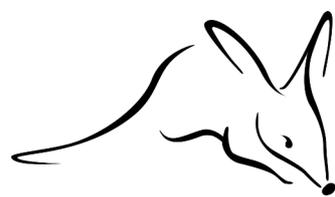


Dakalanta Wildlife Sanctuary Ecohealth Report 2021



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Summary

Australian Wildlife Conservancy (AWC) has implemented an Ecological Health Monitoring Program (Ecohealth) across Dakalanta Wildlife Sanctuary (Dakalanta) to measure the changes in the status and trend of conservation assets, and threats to those assets. Metrics from the program are reported in annual Ecohealth Reports and Scorecards. This is the Ecohealth Report for 2021. Values of metrics derived in this report were based on data collected during surveys carried out between 2011 and 2021. The complete set of metrics and their values are summarised in the accompanying Ecohealth Scorecard.

In implementing the Ecohealth program in 2021, AWC conducted 123 bird surveys and an assessment of the area of weed. These surveys detected 65 species of birds out of 108 species known or likely to occur on Dakalanta.

Bird surveys were carried out in October at Ecohealth monitoring sites located in the major vegetation communities on Dakalanta. Diversity and abundance were both reduced from previous survey. This is thought to be as a result of the period of below average rainfall experienced and continued a decline in abundance over the past few surveys. Several species were observed to be breeding. There were no new species for the sanctuary list from this survey.

A substantial number of Weeds of National Significance have been removed; the area of the sanctuary known to have a high concentration of weeds was estimated to be 3 ha in 2021.

Moving forward, in addition to the standard mammal, reptile and bird surveys, Dakalanta's Ecohealth Monitoring Program will include: targeted surveys on the Southern Hairy-nosed Wombat, Malleefowl and ground orchids; Large Herbivore Surveys; targeted weed surveys; and targeted monitoring of feral predators and herbivores.

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Introduction

Australian Wildlife Conservancy (AWC) currently owns, manages, or works in partnerships across 31 properties in Australia, covering almost 6.5 million hectares, to implement our mission: *the effective conservation of Australian wildlife and their habitats*. AWC relies on information provided by an integrated program of monitoring and research to measure progress in meeting its mission and to improve conservation outcomes.

AWC's Ecohealth Monitoring Program has been designed to measure and report on the status and trends of species, ecological processes and threats on each of these properties (Kanowski et al. 2018). Data from the monitoring program are used to address the following broad questions relevant to our mission:

- 'are species persisting on a property?'
- 'are habitats being maintained?'
- 'are threats below ecologically-significant thresholds?'

For threatened and iconic species, including reintroduced species, AWC's monitoring program aims to obtain more detailed information related to their conservation management, for example data on survival, recruitment, condition, distribution and/or population size.

The structure of the Ecohealth Program is as follows. AWC's Monitoring and Evaluation framework provides guidance on the development of the Ecohealth Monitoring Plans for each property managed by AWC: these plans describe the conservation values and assets of each property, the threats to these assets, and the monitoring program that will be used to track their status and trend, and to evaluate outcomes. Annual survey plans and schedules are developed to implement these plans. The outcomes of these surveys are presented in annual Ecohealth Reports and summary Ecohealth Scorecards.

This document is second in a series of annual Ecohealth Reports for Dakalanta Wildlife Sanctuary (referred to here as Dakalanta). The companion Ecohealth Scorecard presents the indicators and their metrics in a summary format.

Dakalanta Wildlife Sanctuary

Dakalanta is located in the central-west of the Eyre Peninsula in South Australia and is 13,607 ha in extent (Figure 1). The property is in the Eyre-Yorke Block Bioregion, at the transition between the coastal Talia and the inland Eyre Mallee Subregions (IBRA 7.0). Dakalanta was acquired from Earth Sanctuaries Ltd (ESL) in 2002.

Prior to its purchase for conservation purposes in the late 1980s by ESL, Dakalanta was known as Minaro Downs. It supported a sheep grazing enterprise concentrated in the southern portion of the property. There was also an opportunistic cropping enterprise located on deeper, sandier pockets of soil in the cleared central part of the property. Some areas of the property were cleared for cropping and grazing, particularly for sheep. Some sections were chained (i.e., the vegetation was cleared by a chain running between two bulldozers), but were not further developed, allowing the mallee to re-establish. During this time, the property became the subject of a Heritage Agreement between the SA State Government and the landowners, preventing further agricultural land use development, for which the owners were compensated.

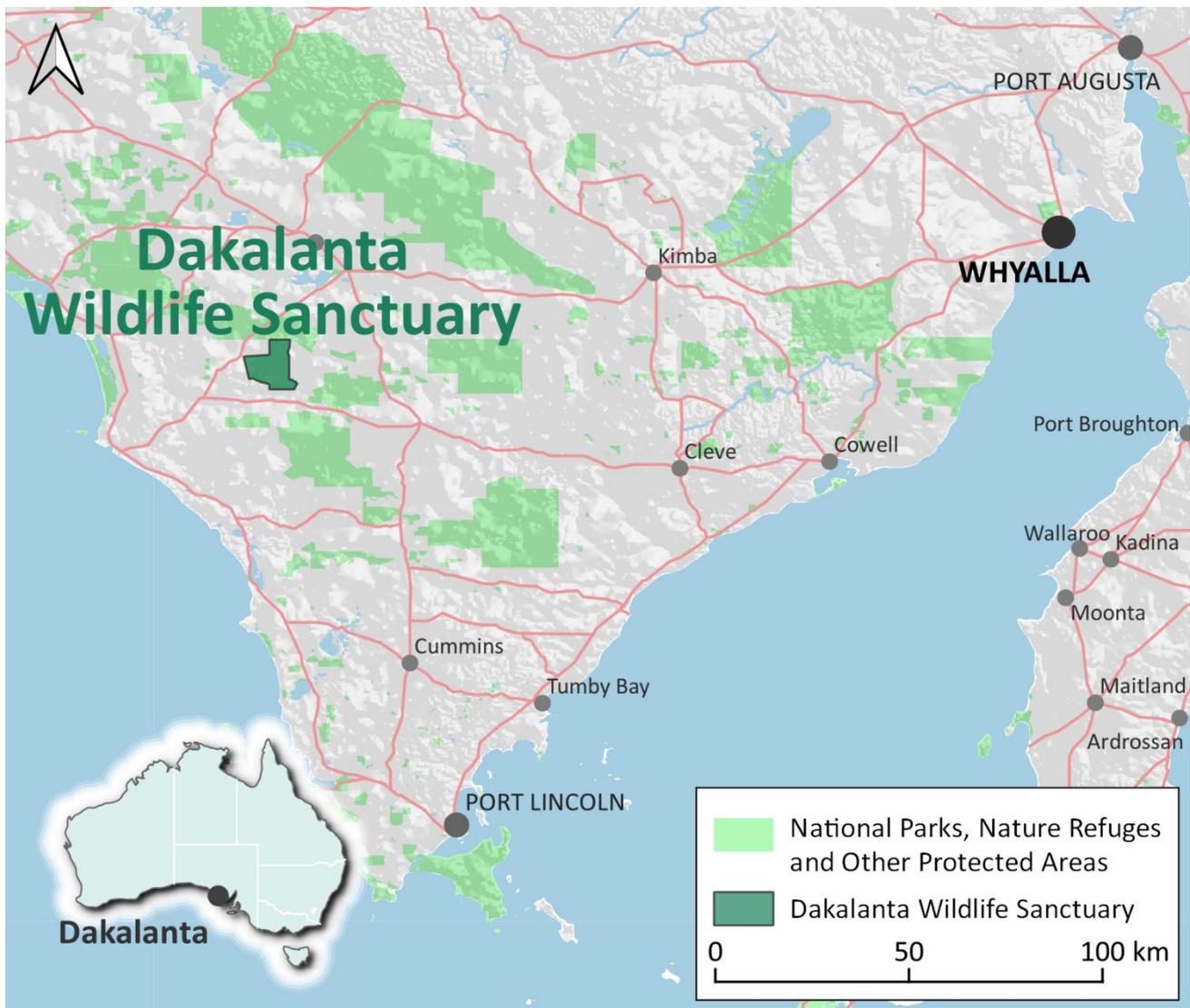


Figure 1. Location and regional context of Dakalanta.

Conservation values

Dakalanta contributes to the protection of the ecosystems in the transition area between the two subregions of the Eyre-Yorke Block: the grassy woodlands of the Talia subregion to the south and west, and the mallee woodlands of the Eyre Mallee subregion to the north and east. The area around Dakalanta has a number of conservation reserves and Heritage Agreement areas (Figure 1). Part of Dakalanta's northern boundary is shared with Cocata Conservation Park, administered by the SA Department for Environment and Water. Otherwise, Dakalanta is bounded by broad-scale sheep and/or cattle grazing properties, some of which have conserved areas of native vegetation via Heritage Agreements.

Vegetation

Dakalanta has 12 broad vegetation communities (Figure 2). The distribution of vegetation communities varies with topography, soil type and past land management practices. The southern portion of the property consists of low rises and flats of calcrete with very shallow soils, which have predominantly been cleared of the original Drooping She-oak (*Allocasuarina verticillata*) grassy woodlands by chaining or grazing. These areas now support extensive grasslands of native and introduced species. Native species of perennial grasses and forbs that remain, such as Wallaby Grass (*Austrodanthonia* spp.), Kangaroo Grass (*Austrostipa* spp.), and Black Grass (*Gahnia lanigera*), are patchily distributed amongst various weed species such as wild oats (*Avena* spp.), nutgrass (*Romulea* spp.), medics (*Medicago* spp.) and Ward's weed (*Carrichtera annua*). This area contains small but important remnant areas of River Red Gum (*Eucalyptus camaldulensis*) woodland, Swamp Paperbark (*Melaleuca halmaturorum*) shrubland and Drooping She-oak grassy woodlands. Southern Cypress Pine (*Callitris gracilis*) is quickly re-establishing in these areas following the removal of livestock.

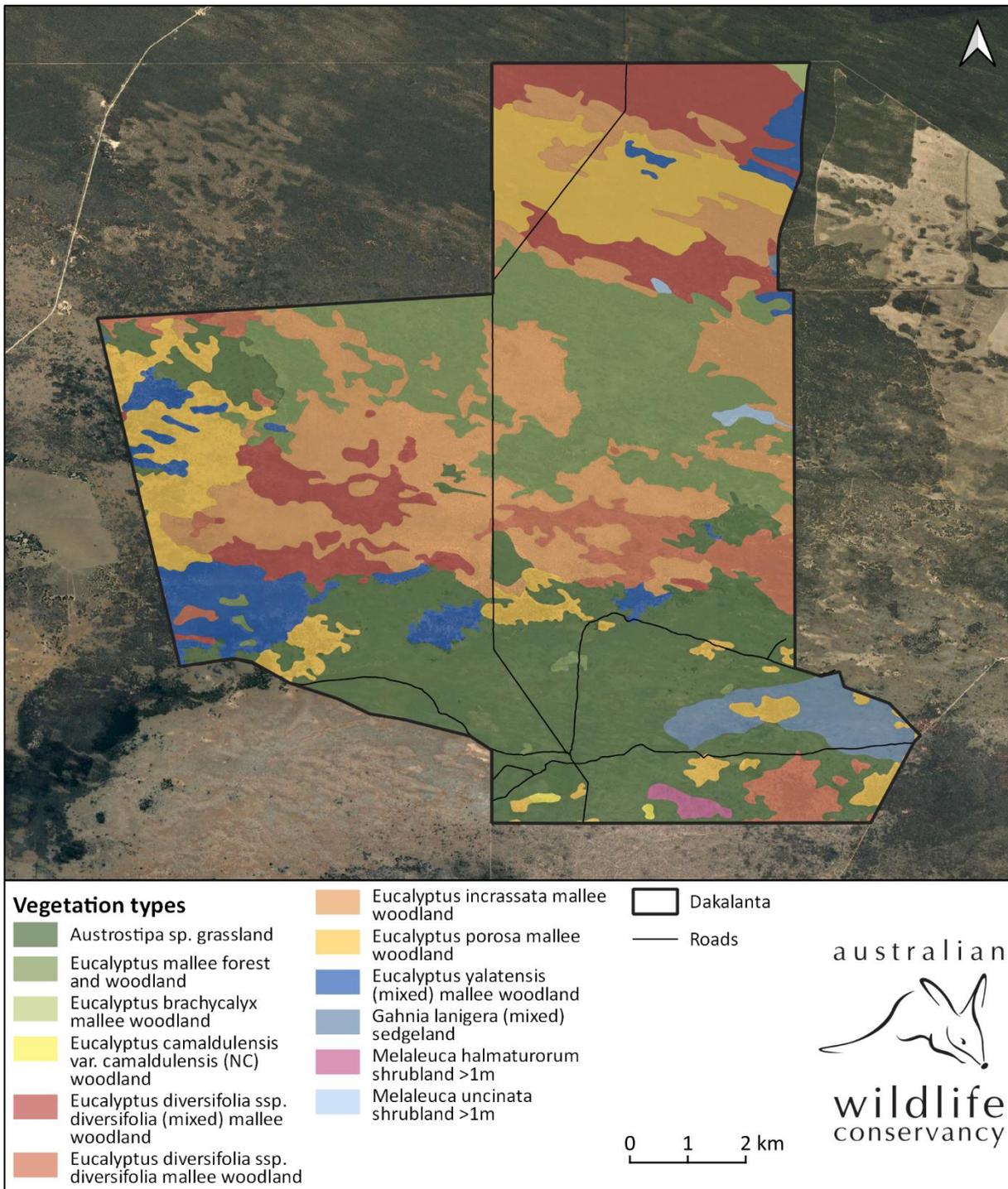


Figure 2. Extent and distribution of broad vegetation types of Dakalanta.

The central and northern portion of Dakalanta supports a more intact vegetation, consisting of mixed mallee species including Mallee Box (*Eucalyptus porosa*), Coastal White Mallee (*E. diversifolia*), White Mallee (*E. dumosa*), Yalata Mallee (*E. yalataensis*) and White Mallee (*E. phenax*); and Southern Cypress Pine woodlands on low sand ridges or shallow calcareous loam flats, both on the shallow underlying calcrete sheet rock. These northern vegetation communities have been less impacted by past agricultural practices, although some are regenerating from past clearing. There are relatively few weeds within these more intact communities. The understory is generally dominated by shrubs such as wattles (*Acacia* spp.), hopbush (*Dodonaea* spp.), fringe myrtles (*Calytrix* spp.) on the shallower soils, and Spinifex (*Triodia irritans*) on sandier soils.

During 2016 and 2017, with the support of AWC, Landcare Australia established a revegetation program over approximately 1,200 ha of open and degraded >1m vegetation in the southern portion of the sanctuary. This program aimed to recreate the Drooping She-oak grassy woodlands that this area would have originally supported. Locally-collected seed of species associated with this vegetation community was direct sown into

the area. The Drooping She-oak woodland has recently been designated by the federal government as a critically endangered vegetation community and is much reduced due to past land management practices and grazing by feral animals.

Dakalanta protects more than 165 native plant species. Sand Bitter-pea (*Davesia arenaria*) and Limestone Bush-pea (*Pultenaea elachista*) are regionally rare species. Up to eight species of native ground orchid have been recorded – with many more expected - and some may be threatened species.

Fauna

A total of 179 species of native vertebrates are currently known or considered likely to occur on Dakalanta (14 mammals, 108 birds, 55 reptiles, and two frogs). This includes one threatened species considered likely to occur – Malleefowl (*Leipoa ocellata*).

Vertebrate assemblages on the Eyre Peninsula are influenced by a biogeographic barrier called the Eyrean Barrier (Keast 1961; Ford 1974). This conceptual dividing line runs through Spencer Gulf and the northern Flinders Ranges. Throughout recent evolutionary history, it split populations of the arid and semi-arid species to the east and west, hindering dispersal. A number of eastern (Bassian) species are not found on Eyre Peninsula, while Eyre Peninsula is the eastern limit of some western (Eyrean) species. The Nullarbor Plain to the west acts as another biogeographic barrier.

Due to the paucity of historic information, the presence of mammal species on Dakalanta prior to European occupation must be deduced from records outside of the region and from present known habitat requirements of these species. Up to 15 vertebrate species of the estimated 42 species thought to have been present on Eyre Peninsula at time of settlement have been lost from Dakalanta (Watts and Ling 1985; Brandle 2010).

More than 170 species of land birds have been recorded from Eyre Peninsula. No bird species are thought to have become extinct on Eyre Peninsula following European settlement. Two species (Diamond Firetail (*Stagonopleura guttata*) and Bush Stone Curlew (*Burhinus grallarius*)) are locally extinct at Dakalanta but are still extant in low numbers elsewhere on Eyre Peninsula.

There are 92 reptile species and four frog species recorded from the Eyre Peninsula. Although little is known of pre-European assemblages, no reptile or frog species are thought to have become extinct in the region.

Threats

Pest animals

Dakalanta, like much of southern Australia, has been impacted by a range of feral animals, including goats (*Capra hircus*), red deer (*Cervus elaphus*) and fallow deer (*Dama dama*), house mice (*Mus musculus*), red foxes (*Vulpes vulpes*), feral cats (*Felis catus*), European rabbits (*Oryctolagus cuniculus*), and Common Starling (*Sturnus vulgaris*). Feral predators and large feral herbivores are subject to ongoing control and monitoring on the sanctuary. A substantial portion of Dakalanta is impacted by feral herbivores, particularly European rabbits. Rabbits generally use burrows of the Southern Hairy-nosed Wombats (*Lasiornhinus latifrons*) as warrens, which precludes control by warren ripping. Goats, red deer and fallow deer are uncommonly encountered in small numbers. AWC conducts opportunistic culling of all feral herbivores on Dakalanta annually.

Feral predators on Dakalanta are the red fox and feral cat. Numbers of these predators likely fluctuate with rabbit numbers. Since 2010, AWC has implemented an annual 1080 poison baiting program on Dakalanta to control foxes, with one or two baiting events per year. Foxes and cats are also shot opportunistically.

Weeds

A total of 40 introduced, or weed, species have been recorded on Dakalanta Sanctuary. Most of the currently known weed species are annuals with few long-lived perennials. One of the currently known weeds - African Boxthorn (*Lycium ferrocissimum*), is classified as a Weed of National Significance and all known plants have been poisoned. Several other weed species, Horehound (*Marrubium vulgare*), Salvation Jane (*Echium plantagineum*) and Lincoln Weed (*Diplotaxis tenuifolia*) are declared species (Department Primary Industries and Regions 2019). Onion weed (*Asphodelus fistulosus*) was previously a declared species however was removed from the declaration in 2015 (Department Primary Industries and Regions 2019). Salvation Jane has

been contained to a few plants, onion weed is in several discrete locations, however the area covered by Horehound and Lincoln Weed is extensive. Therefore, the impact of weeds on ecological health range from minor to substantial. Bridal Creeper (*Asparagus asparagoides*), a Weed of National Significance, has been recorded nearby but is not known on Dakalanta.

Weeds are more common in the most disturbed habitats, around now obsolete farming infrastructure such as yards, tanks and buildings and on and around Southern Hairy-nosed Wombat warrens. Relatively undisturbed habitat such as the mixed species mallee woodland support very few weeds.

Weed management on Dakalanta has largely focused on boxthorn, with over 100 individuals located, mapped and killed to date and the removal of isolated patches of salvation jane and onion weed.

Changed fire regimes

In most regions of Australia fire is a major driver of the structure and composition of local ecosystems, and hence wildlife habitat. Fire is not currently an ecological driver on Dakalanta Wildlife Sanctuary, but the lack of fire may be of ecological significance. There have been no large wildfires in this landscape in many years.

Aboriginal fire practices in the mallee-dominated region of the Eyre Peninsula are poorly documented. However, in other landscapes where Aboriginal fire practices have been documented (e.g., central Australia: Bird et al. 2008), the fire regime typically comprised numerous small low intensity fires, distributed patchily in time and space, grading to less frequent but larger fires elsewhere. There were few available permanent natural water sources in the central Eyre Peninsular so it can be assumed to have been subject to some low level of Aboriginal fire management, particularly in *Triodia*-dominated ecosystems found on deeper sands. Lightning strike is likely to have been another source of fire particularly after favourable seasons produced flushes of growth.

The advent of agriculture and the dislocation of Aboriginal people from their traditional lands resulted in a change in fire patterns, towards infrequent but extensive and relatively intense summer fires. This shift in fire patterns likely caused declines in old growth vegetation, including spinifex communities, and a reduction in the extent of fire sensitive communities. Following European colonisation, pastoralists burnt the grassy woodlands to create forage for livestock, and later settlers cleared the mallee for cropping.

Wildfires have been reported on Dakalanta occasionally, but to date have been relatively limited in extent and low intensity. There are no management burns planned for Dakalanta and there have been no planned or unplanned fire events on Dakalanta in more than 10 years.

Climate and weather summary

Dakalanta is located near the boundary of the warm temperate and semi-arid climate zones. It experiences hot dry summers and mild winters and is within the winter-dominated rainfall zone.

There are no weather records kept onsite at Dakalanta but there are three long-term Bureau of Meteorology recording stations near Dakalanta that are used as a guide: Polda (BOM Station #018139), ~5 km to the south-east (ceased operations in 2005); Elliston (BOM Station number 018069) on the coast approx. 45km west and Kyancutta (BOM station number 018044) approx. 45km to the north-east. Climate data for the three locations are shown in Table 1.

Table 1. Long term average monthly maximum and minimum temperatures and monthly rainfall for Kyancutta, Elliston and Polda weather stations (source: Bureau of Meteorology).

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Kyancutta (1930–2021)	Mean max (°C)	33.1	32.4	29.9	25.5	21.1	17.8	17.2	18.7	22.0	25.4	28.7	31.0	
	Mean min (°C)	14.5	14.4	12.4	9.5	7.4	5.3	4.8	5.0	6.3	8.4	10.9	13.0	
	Mean rain (mm)	14.7	16.2	13.9	19.3	31.7	38.4	39.7	38.8	30.8	25.6	21.8	20.2	310.8
Elliston (Temp 1962–2021, rain 1882–2021)	Mean max (°C)	26.0	25.7	24.3	22.5	19.5	17.2	16.5	17.3	19.4	21.8	23.7	24.8	
	Mean min (°C)	15.8	15.9	14.4	12.3	10.4	8.4	7.9	8.3	9.6	11.2	13.1	14.7	
	Mean rain (mm)	10.9	13.7	14.7	27.1	52.1	71.9	70.6	59.2	39.1	29.9	19.7	16.5	425.2
Polda (1967–2005)	Mean max (°C)	31.0	31.3	28.2	24.6	20.4	17.2	16.7	17.7	20.2	23.7	26.9	29.0	
	Mean min (°C)	14.6	14.9	12.8	9.8	7.6	5.6	4.9	5.4	6.7	8.7	11.4	13.4	
	Mean rain (mm)	13.7	13.7	14.9	22.3	43.2	53.0	61.2	57.5	45.2	30.6	20.7	22.9	398.4

At Polda, mean minimum and maximum temperatures range from 5°C to 31°C; mean annual rainfall is 398 mm. There is a rainfall gradient from the coast (425 mm at Elliston) to inland (311 mm at Kyancutta); Dakalanta is situated somewhere in the middle of this gradient, expected to be similar to Polda (only 40 years of records). This data shows that it is milder in both summer and winter at coastal Elliston than it is further inland at Kyancutta with the Polda area close to Dakalanta is similar to Kyancutta for temperatures but closer to Elliston for rainfall values.

Like much of southern Australia, over the last few years, Dakalanta has experienced higher than average temperatures and drier than average conditions. Annual rainfall recorded at Kyancutta was just below average to well below average in eight of the past 10 years while at Elliston it has been below average to well below average for four of the past ten years (Figure 3). During 2021 summer maximums were slightly cooler than the long term average at both Kyancutta and Elliston while for the remainder of the year at both stations day-time maximums and night-time minimums were slightly higher than long term averages. Rainfall recorded at Elliston in 2021 was well above long term average and rainfall recorded at Kyancutta was average primarily due to a very wet early summer (Figure 4).

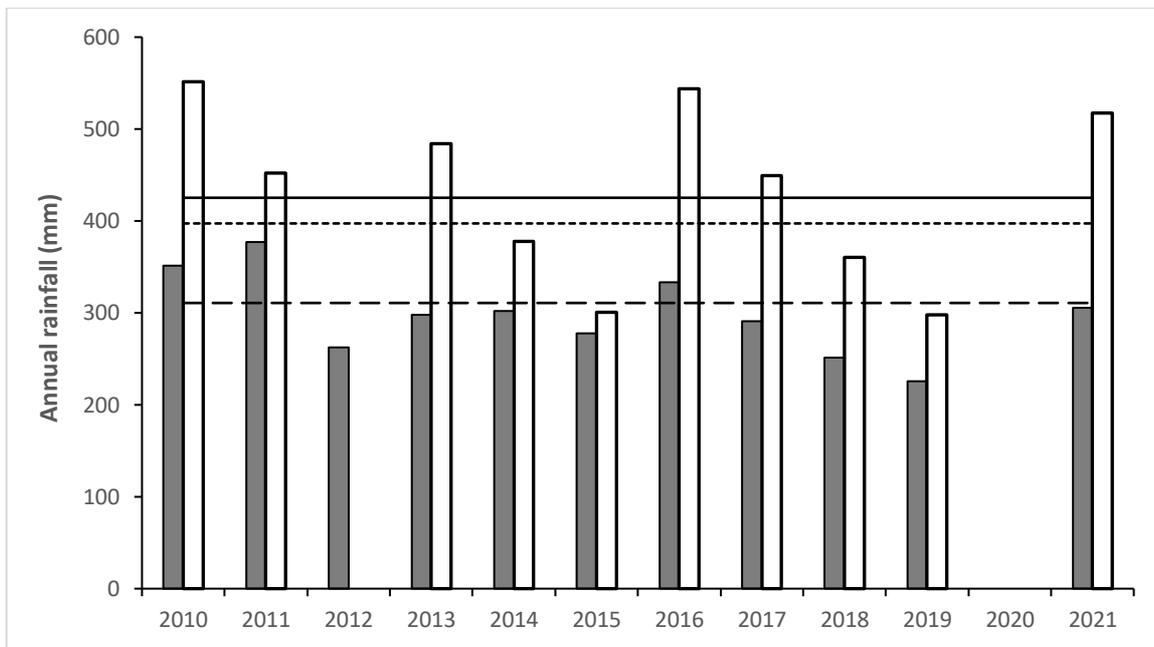


Figure 3. Annual rainfall at Dakalanta, using Kyancutta (grey column) and Elliston (white column). Solid line Elliston long term average 1882-2021, short-dashed line Polda long term average 1967–2005, long dashed line Kyancutta long term average 1930-2021. Note: rainfall record data incomplete at Elliston for 2012 and both Kyancutta and Elliston in 2020 therefore are not included in chart.

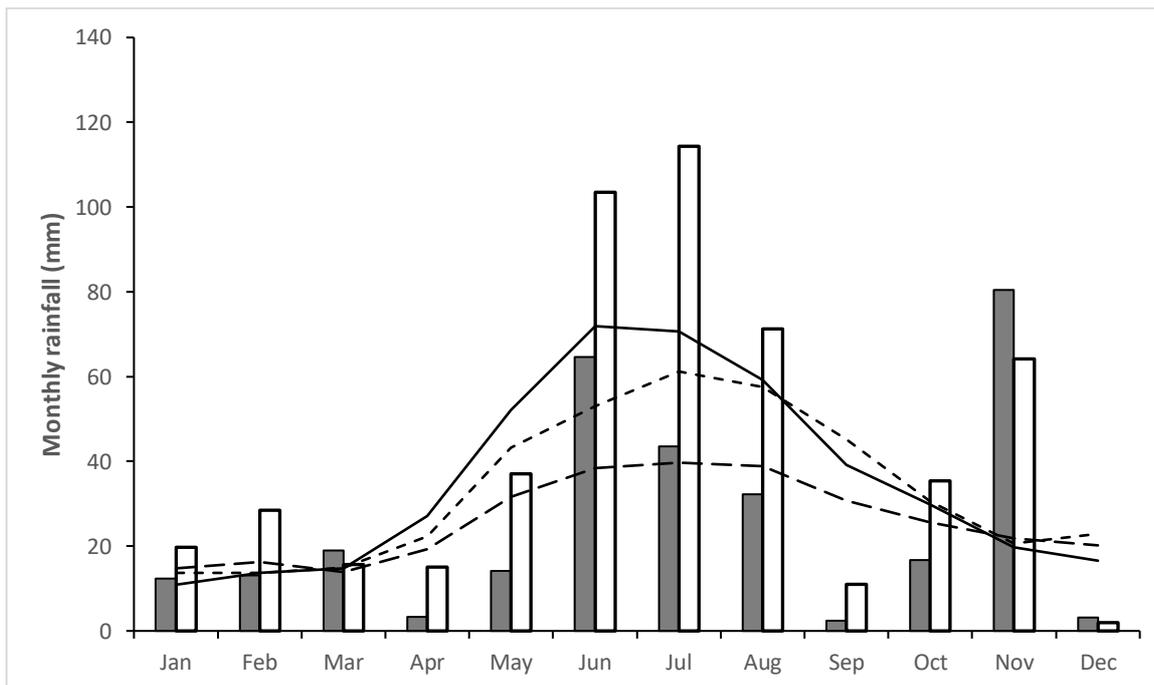


Figure 4. Monthly rainfall at Dakalanta in 2021, using Kyancutta (grey column) and Elliston (white column). Solid line Elliston long term average 1882-2021, short-dashed line Polda long term average 1967–2005, long dashed line Kyancutta long term average 1930-2021.

Methods

Monitoring and evaluation framework

Dakalanta's Ecohealth Monitoring Program has been designed to measure and report on the status and trends of selected biodiversity and threat indicators on the property, using metrics derived from data collected through a series of purpose-designed surveys. Where possible, outcomes will be evaluated against performance criteria relevant to each species, guild or assemblage.

Threatened and iconic species

The Ecohealth program is focused on species of high conservation value, including **threatened** and **'iconic'** species (e.g., regional endemics, species with high public profile and other species of conservation importance because of the role they play in an ecosystem, etc). Where relevant, **reintroduced species** are also in this category.

Monitoring programs for reintroduced species in the establishment phase (i.e., within 5-10 years of establishment) are typically set out in a *Translocation Proposal*, along with success criteria to evaluate outcomes around survival, recruitment, population size, etc.

AWC will develop *Population Management Plans* to underpin management of long-established populations of reintroduced species, to ensure early detection of any serious issues that arise, and to trigger timely responses. These plans will specify a monitoring and evaluation program (e.g., Berry et al. 2021).

AWC will aim to develop *Conservation Plans* for the remaining (extant) threatened and iconic species, with similar objectives to Population Management Plans. These plans will specify metrics to monitor outcomes for target species against nominated performance criteria.

Assemblages

AWC's mission involves the conservation of all wildlife, not only threatened or reintroduced species. For this reason, AWC's monitoring program extends to surveillance monitoring of faunal assemblages (mammals, birds, reptiles, frogs). The monitoring program aims to address questions relevant to the conservation of assemblages.

At the most basic level, the program seeks to establish whether all species that are known to occur on the property are still persisting on the property (i.e., 'are all species present?').

With increasing information, the monitoring program can address more detailed questions relating to conservation of assemblages, such as 'have species maintained their distributions or abundance?' However, the boom/ bust conditions of most Australian environments can lead to large variations in the numbers of individuals in a population and the habitats or sites occupied by a species – these variations may not necessarily be informative in relation to the conservation of a species at a property over the long term.

AWC is currently working on developing an evaluation framework for surveillance monitoring of faunal assemblages. At present, we will continue to present data on a range of metrics relating to indicator species and guilds.

Indicators and metrics

On Dakalanta, 26 biodiversity (species and guilds) indicators have been selected for monitoring (Table 2). Five of these indicators are reported on in this 2021 Ecohealth Report, all related to surveillance monitoring of faunal assemblages.

Threat metrics are selected to monitor the status and trends of introduced weeds, predators and herbivores, and fire regimes. Six threat indicators have been selected for monitoring (Table 3). No feral predator or herbivore transects were conducted on Dakalanta during 2021, as such none of these threat metrics are reported on in this 2021 report.

Table 2. Biodiversity indicators and metrics for Dakalanta.**Key threatened and iconic vertebrates**

Indicator	Survey name	Survey method	Metric/s
Mammals			
Southern Hairy-nosed Wombat (<i>Lasiorhinus latifrons</i>)	Southern Hairy-nosed Wombat Survey (TBD)	TBD	TBD
Birds			
Malleefowl (<i>Leipoa ocellata</i>)	Malleefowl Survey (TBD)	TBD	TBD

Vertebrate assemblages and surveillance species

Indicator	Survey name	Survey method	Metric/s
Mammals			
Assemblage richness	Standard Trapping Survey, incidentals	Box traps, pitfall traps	Number of species
Large mammals			
Assemblage richness	Large Herbivore Survey (TBD)	Transects	Number of species
Large macropod guild	Large Herbivore Survey (TBD)	Transects	Abundance Richness
Small-medium mammals			
Assemblage richness	Standard Trapping Survey	Box traps, pitfall traps	Number of species
All small-medium mammals (trappable)	Standard Trapping Survey	Box traps, pitfall traps, funnel traps	Abundance
Dasyurids - guild	Standard Trapping Survey	Box traps, pitfall traps, funnel traps	Abundance
Little Long-tailed Dunnart (<i>Sminthopsis dolichura</i>)	Standard Trapping Survey	Box traps, pitfall traps, funnel traps	Abundance, occupancy
Western Pygmy Possum (<i>Cercartetus concinnus</i>)	Standard Trapping Survey	Box traps, pitfall traps	Abundance, occupancy
Reptiles			
Assemblage richness	Standard Trapping Survey	Pitfall traps, funnel traps	Number of species
Small-medium reptiles - all	Standard Trapping Survey	Pitfall traps, funnel traps	Abundance, richness
Skinks - guild	Standard Trapping Survey	Pitfall traps, funnel traps	Abundance, richness
Geckos - guild	Standard Trapping Survey	Pitfall traps, funnel traps	Abundance, richness
Agamids - guild	Standard Trapping Survey	Pitfall traps, funnel traps	Abundance, richness
Oriental Skink (<i>Ctenotus orientalis</i>)	Standard Trapping Survey	Pitfall traps, funnel traps	Abundance, occupancy
Barking Gecko (<i>Underwoodisaurus milii</i>)	Standard Trapping Survey	Pitfall traps, funnel traps	Abundance, occupancy
Peninsula Dragon (<i>Ctenophorus fioni</i>)	Standard Trapping Survey	Pitfall traps, funnel traps	Abundance, occupancy
Birds			
Assemblage richness	Standard Bird Survey	Pitfall traps, funnel traps	Number of species
All birds	Standard Bird Survey	20-min counts	Abundance, richness

Indicator	Survey name	Survey method	Metric/s
Honeyeaters - guild	Standard Bird Survey	20-min counts	Abundance, richness
Ground active birds - guild	Standard Bird Survey	20-min counts	Abundance, richness
Woodland birds - guild	Standard Bird Survey	20-min counts	Abundance, richness
Frogs			
Frogs - all	Frog Survey (TBD)	TBD	Abundance, richness

Vegetation indicators and surveillance species

Indicator	Survey name	Survey method	Metric/s
Drooping She-oak grassy woodland	Flora Survey (TBD)	TBD	TBD
Ground orchids	Flora Survey (TBD)	TBD	TBD

Table 3. Threat indicators and metrics for Dakalanta.

Indicator	Survey name/ methods	Metric/s	Performance criteria
Pest animals			
Feral cat (<i>Felis catus</i>)	Feral Predator Survey (TBD)	Abundance	TBD
Fox (<i>Vulpes vulpes</i>)	Feral Predator Survey (TBD)	Abundance	TBD
Feral herbivores			
Feral goat (<i>Capra hircus</i>), red deer (<i>Cervus elaphus</i>), fallow deer (<i>Dama dama</i>)	Large Herbivore Survey (TBD)	Abundance	TBD
Rabbit (<i>Oryctolagus cuniculus</i>)	Rabbit survey (TBD)	Density Occupancy	TBD
Weeds			
Weeds	Weeds Survey (TBD)	Area infested	TBD
Other threatening processes			
Over-abundant macropod species	Large Herbivore Survey (TBD)	Population estimate	TBD

Survey types and history

To report on the Biodiversity and Threat Indicators, our survey teams conduct a variety of surveys over a period of 1–5 years. These include:

For key threatened and iconic species, targeted surveys include:

- Southern Hairy-nosed Wombat Surveys (TBD)
- Malleefowl Surveys (TBD)

For surveillance monitoring of assemblages, these include:

- Standard Trapping Survey
- Standard Bird Survey
- Large Herbivore Survey (TBD)
- Flora surveys (TBD)
- Frog Survey (TBD)

To monitor threats, a range of surveys are used, including:

- Feral Predator Survey (TBD)
- Large Herbivore Survey (TBD)
- Rabbit Survey (TBD)
- Weeds Survey (TBD)

One of the ecological surveys was conducted on Dakalanta in 2021: Standard Bird Survey. Below is a list of surveys reported upon in this Ecohealth Report (Table 4). The methodology is described and results of these surveys and computations are reported on in this document.

Table 4. Survey history and effort for Ecohealth surveys on Dakalanta reported on in this report.

Survey name	Effort (2021)	Description/comment	Previous surveys
Standard Trapping Survey	0	41 sites with pitfall, Elliot and funnel traps. Stratified to cover a range of topography and major vegetation types	2018: 4,920 trap-nights 2011–14: 4,560 trap-nights
Standard Bird Survey	123 bird surveys	41 survey sites. Each survey was a 20 minute - 2 ha survey on 3 consecutive mornings shortly after dawn with a single observer.	2018: 123 bird surveys (41 sites, 3 replicates) 2011–14: 114 surveys (38 sites, 3 replicates)

Survey design and methods

The Dakalanta Ecohealth Monitoring Program is based on 41 permanent survey sites. Three to 12 sites are located in each of five main habitat types (Figure 5). Survey sites were selected based on vegetation type, accessibility, and depth to underlying sheet limestone. Replicates in a habitat type are located at least 500 m apart. Previous surveys covered 38 sites; these were surveyed annually, in March, from 2011 to 2014. For the 2018 survey, the number and location of survey sites were revised to better reflect the relative area of each of the five main habitat types on the sanctuary. This revision resulted in some of the original 38 sites being discontinued and new sites being established resulting in a net increase in the number of permanent survey sites (to 41). The timing of the survey was also changed from autumn to spring to better fit with survey effort elsewhere in the region. In addition, the planned frequency of surveys was reduced from annually to nominally every three years, as environmental change in semi-arid environments is usually slow enough that surveys are not required every year. Surveys are best carried out during wetter or drier than normal years, when major changes in the fauna assemblages may be expected.

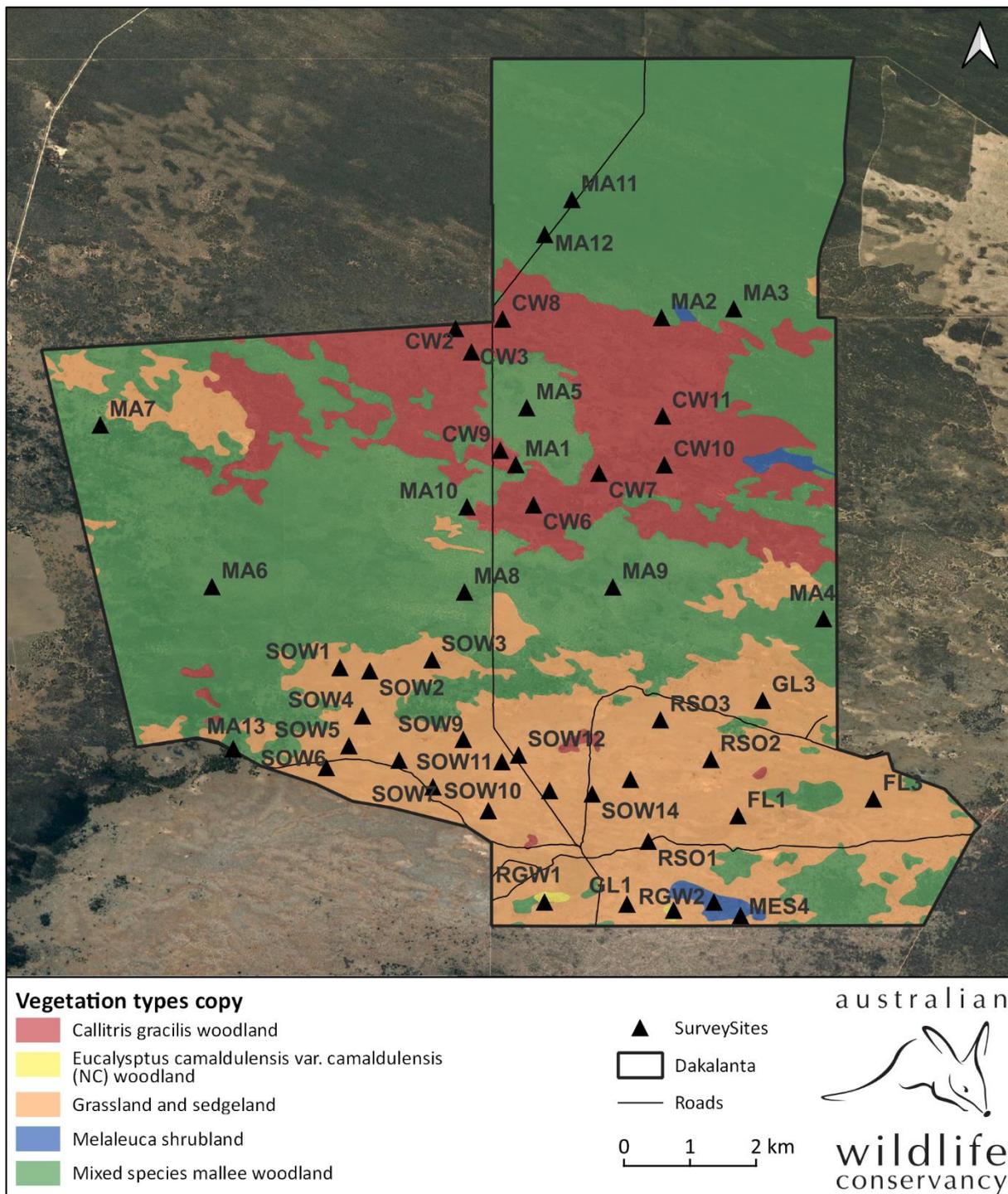


Figure 5. Locations of Ecohealth monitoring sites on Dakalanta, stratified by vegetation type.

Standard Bird Survey

Standard Bird Surveys are conducted at the 41 Standard Trapping Survey sites (Figure 5), a minimum annually, and more frequently in some years (two surveys per year). In 2021, the Standard Bird Survey was conducted in spring, with each of the 41 sites replicated across three survey mornings.

Surveys were carried out using the BirdLife Australia Atlas methodology (Blakers et al. 1984). The observer spent 20 minutes actively searching 2 ha centred on the survey site. All sightings or vocalisations were identified and recorded. Additional individuals of a species were only recorded if the observer was certain that they had not been recorded previously. Surveys were repeated on three mornings.

Weed Survey

Area infested by weeds was estimated through visual assessment of weed extent. In the future, extent of infestation of individual weed indicator species (i.e., species that are identified as priorities in the Dakalanta Weed Management Strategy and, thus, selected as Ecohealth Threat Indicators) will be mapped and measured using a standard approach.

Analysis methods

Most Ecohealth metrics are common across the indicator species for Dakalanta. Unless noted otherwise, the metrics are calculated as set out in Table 5 below.

Table 5. Metrics and associated calculations for Dakalanta.

Indicator	Metric	Survey Data Sources	Description	Analysis Summary / Calculation
Assemblage richness	Number of species	All surveys and incidental records	A measure of intactness for the whole sanctuary	The number of species detected on the sanctuary within the last 1-5 years is compared to the number of species listed as 'confirmed', 'very likely' or 'likely' on the sanctuary species list.
Various	Abundance	Standard Bird Survey	Abundance: A measure of activity; number of detections per 100 trap nights or per site/survey	<p>Per 100TN</p> <p>Individuals: (total number of individuals of a particular species recorded/total trap nights)/ * 100 trap nights</p> <p>Guilds: (number of individuals recorded within the relevant guild/total trap nights) * 100 trap nights</p> <p>Per site</p> <p>Guilds: Average number of individuals recorded across surveys at each site, averaged across all sites</p>
Various	Richness	Standard Bird Survey	Richness: A measure of diversity; average number of species per site/survey	Total number of species recorded within the relevant guild / total number of sites or surveys

Results

Key threatened and iconic vertebrates

No surveys were conducted for threatened or iconic species at Dakalanta during 2021.

Assemblages and surveillance species

Mammals

No mammal surveys were undertaken in 2021.

Reptiles

No reptile surveys were undertaken in 2021.

Birds

In 2021, a total of 65 species were recorded of the 108 species that are known or likely to occur on Dakalanta.

The Standard Bird Survey was conducted in spring 2021. Abundance and species richness were all lower than those recorded in previous survey (Table 10). In 2021, bird abundance was spread relatively evenly across the three guilds (Table 10). The ground active birds were the most abundant, followed by woodland birds and honeyeaters (Table 10).

Table 10. Bird abundance and richness in 2021. Abundance is the average count (number of individuals) per survey; richness is the average number of species detected per survey.

Species	Abundance		Richness	
	2018	2021	2018	2021
All birds	9.7	8.5	4.3	3
Honeyeaters - guild	2.7	1.7	1.1	0.6
Ground active birds - guild	3.1	3.9	1.3	1.2
Woodland birds - guild	3.1	2.2	1.5	1

Threat indicators

Feral animals

No feral predator or herbivore surveys were conducted on Dakalanta during 2021.

Weeds

In 2021, 3 ha of Dakalanta is estimated to be infested with weeds. During 2021, more than 9,000 individual weed plants were manually removed or treated *in situ* with herbicide. These were primarily Onion Weed, Horehound and African Boxthorn. Weeds are an ongoing threat that require constant management and monitoring. Over the past 10 years, management action on Dakalanta has been concentrated on 'Weeds of National Significance' (WONS), proclaimed species and environmental weeds that can be controlled. In that time AWC has systematically located, mapped and killed more than 120 individual African Boxthorn and variable numbers of other weed species such as Onion Weed, Salvation Jane and Horehound.

Discussion

Dakalanta is a medium-sized sanctuary within the AWC property portfolio that provides important connectivity in the Eyre Peninsula region. The sanctuary's range of vegetation communities supports a diversity of fauna and flora, including several declining and regionally significant bird species. Dakalanta also supports a significant area of the critically endangered Drooping She-oak grassy woodland vegetation community.

The 2021 Standard Bird Survey saw a lower overall species richness and abundance of birds since the previous survey. Each of the guilds were lower in abundance from previous survey. These results reflect the impact of the prolonged dry period this area has experienced over the past few years where diversity is broadly stable

but numbers of individuals of each species are reduced. This is particularly evident with the resident small ground active bush birds and woodland birds that do not move compared to many species of honeyeater that attempt to move to more favourable areas when conditions become unfavourable. This may be due to lack of flowering species and several dry years.

The highest priority management issues on Dakalanta are feral herbivores, over-abundant large macropods and feral predators. These groups impact on conservation-dependent flora and fauna through overgrazing, predation and competition. Over-grazing also impedes the recovery of the highly degraded grassy woodland habitat. The degraded nature of a significant proportion of the sanctuary, combined with its being surrounded by agricultural properties, makes some management issues challenging. Nonetheless, a substantial number of Weeds of National Significance have been removed; with the highest number to date removed in 2021. Ongoing monitoring and management of these threats is essential to support conservation efforts on Dakalanta.

Moving forward, in addition to the standard mammal, reptile and bird surveys, Dakalanta's Ecohealth Monitoring Program will include: targeted surveys on the Southern Hairy-nosed Wombat; determining if the Malleefowl is present; targeted surveys for ground orchids, Large Herbivore Surveys; targeted weed surveys; and targeted monitoring of feral predators, large herbivores and rabbits.

Acknowledgment

AWC acknowledges the Traditional Owners of the country on which Dakalanta Wildlife Sanctuary resides. We also acknowledge their continuing connection to land, culture and community. We pay our respects to Traditional Owner Elders past present and emerging.

AWC's Ecohealth Program is only possible because of the generosity of AWC's supporters.

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References

- Berry L, Holland G, Anson J, Pierson J, Kanowski J (2021) *Bridled nailtail wallaby: Population management plan Scotia Sanctuary*. Australian Wildlife Conservancy, Perth, WA.
- Bird RB, Bird DW, Coddling BF, Barker CH, Jones JH (2008) The "fire stick farming" hypothesis: Australian Aboriginal foraging strategies, biodiversity, and anthropogenic fire mosaics. *Proceedings of the National Academy of Sciences* Vol. 105 No. 39.
- Blakers M, Reilly P, Davies S (1984) *The atlas of Australian Birds*. Melbourne University Press.
- Brandle R (2010) *A biological survey of the Eyre Peninsula of South Australia*. Department for Environment and Heritage, South Australia.
- Department of Primary Industries and Regions (2019) *Landscape South Australia Act 2019*. Government of South Australia, Adelaide
- Ford J (1974) Speciation in Australian Birds Adapted to Arid Habitats. *Emu - Austral Ornithology* 74, 161–168.
- Kanowski J, Joseph L, Kavanagh R, Fleming A (2018) Designing a monitoring framework for Australian Wildlife Conservancy, a national conservation organisation. In: *Monitoring Threatened Species and Ecological Communities* (Eds S Legge, DB Lindenmayer, NM Robinson, BC Scheele, DM Southwell, BA Wintle) pp 239-251. CSIRO, Melbourne
- Keast A (1961) Bird speciation on the Australian continent. *Bulletin of the Museum of Comparative Zoology, Harvard* 123, 303–495.
- Mutze G, Cooke B, Lethbridge M, Jennings S (2014) A rapid survey method for estimating population density of European rabbits living in native vegetation. *The Rangeland Journal* 36, 239.
- Watts CHS, Ling JK (1985) Marine and terrestrial mammals. In: *Natural history of Eyre Peninsula*, Twidale CR, Tyler MJ, Davies M (Eds), Royal Society of South Australia, Northfield, Australia.

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