ROTTNEST IS
Terrestrial Conservation Action Plan

Our Vision

"The Rottnest Island Reserve will be a safe haven for indigenous flora and fauna; a unique place where visitors can enjoy and appreciate diverse nature-based and cultural experiences, now and in the future."




Foreword from the CEO

The Rottnest Island Authority (RIA) is pleased to present the Terrestrial Conservation Action Plan (TCAP) for Rottnest Island. The TCAP is a key initiative under the Rottnest Island Management Plan 2014-2019 and forms one of three management tools used to care for our unique and diverse island environment.

The RIA adopted the Nature Conservancy's 'Conservation Action Planning' process in 2011 as its platform for biodiversity conservation planning. The methodology was chosen because it affords a strategic and adaptive approach to biodiversity conservation management. The TCAP has now been developed, tested and applied with input from a variety of stakeholders, researchers and experts.

It is with great pleasure that we make this plan available to the broader community to demonstrate the RIA's approach to biodiversity conservation and to recognise our ongoing partnership and success with community in driving biodiversity conservation of Rottnest Island.

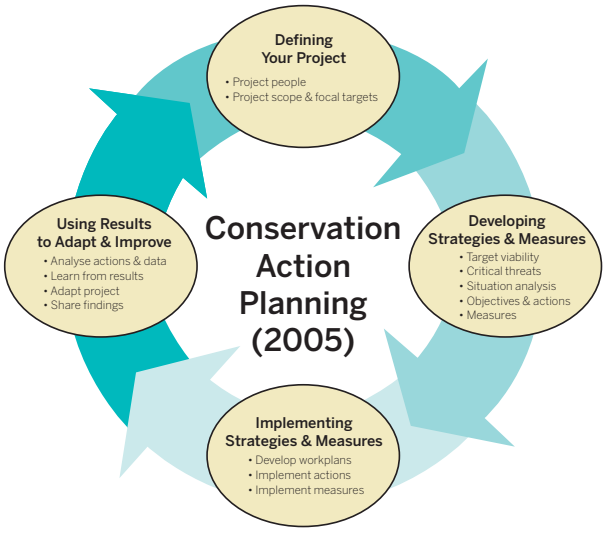
This document provides an overview of the planning process and system that is applied by the RIA in the biodiversity conservation management on Rottnest Island.

Rottnest Island is an A-class Reserve situated 19 kilometres west of Fremantle, Western Australia. The Island lies in an east-west orientation, and is approximately 11 kilometres long and 4.5 kilometres wide at its widest point. The Rottnest Island Reserve (Reserve 16713) covers a land area of 1,859 hectares and 3,800 hectares of marine reserve.

Rottnest Island is a highly desirable holiday destination due to the Mediterranean climate, scenic natural environment and biodiversity. Approximately 500,000 people visit the Island each year by passenger ferry, private boat or light aeroplane.

Under the *Rottnest Island Authority Act 1987*, the Rottnest Island Authority (RIA) is responsible for the delivery of a range of functions in the areas of tourism, recreation, environmental protection and conservation. The Island has a myriad of natural values that are of importance for biodiversity conservation at a local, state and national level, and are an integral part of the Island amenity and attraction for visitors. Protection of the Rottnest Island Reserve to maintain a healthy environment is critical to ensure ecosystem function today and in the future, with minimal human intervention.

The Conservation Action Planning process was used to identify the natural values of the Rottnest Island Terrestrial Reserve, determine current and desired health, consider threatening processes, and identify priority conservation actions to enable resources to be directed where most needed.



Conservation Action Planning is a proven approach for planning, implementing and measuring success for conservation projects. The conservation goal at a landscape level is to maintain healthy, viable occurrences of the focal conservation targets. By definition, healthy occurrences are not significantly stressed *(The Nature Conservancy, 2007)*.

The scope of the Rottnest Island Terrestrial Conservation Action Plan encompasses the terrestrial environment up to the high water mark (i.e. the level reached by the ocean at high tide), and includes off-shore islets and the Settlement Area.

Conservation Targets

Five focal conservation targets were selected to represent and encompass the array of biodiversity throughout the Rottnest Island Terrestrial Reserve. Focal conservation targets are a limited suite of species, ecological communities and ecological systems chosen to represent the biodiversity of the project area. These are the basis for setting goals, carrying out conservation actions and measuring conservation effectiveness.

Quokka

As the only endemic mammal found permanently and widespread on Rottnest Island, the Quokka *(Setonix brachyurus)*, a key tourist attraction, was identified as its own conservation target. This nocturnal marsupial species is listed as 'Vulnerable' under State and Commonwealth legislation, and 'Vulnerable' on the global IUCN Redlist. Rottnest Island currently supports the largest viable quokka population, with an estimated 10,000 to 12,000 individuals. Quokkas are a browsing herbivore found in varying densities across the entire Island, in all terrestrial habitat types. The quokka was once hunted for meat on the Island, but numbers exploded after they became protected in 1917, resulting in increased grazing pressure on vegetation due to the large population size. Whilst the quokka population on the Island is relatively stable, they are still susceptible to threats such as disease, uncontrolled fires, and anthropogenic impacts such as artificial food availability due to visitor interactions.

Limestone Heath

The Limestone Heath conservation target is associated with shallow sands which are ecologically distinct from the deeper sand communities on the Island. The target encompasses limestone habitat occurring both along the coastline (including offshore islets) and within inland areas. Flora species such as Cockie's Tongues *(Templetonia retusa)*, Seaheath *(Frankenia pauciflora)* and Nitre Bush *(Nitraria billardierei)* are associated with this community. Limestone Heath provides breeding habitat for birds such as the Eastern Osprey *(Pandion cristatus)* and the Rock Parrot *(Neophema petrophila)*, which rely on limestone outcrops for nesting. The shallow sands also provide important habitat for reptile species, including the Rottnest Island Bobtail *(Tiliqua rugosa konowi)* and Rottnest Island Dugite *(Psuedonaja affinis exilis)*, which are both listed as 'Vulnerable' under State legislation as they are genetically distinct from the mainland populations. The vegetation associated with this target is predominantly undisturbed with minimal weed invasion. The key threat to this target is uncontrolled fire which could result in loss of flora diversity and impacts to fauna populations.

Coastal Habitat

The Coastal Habitat conservation target comprises the Island's sandy beaches, mobile and stationary sand dunes. Mobile sand dune vegetation assemblages occur on beach backshores and foredunes and are dominated by Beach Spinifex *(Spinifex longifolius)* and Coastal Sword-sedge *(Lepidosperma gladiatum)*. Stable sand dunes are situated behind the mobile sand dunes and are generally older with more complex soils capable of supporting more varied vegetation assemblages, including species such as Coastal Daisy Bush *(Olearia axillaris)*, Fan Flower *(Scaevola crassifolia)*, and Seaberry Saltbush *(Rhagodia baccata)*. Rottnest Island's coastal areas provide significant habitat for an array of reptile and shorebird species. Rottnest has been classified as an 'Important Bird Area' by BirdLife International as it provides critical breeding habitat for the Fairy Tern *(Sterna nereis)*, which is listed as 'vulnerable' under Commonwealth legislation. Coastal habitat is shaped by natural processes through wind and ocean influence, however this process can be exacerbated by human activity, leading to the loss of fragile dune vegetation and associated fauna habitats.

Woodland and associated Heath Community

Prior to European settlement in 1831, over half of Rottnest Island was covered in Rottnest Island Pine *(Callitris preissii)* and Rottnest Island Tea Tree *(Melaleuca lanceolata)* woodland, however the majority of this was lost due to clearing and inappropriate fire regimes. This resulted in the woodland vegetation being replaced by an altered heath community dominated by Prickle Lily *(Acanthocarpus preissii)* and Feather Speargrass *(Austrostipa flavescens)*, leaving approximately 4% of the Island covered by scattered relic stands of woodland. The Woodland and associated Heath conservation target encompasses both the woodland and altered heath community, which are intrinsically linked. The Rottnest Island Pine *(Callitris preissii)* and Rottnest Island Tea Tree *(Melaleuca lanceolata)* Woodland is listed as a 'Vulnerable' Threatened Ecological Community under State legislation. The Rottnest Island Authority has been undertaking woodland restoration on Rottnest since 1963, and these areas provide key habitat for the 43 species of bushbird regularly surveyed on Rottnest. The habitat is especially important for the Golden Whistler *(Pachycephala pectoralis)* and Red-capped Robin *(Petroica goodenovii)* whose populations have declined on the Swan Coastal Plain but increased on the Island. Relic stands of woodland will die out in the near future because regeneration is not occurring. High tree density and quokka grazing have been identified as the principal factors limiting regeneration.

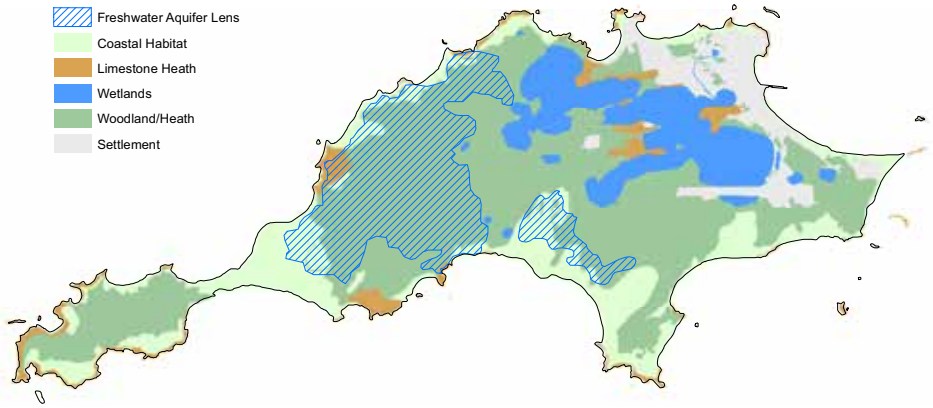
Wetlands

The Wetlands conservation target comprises the salt lakes, freshwater seeps, brackish swamps and groundwater, which are essential for the continued functioning of all of the Island's ecosystems. Rottnest Island's salt lakes, swamps and seeps are listed as 'Wetlands of National Importance' under the Directory of Important Wetlands in Australia.

A number of the deeper salt lakes support significant hypersaline microbialite communities that are listed as Priority Ecological Communities (PEC) under State legislation. These microbialite communities are unique to the south-west of Western Australia and are highly susceptible to altered hydrological regimes, contamination and trampling. The vegetation assemblages found around the salt lakes predominantly represent the Subtropical and Temperate Coastal Saltmarsh Ecological Community, which is listed as 'Vulnerable' under Federal legislation. Rottnest Island is a major stop-over area for migratory shorebirds in south-western Australia, and supports regionally-significant numbers of the Red-necked Stint *(Calidris ruficollis)* which is listed under several international treaties. The wetlands on Rottnest also provide significant drought refuge area for migratory shorebirds, including over 1% of the world's population of the Banded Stilt *(Cladorhynchus leucocephalus)*.

Water supply to the freshwater seeps and brackish swamps on Rottnest Island occurs via precipitation and groundwater. Soil moisture is maintained year-round, with a diverse assemblage of vegetation dominated by the sedge species and some salt tolerant species around the brackish margins. The swamps and seeps provide critical breeding habitat for three species of frogs: the Moaning Frog *(Heleioporus eyrei)*, Sandplain Froglet *(Crinia insignifera)* and Western Green Tree Frog or Motorbike Frog *(Litoria moorei)*, which are morphologically distinct to those on the mainland.

The Tamala aquifer is an unconfined aquifer located beneath the Island which contains two freshwater lenses, one located in the vicinity of Wadjemup Hill and a smaller lens located under Oliver Hill. The Wadjemup Hill lens is recharged via rainfall events and has been a major source of Rottnest Island's potable water since 1978. There has been an increasing trend in overall salinity of the lens likely due to decreasing rainfall and prolonged groundwater abstraction from the aquifer.



Threats to conservation

The biodiversity of the selected conservation targets has either already been degraded, or is facing threats that need to be countered by conservation actions. Key threats to Island conservation targets were identified and prioritised in order to direct conservation actions and resources where they are most needed.

Ten key threats were identified (Table 1) with the highest ranked threats as follows:

1. Salinity Intrusion into Wadjemup Aquifer and Sea-level Fluctuation

Salinity intrusion into the Wadjemup Aquifer resulting from unsustainable abstraction and sea level fluctuation (variability in storm surges, swell and wind waves) poses a critical threat to the viability of the Wetland target. The annual average reading for the borefield has increased over the last 10 years, doubling in some bores. There is limited fresh water availability across the island therefore salinisation of the freshwater lens and seeps will potentially have a large impact on island fauna and ground water dependant ecosystems on Rottnest Island.

2. Altered Hydrological Regime

Historical and current land and water-use activities have already impacted on microbial mat and microbialite communities on Rottnest Island. This has included trampling from cycling and foot traffic, elevated nutrient inputs from discharge of nutrient-rich groundwater, and smothering due to increased sediment inputs from road run-off.

Any future changes in the use of the lakes or surrounding aquifers has the potential to affect groundwater and surface water interactions further impacting on the health of microbialite communities. Currently the environmental water requirements of these communities are unknown, therefore it is not possible to assess the threat that hydrological changes will have on their health.

3. Quokka-grazing Pressure on Woodland Seedlings

Quokkas graze heavily on seedlings preventing woodland tree species from being able to establish through natural recruitment. This affects the resilience of the woodland community, which requires succession of plants of varying ages to ensure longevity as older trees senesce and are no longer able to produce viable seed.

Table 1: Key threats across conservation targets

Threats across Targets	Quokka	Limestone Heath	Coastal Habitat	Woodland and associated Heath	Wetlands	Overall Threat Rank
Weed Invasion		Low	Low	Low		Low
Trampling					Low	Low
Sea-level Fluctuation			Low		High	Medium
Salinity Intrusion into Wadjemup Aquifer					High	Medium
Quokka Grazing Pressure on Woodland Seedlings				Medium		Low
Localised Erosion			Low			Low
Fire	Low	Low		Low		Low
Disease Introduction	Low					Low
Contamination (metals, nutrients)					Low	Low
Altered Hydrological Regime					Medium	Low
Summary Target Ratings	Low	Low	Low	Low	High	Medium

Other threats identified include weed invasion, localised erosion within coastal habitat and limestone heath, uncontrolled fire, disease introduction affecting quokkas, and trampling (walking and cycling) in wetlands impacting on vegetation, microbialites and shorebirds.

Goals and Objectives

The conservation goal for the Rottnest Island Conservation Action Plan is to enhance the health of conservation targets by reducing or eliminating threats, and improving condition and resilience. Assessment of the key factors affecting conservation targets was undertaken to determine how to overcome critical threats and restore degraded targets. The development of conservation strategies included consideration of direct threats, indirect threats, knowledge gaps and opportunities.

Strategy Action: Woodland Management Plan

Target: Woodland and Associated Heath

Objective: By 2017 develop and launch Woodland Management Plan to enhance the long-term resilience of the woodland community, while continuing to provide important fauna habitat.

The plan will address the threats of quokka predation and high density planting on tree seedling survival to provide future direction on woodland management including selection of future restoration sites and their desired structure, diversity, and habitat functions.

Strategy Action: Groundwater Resource and Wetland System Investigations

Target: Wetlands

Objective: By 2018 update hydrological knowledge and incorporate into current management practices.

Since 2012, the RIA have significantly invested in the upgrade of water utilities to create greater capacity in desalination and waste water reuse, in order to reduce reliance on the Wadjemup Aquifer. This was supported by a hydrological assessment of groundwater resources and preparation of a Groundwater Licence Operating Strategy (GLOS) to manage impacts on aquifer salinity, water levels and ecosystem services. As a result, abstraction from the aquifer is now capped at 20,000kL per year, a significant reduction from the average of ~33,000kL per year abstracted since 2007. In addition, the RIA is currently upgrading the existing Waste Water Treatment Plant in order to increase recovery of wastewater. The plant will seek to recover ~65,000kL of waste water annually, which will be used for irrigation purposes on Rottnest Island, further reducing the requirement to undertake abstraction.

Since 2013, the Australian Nuclear Science and Technology Organisation (ANSTO) have been undertaking research to assess groundwater quality, residence times, and flow paths of the Wadjemup Aquifer. In 2015, the RIA in partnership with University of New South Wales, ANSTO, and the Department of Water were successful in obtaining funding for a collaborative research project which is expected to further improve knowledge and understanding of ground water flows and connectivity on Rottnest Island.

Research in collaboration with the University of Western Australia is in progress to gain a better understanding of the hydrological dynamics of Rottnest's wetland system and the environmental water requirements of the poorly understood microbial mats and microbialite communities. The result will assist in determining and mitigating any potential anthropogenic impacts to these communities.

Strategy Action: Quokka Genetics and Demographics Research

Target: Quokka

Objective: By 2017 improve understanding of genetics, health and demographics of quokka populations and sub-populations on Rottnest Island, and review long term conservation management direction.

A 3 year collaborative project has been established between the Rottnest Island Authority, Department of Parks and Wildlife, and University of Western Australia to determine quantitative estimates of population size, investigate home range and habitat use, and understand seasonal fluctuations in body condition, survival and reproduction.

Strategy Action: Bushfire Management Plan

Targets: Limestone Heath, Woodland and associated Heath, and Quokka

Objective: By 2017 finalise Rottnest Island Bushfire Management Plan and implement preparedness actions.

The plan will address conservation requirements including preparedness, response and recovery actions. Relevant preparedness actions such as seed bank collection and storage, and sensitive site mapping will be undertaken. Controlled burning trials relating to success of self-seeding and regeneration will be considered within the broader bushfire management regime on Rottnest Island.

Strategy Action: Formalise Coastal Access

Target: Coastal Habitat and Limestone Heath

Objective: By 2018 formalise coastal path network to control access and reduce erosion risk and fragmentation.

This strategy is currently being implemented as part of the Rottnest Island Wadjemup Walk Trail (WWT) Project. Uncontrolled access is being addressed through path realignment, development of infrastructure, area stabilisation, signage, bollards, fencing, revegetation, brushing, and education. To date a total of 2.5km of coastal access has been closed.

Strategy Action: Maintain Adequate Resource Capacity

Targets: Woodland and associated Heath, and Coastal Habitat

Objectives: Continue to seek funding, develop volunteer opportunities, and engage appropriate community members to deliver conservation actions.

Maintaining adequate resourcing (including labour, materials, and facilities) is vital for enabling successful and efficient delivery of conservation programs. This includes ensuring adequate

planning and resource allocation for future maintenance and monitoring, such as tree guard changing and removal, and fence removal.

In 2011, the RIA upgraded the old nursery facility to make it functional for the purposes of seed storage, seed treatment, and seedling propagation of species native to Rottnest Island, as well as proving a hub for conservation volunteering. A specialised volunteer team was formed to assist with nursery activities, which currently contributes approximately 1800 volunteer hours per year. The nursery has capacity to propagate up to 40,000 seedlings (using seeds and cuttings collected from the island) to deliver conservation projects cost-effectively.

Conservation projects attract a vast number of volunteers and researchers to the Island annually. The RIA seek to create a community precinct to support this interest and maximise opportunities for community engagement and improved conservation outcomes.

The RIA work closely with the Rottnest Foundation, Conservation Volunteers Australia and the Rottnest Society, who source external funding and provide volunteers for on-ground delivery of conservation projects. In addition, the RIA continues to seek opportunities to build new relationships to further enhance resourcing capacity.

Strategy Action: Earthcheck Sustainability Management System

Targets: ALL

Objective: By 2017, implement Sustainability Management System. Achieve Gold Earthcheck Certification by 2020.

The Rottnest Island Authority has committed to working towards sustainability by implementing the EarthCheck certification and sustainability program. The RIA has benchmarked with EarthCheck every year since 2011 and is committed to achieving Silver Certification in 2015 and Gold Certification in 2020. To achieve Silver certification an Environmental Management System based on the International Standard ISO 14001 and Earthcheck standards has been implemented. The two standards combined have created the EarthCheck Sustainability Management System (SMS). The SMS achieves the management system cycle of 'Plan, Do, Check, Act', a process of continuous improvement, aimed at improving business and environmental performance. A key component of this involves the identification of environmental risks and impacts associated with all activities on Rottnest Island, and the development of an Environmental Action Plan to address these.

Other Strategy Actions include:

- Develop and implement Biosecurity Policy and Guidelines
- Identify priority weed species and sites, and implement control measures
- Prepare and implement a Salt Lake Bank Management Plan to address protection of microbialite communities, littoral vegetation, and shorebirds.

Measuring our Success

A monitoring program has been developed to measure the viability or 'health' of focal conservation targets, and assist with determining the effectiveness of conservation strategies. One or more indicators have been selected in order to evaluate and monitor key ecological attributes for each conservation target (Table 2). Criteria were developed to set the 'acceptable range of variation', and determine the current and desired status for each indicator.

The process of setting measures of health for conservation targets is challenging as the targets themselves are complex systems that vary naturally over time. Indicators were set using the best available information on the target's biology and ecology, with assumptions and research requirements identified. Regular review of indicators will be undertaken in order to refine and improve upon measures as new knowledge and research becomes available.

Table 2: Viability Indicators

Conservation Target	Indicator	Current Status	Desired Status	Details
Woodland/Heath	Endemic flora species diversity	Good	Good	Benchmarked in 2012, monitored biennially.
	Bush bird diversity and presence	Good	Good	Monitoring has been undertaken by Birdlife Western Australia since 2000.
	Woodland seed viability	Very Good	Good	Monitored biennially since 2012.
	Seedling survival	Fair	Good	Monitored biennially since 2012. The Woodland Management Plan will be implemented to improve viability.
	Tree health	Very Good	Very Good	Monitored biennially since 2012.
Limestone Heath	Endemic flora species diversity	Good	Good	Benchmarked in 2012, monitored biennially.
Wetlands	Presence of tadpoles in freshwater seeps and brackish swamps	Good	Good	Monitored annually since 2012. Historical data used to determine 'acceptable range of variation'.
	Average nutrients: Total N and Total P of salt lakes	Fair	Good	This indicator will be refined based on outcomes of the Groundwater Resource and Wetland System Investigations Strategy.
	Groundwater salinity: Average electrical conductivity of Wadjemup Aquifer	Poor	Good	This indicator will be refined based on outcomes of the Groundwater Resource and Wetland System Investigations Strategy.
	Spatial distribution of endemic littoral vegetation (ha)	Very Good	Good	Benchmarked in 2013, monitored biennially.
Coastal Habitat	Endemic flora species diversity	Good	Good	Benchmarked in 2012, monitored biennially.
	Spatial distribution of vegetated area (ha)	Good	Good	Monitored biennially since 2012.
Quokka	Body Condition Index	Unknown	TBD	These indicators will be refined based on outcomes of the Quokka Genetics and Demographics Research Strategy.
	Level of fluctuating asymmetry within the population	Unknown	TBD	
	Male: Female ratio for both PY and adults	Very Good	Good	
	Female Adult: Juvenile Ratio	Unknown	TBD	

TBD - To Be Determined

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