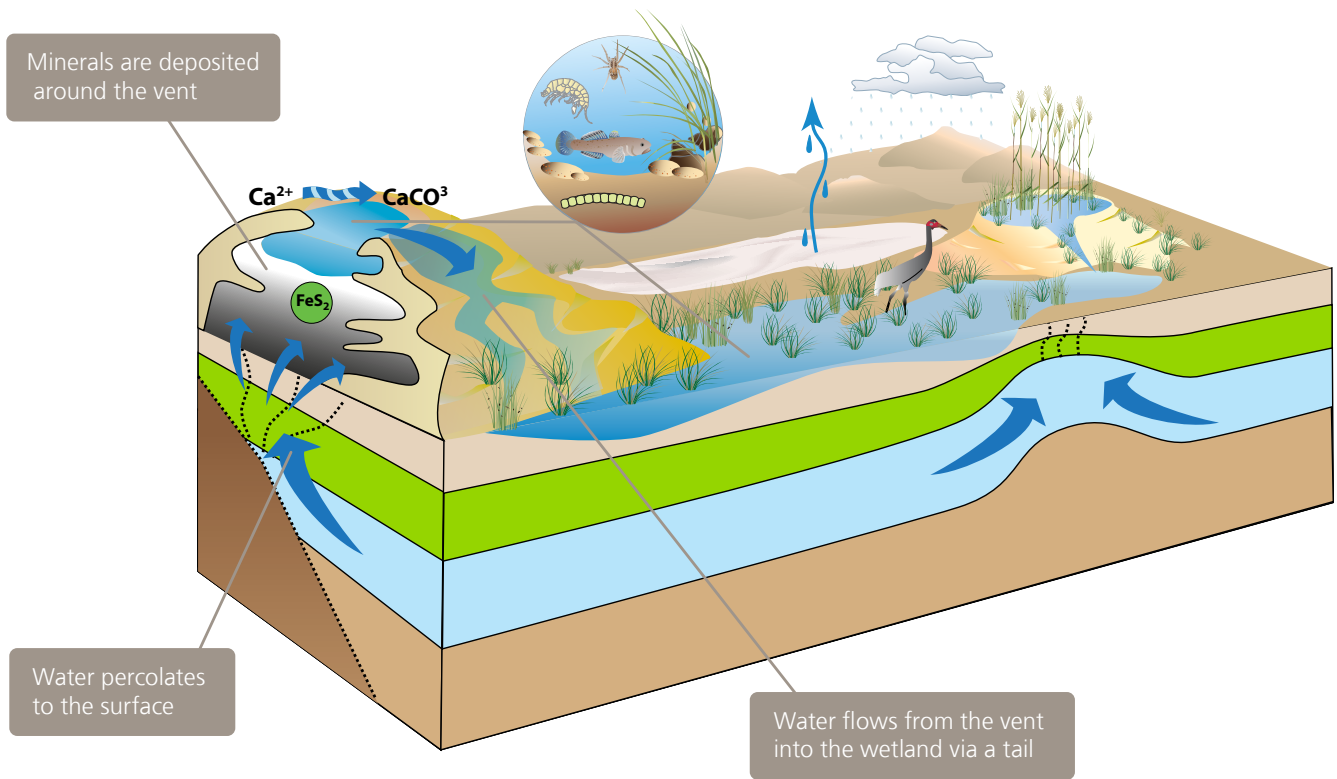
Groundwater flows through the basin in a largely westerly and south-westerly direction towards South Australia. Arabana people have always known and relied heavily on the springs. In the 1860s, John McDouall Stuart crossed Australia using the springs as stepping stones. Early pastoral stations, the Australian Overland Telegraph Line and the Ghan Railway were also dependent on the springs. This artesian water continues to support numerous traditional Aboriginal cultural practices, rural communities and pastoral enterprises, as well as energy and mineral resource development projects.

The formation of mound springs is an intricate process. This process is depicted in a conceptual model (Figure 2) and can be broadly summarised through the following four stages:

1. Throughout the Great Artesian Basin there are natural discharge points where water percolates to the surface via fracture zones, or from the exposed aquifer.
2. Some springs, such as those in Wabma Karabu Mound Springs Conservation Park, have formed pools and prominent kutha ngarrawa (mound springs). These kutha ngarrawa are comprised of travertine or tufa – a type of limestone formed when kutha (water) with high mineral and bicarbonate content has percolated to the surface, depositing minerals on the surface in the vicinity of the spring vent. These deposits are fragile and can be easily damaged.
3. Springs with sufficient water flow develop a tail where water flows out. This overflow from the spring creates vegetated wetlands.
4. The structure and floristic composition of wetlands formed in this way depends on the balance between evaporation and fresh water flow from the spring.

There are over 5,000 springs in South Australia, ranging in size from a few square centimetres to complexes covering hundreds of hectares. They also vary in geological form, ranging from large travertine mounds to sandy seeps. As a result of relatively stable function over thousands of years, all springs contain examples of relict fauna from a period of time when the region was significantly wetter.

Figure 2 - Conceptual model of Mound Spring formation



Legend

Physical setting

- Travertine mound springs
- Fracture zone where water seeps through
- Salt scald
- Quaternary and tertiary sediments and rocks
- Bulldog shale
- Great Artesian Basin aquifer
- Permian formation
- Basement rock

Vegetation

- Fringing wetland vegetation
- Phragmites australis* (Common reed)

Fauna

- Endemic fish
- Endemic invertebrates
- Amphipods
- Endemic hydrobiid snails
- Birds

Drivers and processes

- Groundwater movement
- Evaporation
- Ca^{2+} \rightarrow $CaCO^3$ Calcium carbonate accumulates
- Stromatolites and cyanobacteria
- Iron sulphides

While each spring is unique, the springs within each complex usually share a common groundwater source as well as similar hydrochemistry and biology. As a result of their geographic isolation and diverse hydrochemistry, springs often contain many endemic and rare flora and fauna species that live in spring waters or the adjacent wetlands.

The water that erupts in the park has travelled over one million years through thousands of kilometres of complex artesian systems. Due to the economic significance of this resource, over 10,000 bores have been drilled into the basin's aquifers. In the past, many of these were uncontrolled, flowing freely into open drains where more than 95 percent of the water was lost through evaporation

and seepage. These free-flowing bores have resulted in a substantial reduction in water pressure over much of the basin, leading to the degradation or loss of many of the Great Artesian Basin's natural spring-fed ecosystems.

The maintenance of healthy mound springs requires that water pressure be maintained at a constant state. There has been a coordinated effort by land managers throughout the Lake Eyre Basin to cap bores, remediate damaged springs and minimise any further reduction in water pressure. The ongoing health of mound springs requires a continuation of these coordinated efforts.



What are we looking after?

The park protects:

- Plants, animals and landscape features that are interconnected, forming a fundamental part of Arabana culture.
- A cultural landscape of profound significance to Arabana people including Ularaka (all that is Arabana), sites, objects and stories including the story of Kakutahna - the creator ancestor - and others passing through this landscape.
- A complex of kutha ngarrawa (mound springs) that has a relatively stable and consistent level of water discharge.
- Organisms and ecological systems which enable the ongoing development and function of each unique kutha ngarrawa, including structurally important wetland species that stabilise the tail of the wetland and tiny stromatolites and thrombolites which have built some of the world's best examples of carbonate deposit formation (Gotch 2013).
- A landscape containing active and extinct kutha ngarrawa, which illustrate the complex hydrogeological process which formed this landscape over millions of years.
- A series of visitor destinations including kutha ngarrawa, relics of the Old Ghan Railway, and relics of the Australian Overland Telegraph Line which make an important contribution to regional tourism.
- Some of Australia's best examples of the *Community of native species dependent on natural discharge of groundwater from the Great Artesian Basin*. This community is listed under the EPBC Act, and includes five plant species that have been listed as rare or threatened under the *National Parks and Wildlife Act 1972* (Appendix 2).
- Habitat for thirteen fauna species listed as rare or threatened under the *National Parks and Wildlife Act 1972*. Habitat for the Thick billed Grasswren (*Amytornis modestus indulkanna*), listed as vulnerable under the EPBC Act (Appendix 2).
- Wetland tails which support Bore drain sedge (*Cyperus laevigatus*) and the Pale Spike rush (*Eleocharis sp.*), listed as vulnerable under the EPBC Act. These species have an important stabilizing function.
- Arid zone vegetation comprised predominantly of low open shrubland with Cotton Bush (*Maireana aphylla*), Old Man Saltbush (*Atriplex nummularia ssp. nummularia*), Bladder Saltbush (*A. vesicaria*) and Kudlawa (Nitre Bush) (*Nitraria billardierei*).
- Recently identified invertebrate species, including four geographically isolated species of Marangkarra (spider) which are of particular scientific interest (Appendix 3).



What are the challenges and opportunities?

Challenges and opportunities in the protection and management of this park include:

- Celebrating Arabana culture on Country and assisting in the protection of cultural heritage sites and stories. Such sites and stories extend far beyond the park boundary, such as the Seven Sisters story and a special women's place.
- Enabling Arabana people to share their knowledge and culture, develop business ventures, reestablish traditional management practices, create jobs, exercise their traditional rights, care for Wadlhu Ngurrku-ku (Healthy Country) and maintain connections to the land and culture.
- Understanding the effects of changed rates of evapotranspiration from kutha ngarrawa (mound springs), which may arise as a result of a changing climate.
- Preventing impacts on ngarrawa that can be caused by the excessive spread of Common reed (*Phragmites australis*), stray stock, inappropriate visitor activity, the introduction of invasive species or the activity of pest animals such as rabbits.
- Enabling visitors to enjoy the park and gain an appreciation of kutha ngarrawa, Arabana Culture and Wadlhu Ngurrku-ku without impact on cultural sites, sensitive kutha ngarrawa features or arid zone vegetation.
- Minimising the effects of resource development activities and water resource use across the Great Artesian Basin.
- Ensuring that management activities are informed by the detailed studies of kutha ngarrawa which have been undertaken throughout the Great Artesian Basin.



Management themes and priorities

This section of the management plan addresses the most important management issues for the park, focusing on two key themes.

Theme 1: Maintaining Wadlhu Ngurrku-ku (Healthy Country)

Arabana people are concerned about Wadlhu Ngurrku-ku. They aim to help manage Country and return it to a more healthy state as outlined in the *Arabana Wadlhu Ngurrku-ku Healthy Country Plan 2014-19* (Arabana Aboriginal Corporation 2014). The Arabana Parks Advisory Committee will assist the Arabana people to work in partnership with government agencies towards Wadlhu Ngurrku-ku. Ngarrawa (mound springs) are a central theme in Arabana culture and the ularka stories that connect Arabana people to their Country. These stories were exchanged at ceremony for thousands of years to extend cultural ties and facilitate trade across this landscape. Ngarrawa also provided water and resources. For example, the Common reed (*Phragmites australis*) grows within some ngarrawa and has been used to make fine baskets, mats, string and nets for catching warukathi (emus), marirri (ducks), and fish.

Changes are mainly around where we went hunting and camping around Lake Eyre – now it's all dead, even the trees and bushes even around Finniss, all dead, and here at four mile sand hills, much less. Another one the Bubbler – water today hardly any water there. Used to be birdlife, Marirri (ducks) and Kuti (swans), it sad to see that. Billy button plants don't see them so much on sand hills – parachelia too – another plant cattle used to thrive on, live on it, so could live on sand hills for weeks on end - couldn't find it now, maybe cos of climate change, maybe cos of lack of rain.

The old people say that if the land is sad, the people are sad. If you look at it now, it's not like it was where they were growing up, so they are sad.

Dean Stuart, as quoted in Community based adaptation to climate change: The Arabana, South Australia Final Report (Nursey-Bray et al. 2013)

The story for Wabma Kadarbu

One day an old man is out hunting on the flood plains of the Margaret Creek. His name is Kakakuta or sometimes known as Tyarrha Nyudlu. He comes across the tracks of a snake which he begins to follow. Sandhill carpet snakes were very common in the area many years ago. The snake however eludes him by diving down a hole which incidentally later becomes a spring. When the old people used to tell us the tale as kids many years ago, this is where the old man started digging and that is how that small creek came to be. Half way along the course of his digging, he pokes in a stick to determine the course and depth of the hole and thinks that he could see a shadowy glimpse of the snake but it eludes him yet again. He continues digging and eventually catches up with the snake at the end of the hole which is now commonly known by the name of the Bubbler. There he pulls it out and kills it with his boomerang. He sits back down for a rest after all his labours at the spot that he rests, in time, a tree grows.

Back at that time it was said to be a mulga tree. When I was a child growing up in the area, it was a needlewood tree. This tree is important in the Kakakuta story because Malbungka, the leader of the Urumbula Ularaka who is travelling up from Port Augusta to the NT for some reason, curses the tree as he passes by. It is the only tree for miles and it dies. However a tree will always grow in its place and not always of the same species but something will always happen to it and it will die. Up to recent times a wattle has been growing there but someone has cut it down.

After his rest Kakakuta takes the snake a short distance away and makes a fire and cooks it. The place where he pulls the snake out and kills it is known to the Arabana as Pirtahli-nha, and where he cooks it, as Thirrka-nha. Thirrka means 'hot ashes and coals', but Europeans love to call it an oven. Well, I suppose it is in a way. When pulling the snake out of his fire, the old man leaves the stick that he was using in the ashes of the fire and it is still there to this day. Pirtahli-nha is known to the Europeans as the Bubbler and Thirrka-nha as Blanche Cup. Pirtahli-nha in my childhood days was a spectacular site. It was vital. It was alive. Today well it makes you sad.

Kakakuta eats the snake and throws away the head which forms into what is known as Hamilton Hill and what Arabana call Wabma Kadarbu. All the rest of the sand hills and piles of rocks that can be seen scattered around in the area are said to be bits and pieces of the skin and bones that the old man throws away as he eats. He eats it all except a small rib bone with hardly any meat on it and this he saves and gives to his wife who has been waiting all of this time at the nearby site called Tyarrha Nyudlu. This site later becomes the Hamilton Hill Mound Springs. She is not impressed and this is the one and only time that her mother gets mentioned in the story as together they then place a curse on the old man. He leaves her there at that site and is in a happy mood as he travels south. Half way along his journey however, he begins to feel unwell and by the time that he reaches Gudnampa-nha he is very ill indeed. In the meantime, his wife decides to follow them into Gudnampa-nha. On arriving there, she finds old Kakakuta is in a very bad way and is gravely ill. Parts of his body have swollen up and seem to be getting worse as time goes by. He calls all the people together and as they gather around him his swollen body parts burst in a terrible and spectacular explosion. The people closest to him were turned into rocks that can be still seen today on the bed of the creek although some people say that these rocks represent his stomach. People further away were turned into ti-trees and they are also there today. It is also said that some of the geological features and formations in the south of Kati Thanda-Lake Eyre were formed by this tragic event. The springs at Gudnampa-nha have been known by Arabana from that day on as Manhakadi-Baltiarpu-kanha.

S. Strangways, Arabana elder, personal communication 2015

As was the case throughout outback South Australia, the arrival of Europeans had a dramatic effect on Aboriginal people and their culture. Renewed management of wadlhu ngurrku-ku by Arabana people will help stories to remain strong, help the community to appreciate Arabana culture, and help people to respect the Arabana people's ongoing relationship with Country.

The development of the Ghan Railway, the Australian Overland Telegraph Line and pastoral stations provided employment opportunities for Arabana people and remain an important part of the

region's history. Nearby pastoral stations, relics of the Old Ghan Railway, and relics of the Australian Overland Telegraph Line such as the Margaret Siding ruins are a part of the region's identity and history.

The continuation of stories and active involvement in maintaining Wadlhu Ngurrku-ku are fundamental aspects of Arabana culture. Arabana people are concerned about the continuation of these stories which have been passed down for generations and the intricate social networks that are linked to them (Nursey-Bray et al. 2013; Strangways 2015).

The Arabana people remain determined to maintain their culture and pass their stories on. However this aspiration becomes particularly difficult if their Country has been altered or degraded. Certain stories, such as the story of Thantapirri the quoll, and Kadnungka the Old Woman Hare Wallaby, now relate to species that are no longer present within the park. Arabana people are committed to working in partnership with governments to address their concerns.

The park enables the Arabana people to carry out their custodial responsibilities for Country and pass their culture on. It provides sites for traditional activities such as hunting, gathering and the collection of resources.

The ngarrawa and many other cultural sites within the park are registered and protected under the *Aboriginal Heritage Act 1988*. However, there are additional sites within and adjacent to the park that are a concern for Arabana people because they have been irreparably damaged or remain unprotected from threatening processes. Others are not protected because they have not yet been identified or registered. Over time, the Arabana people aim to consolidate the protection of their Country by incorporating several culturally significant sites nearby within the park.

Maintaining the natural function and ecological structure of the ngarrawa, in particular the wetland tails, will be a key priority for the maintenance of wadlhu ngurrku-ku. This will require ongoing monitoring, further research, and the application of actions that blend scientific-based management strategies with traditional land management practices.

***That main road goes straight through our stories
and this creates a management issue for us all.***

Jodie Warren, Arabana person, 2014

Many programs for the protection of Country are already in place. These programs focus on responding to climate change, and are conducted on a broad scale through the cooperation of all land managers. As the park is a small area within an enormous landscape, this cooperative approach is essential. At a national level, the coordination of activities is guided by the *Lake Eyre Basin Intergovernmental Agreement 2004* and the *Great Artesian Basin Strategic Management Plan* (Great Artesian Basin Consultative Council 2004). Within the park, land management activities are guided by a number of strategies and plans that have been developed by Arabana people and others. These include:

- South Australian Arid Lands Natural Resources Management Board (SAAL NRM) Regional Natural Resources Management Plan (SAAL NRM 2010).
- *Arabana Wadlhu Ngurrku-ku Healthy Country Plan 2014-2019* (Arabana Aboriginal Corporation 2014).
- *Community based adaptation to climate change: The Arabana, South Australia Final Report* (Nursey-Bray et al. 2013).

The Wabma Kadarbu Mound Springs Conservation Park Management Plan will complement these plans and guide future Arabana Working on Country activities within the park.

Objectives

Maintain healthy Country within the park through an ongoing partnership and the sharing of ideas and knowledge between the South Australian Government, the Arabana people, and the broader community.

Recognise, protect, promote and build community respect for Arabana culture and their role as custodians of Country.

Strategies

- Provide information to visitors that communicates Arabana culture, appropriate visitor behaviour, the unique values of the kutha ngarrawa, and the Arabana people's relationship with the Great Artesian Basin, ensuring that the intellectual property of the Arabana people is respected.
- Identify, record and develop strategies to ensure the long term protection of any cultural sites that are not yet adequately protected.
- Develop protocols to ensure that hunting activities conducted by Arabana people within the park are monitored and reported annually to government.
- Continue to involve the Arabana community, the Friends of Mound Springs and park neighbours in activities and programs including:
 - scientific research,
 - Arabana working on Country activities, including opportunities for Arabana people to contract services and be employed as rangers on Country, and
 - implementation of the *Arabana Wadlhu Ngurrku-ku Healthy Country Plan 2014-19* (Arabana Aboriginal Corporation 2014).





Theme 2: Kutha (water) nourishing Wadlhu Ngurrku-Ku (Healthy Country)

The sustainable use and management of kutha ngarrawa (mound springs) and kutha (water) is an important part of Arabana culture and has always sustained life across Arabana Country. Strategies for the protection of this life source have been passed on through stories. Traditional management practices such as burning have maintained the health of kutha ngarrawa. While much is still unknown, traditional knowledge passed on over thousands of years is now complemented by an emerging body of scientific research and knowledge.

Over twenty years of monitoring conducted within the park illustrates the gradual change in kutha ngarrawa over time. Water flows are also monitored across the region. The continuation of these programs will inform research and enable incremental threatening processes to be found and dealt with.

Due to their geographical isolation over millions of years, each kutha ngarrawa is like an island with a unique set of ecological characteristics, water flow, hydrogeological structure and biodiversity. Each kutha ngarrawa supports an assemblage of small but significant species, many of which are unusual, relict of earlier time periods, and found nowhere else in the world. Subtle changes can have a dramatic impact on the health of the system and may cause water flow to cease altogether. Therefore, each kutha ngarrawa has a unique set of management requirements.

Should they become established, invasive species such as Mosquito Fish (*Gambusia* sp), Date Palms (*Phoenix dactylifera*), Annual Beard Grass (*Polypogon monspeliensis*) and Buffel Grass (*Cenchrus ciliaris*) have the potential to alter the unique and delicate balance of each kutha ngarrawa. A rapid response to the detection of any potentially harmful or invasive species is a priority for the management of the park.

The native fauna of Australia's arid zone such as Kungarra (kangaroo), Warrukathi (emu) and Madlayapa (dingo) depend on kutha ngarrawa and are able to access kutha without impacting on the continued function of kutha ngarrawa. Conversely, stock which were introduced in the 1800s had a major impact on kutha ngarrawa and increased the fertility of these sites. While stock are now excluded from the park, their removal appears to have triggered the spread of the Common Reed (*Phragmites australis*) in the nutrient rich soils around the kutha ngarrawa. This is altering the water flow patterns and the ecological balance of some kutha ngarrawa. The Common Reed is native to the spring community, but was traditionally managed by Arabana people through periodic burning to stop this species choking up ngarrawa. The long term effects of the change to contemporary management practices are unknown, and require further investigation.

The park is a regionally significant visitor destination, however the cultural and environmental significance of the park is not yet well appreciated. The park has potential to become a focal point that engages visitors in the Arabana story, raising awareness of the pressures facing outback Australia's landscape and the Great Artesian Basin.

Access roads, carparks and boardwalks at Pirdali-nha (The Bubbler) and Thirrka (Blanche Cup) enable people to see the park's active kutha ngarrawa. Signs encourage people to stay on the boardwalks and avoid any contact with the sensitive kutha and surrounding ecosystem. They also highlight the biological and cultural significance of these sites.

Swimming is not allowed in order to prevent alteration of kutha chemistry and to minimise the disturbance and loss of sediments onto the ecologically sensitive wetland tail. To prevent the compaction of soils and the degradation of sensitive wetland vegetation, off track driving is not allowed and visitors are not allowed to walk on areas adjacent to the boardwalks.

Visitors can camp and swim at the privately managed Coward Springs campground, which is adjacent to the park. This site also provides further information about the rich history of the area.



Water pressure within the Great Artesian Basin has reduced as a result of water extraction. Any further reduction in water pressure is likely to reduce water flows and may cause some kutha ngarrawa to stop flowing altogether. The management of water extraction within the Great Artesian Basin is outside the scope of this plan.

It will be important, however, to continue promoting the importance of water pressure for the conservation of ngarrawa, ensuring that decisions about water extraction are informed by scientific and cultural knowledge.

Objective and strategies

Conserve kutha ngarrawa (mound springs) and kutha (waters) as unique and naturally functioning ecosystems.

- Involve Arabana people in the management of kutha, kutha ngarrawa and Wadlhu Ngurrku-ku (Healthy Country).
- Continue to address threats to biodiversity, and the form and function of the kutha ngarrawa in line with the *Recovery Plan for the community of native species dependent on natural discharge of groundwater from the Great Artesian Basin* (Fensham *et al.* 2010).
- Monitor the ecological integrity of each kutha ngarrawa within the park and take action as necessary to:
 - minimise the impact of stray stock, pest plants, and pest animals,
 - ensure that invasive species do not become established, and
 - address inappropriate visitor activity.
- Ensure that objectives for the protection of kutha ngarrawa are incorporated into:
 - any future review of the Water Allocation Plan for the Far North Prescribed Wells Area (SAAL NRM Board 2009b),
 - the assessment of any mineral or petroleum development activities that have potential to impact on the kutha ngarrawa within the park, and
 - regional plans and programs for the management of pest plants and animals.
- Plan and implement strategies for the management of the Common Reed in conjunction with Arabana people. Consider the application of traditional burning as a management tool.
- Continue to build an understanding of ngarrawa and strategies required for their protection by encouraging further research of the park's hydrogeology, ecology, flora, fauna and invertebrates.
- Continue to support the protection of kutha ngarrawa through the collective efforts of Arabana Working on Country programs, the Friends of Mound Springs and park neighbours.



Appendix 1

Arabana language guide

ARABANA LANGUAGE	ENGLISH TRANSLATION	PRONUNCIATION GUIDE
<i>Arabana</i>	Traditional Owners of Country	u-roo-bunna as in 'up'
<i>Arru urkari</i>	Hello everyone	
<i>Kadni</i>	Bearded Dragon	
<i>Kalta</i>	Sleepy Lizard	
<i>Kapirri</i>	Sand Goanna	'cup-arri'
<i>Kararra</i>	Wedge-tailed Eagle	'rr' as in 'trill' or a rolled 'r'
<i>Katarunka</i>	Corella	
<i>Kidlangkilda</i>	Galah	
<i>Kudlawa</i>	Nitre Bush	
<i>Kungarra</i>	Kangaroo	'ng' as in sing
<i>Kutha</i>	Water	'Koo-tha'
<i>Kutha Ngarrawa</i>	Mound spring	'Koo-tha' and 'u-rr-awa' role the 'rrs' and 'u' as in 'up'
<i>Kuti</i>	Black Swan	'i' as in 'bit'
<i>Madlayapa</i>	Dingo	'ay' as in 'play'
<i>Marangkara</i>	Spider	'ng' as in 'sing'
M arirri	Duck	'm' as in 'many'
<i>Pirdali-nha</i>	The Bubbler	'pur-dali-na'
<i>Thari-Thari-nha</i>	Little Bubbler	'th' tongue tucked behind top front teeth
T hidna	Foot	tongue at front of mouth 'td' sound.
<i>Thidna mara</i>	Frog	
<i>Thirka</i>	Blanche Cup	
<i>Thuka</i>	Mother	
<i>Thunti thunti</i>	Willie Wagtail	
<i>Ularaka</i>	All that is Arabana	
<i>Wabma</i>	Snake	'a' as in 'above'
<i>Wabma Kadarbu</i>	Snake head (Mount Hamilton)	
<i>Wadlhu Ngurrku-ku</i>	Healthy Country	
<i>Wakarla</i>	Crow	
<i>Warrukathi</i>	Emu	'u' as in 'put' or 'oo'
<i>Wudicari</i>	Magpie	
Y atyaparra	Zebra Finch	'y' as in 'yell'

(Source: Dean Stuart, Uncle Sid Strangways, Aunty Millie Warren, Jodie Warren, Aaron Stuart, and Peter Watts - Arabana people.)

Appendix 2

Rare or threatened species currently known to occur within Wabma Karbu Mound Springs Conservation Park

NAME	NPW ACT SA ¹	EPBC ACT (CWLTH) ²	IUCN REDLIST ³
Fauna			
Thick-billed Grasswren (<i>Amytornis modestus indulkanna</i>)	*	Vu	
Australian Bustard (<i>Ardeotis australis</i>)	Vu		
Banded Stilt (<i>Cladorhynchus leucocephalus</i>)	Vu		
Brolga (<i>Grus rubicunda</i>)	Vu		
Blue-winged Parrot (<i>Neophema chrysostoma</i>)	Vu		
Plains Mouse (<i>Pseudomys australis</i>)	Vu		
Common Sandpiper (<i>Actitis hypoleucos</i>)	R		
Bush Stonecurlew (<i>Burhinus grallarius</i>)	R		
Peregrine Falcon (<i>Falco peregrinus</i>)	R		
Restless Flycatcher (<i>Myiagra inquieta</i>)	R		
Glossy Ibis (<i>Plegadis falcinellus</i>)	R		
Spotless Crake (<i>Porzana tabuensis</i>)	R		
Wood Sandpiper (<i>Tringa glareola</i>)	R		
Terek Sandpiper (<i>Xenus cinereus</i>)	R		
Hydrobiid snails			
<i>Fonscochlea aquatica</i>			End
<i>Fonschochlea variabilis</i>			End
<i>Fonscochlea zeidleri</i>			Lr / nt
Flora			
Swainsona Pea (<i>Swainsona minutiflora</i>)	Vu		
<i>Swainsona oligophylla</i>	R		
<i>Zygophyllum humillimum</i>	R		
<i>Frankenia cupularis</i>	R		
Black's Bindyi (<i>Sclerolaena blackiana</i>)	R		
Bore drain sedge (<i>Cyperus laevigatus</i>)	Lr / nt		
Pale Spike rush (<i>Eleocharus sp.</i>)	Vu		
R Rare Vu Vulnerable End Endangered Lr/nt Lower risk / near threatened * not assessed yet			

¹ National Parks and Wildlife Act 1972 (South Australia).

² Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth).

³ International Union for the Conservation of Nature (IUCN) Red List of Threatened Species



Hydrobiid snails



Isopod



Marangkarra (spider)



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For further information please contact

Department of Environment, Water and Natural Resources phone information line (08) 8204 1910, or see SA White Pages for your local Department of Environment, Water and Natural Resource office.

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