

## VAST-2 - Site-based recording of use and land management and their effects on native vegetation over time

**Citation:** Thackway, R (2012). Wirilda, Harrogate, SA. Eucalyptus - Allocasuarina open grassy woodland. Ver.1. VAST-2: tracking vegetation transformation in Australian landscapes. Australian Centre for Ecological Analysis and Synthesis, University of Queensland, Brisbane.

### 1. Name of site/area

Wirilda - Eucalyptus-Allocasuarina open grassy woodland.

Harrogate, SA - Brendan and Elizabeth Lay (Eastern slopes Mt Lofty Ranges), Eucalyptus-Allocasuarina open grassy woodland, 17 ha in area, all restored vegetation covered by Heritage agreement for permanent protection for biodiversity conservation.

### 2. Last modified (version no. 1)

Minor changes July 2013.

### 3. Location of site

**State:** South Australia

**Biogeographic context** – n/a

**Co-ordinates:** 35°0'1.32"S, 139°1'25.69"E

### 4. Area of the site

26 ha.

### 5. Brief description of the natural undisturbed ecosystem of the site/area

- Wirilda is located a short distance from the Bremer River. The natural undisturbed ecosystem was a grassy woodland on the eastern fall of the Mount Lofty Ranges
- Pre-European reconstructed vegetation community: River red gum (*Eucalyptus camaldulensis*), Blue Gum (*E. leucoxylon*) – Drooping sheoak (*Allocasuarina verticillata*) open woodland.
- Found on the mid and lower slopes gently to moderately undulating (5-20% slopes) (Lay 1983).
- Skeletal soils overlying bedrock of a highly micaceous porphyry or graywacke. These rock strata are inclined almost vertically, giving the country a characteristic appearance with small "pinnacles" of rock outcropping throughout. (Lay 1983).
- Where any depth of soil is present, neutral sandy-loams overly a friable red clay of pH 8-8.6. (Lay 1983).
- Rainfall on the site is about 450 mm falling mainly in winter and spring but is highly variable. Frosts only occur in the valleys, and average January maximum temperature is about 29°C.



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### 6. Current purpose (2011/12) of the site/area

Private land conservation covenant near Harrogate, SA

Since 1982 Wirilda has been gazetted as a Heritage Agreement under the SA Department of Environment and Heritage's legislation to protect native vegetation. In addition, all of Wirilda is run in conjunction with a fellow scientist in the Agriculture Department, who owns adjoining land east of the Bremer River. Together we manage about 105 hectares (255 acres) for reforestation (Lay 1983).

### 7. Reference or benchmark vegetation description: pre-clearing or pre-European community

Eucalyptus - Allocasuarina open grassy woodland. NVIS level 6 sub-association

	Overstorey	Midstorey	Understorey - ground layer
Species	Eucalyptus camaldulensis (River red gum) +/- E. leucoxylon (Blue Gum)+/- Allocasuarina verticillata(Drooping sheoak) are co-dominant	Acacia argyrophylla, +/- Acacia armata+/-A. paradoxa, +/- A. pycnantha and the rare A. menzeli; +/- Bursariaspinoso+/-, Melaleuca acuminata, +/- M. lanceolata +/- Callistemon macropunctatus in creeklines	Lomandra effusa, L. multiflora ssp. dura, Austrodanthonia spp., Austrostipa spp., +/-Themeda triandra ground layer.
Species richness	12	25	60
Growth form	Tree	Shrub	Sedges and tussock grasses
Structural Formation Class	Open Woodland	Sparse shrubland	Open tussock grassland
Height	15-20m	1-3m	<1m
Foliage cover (%)	10-30	<10	25

### 8. Brief history of the site/area:

1750-1849	Meru indigenous people manage the area
1838	Explorers traversed the area
1850	Pastoralists with shepherds, grazing sheep
1883	Land selected, boundary fencing established
1883-1900	Continuous grazing with sheep and cattle grazing native vegetation
1890	Heavy timber cutting for Callington and Kanmantoo mines, sheep grazing
1901-72	Continuous grazing with sheep and cattle grazing modified and native pastures
1901-ongoing	Area invaded by invasive pasture species (oats) and weeds
1950	Commenced fertilizing pastures using super - applied aerially
1972	Area purchased by the Lay family



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1974	Ceased applications of super fertilizer, ceased grazing all Cattle removed
1974-1981	Planted thousands of local endemic seedlings mainly trees and shrubs
1974-2012	Monitoring and recording of seedling survival and regeneration
1974-1985, 2006-12	Major effort in controlling weeds and feral animals
1982	Area gazetted as a Heritage Agreement
1992	Massive summer rains (a 1:430 year event) with major erosion along watercourses and regeneration of most species
2004	Neighbour starts fire that burns out 25% of area
2006	Area gains a 10 year package of funding under the “bushbids” biodiversity stewardship programme
2007	<i>Monadenia</i> weed orchid and bridal creeper begin to invade area

### 9. Proximity to large area of intact and largely intact and unmodified remnant

Greater than 50 km

### 10. Sources of data and information used to complete description of use and management and their effects of native vegetation over time

- A. Lay B & E pers, comm. Feb 2012
- B. Original land survey plan – 1853
- C. Inferred by Richard Thackway
- D. Lay, B. (1983). Re-establishing a ‘natural’ vegetation community. Conference paper Society for Growing Australian Plants, SA Region, Adelaide.
- E. Photos taken by B & E Lay pers, comm. along Wirilda Road
- F. Aerial photo 05/1984 February 1:10,000
- G. Google Earth images 24/06/2002, 24/02/2003, 24/01/2004, 17/08/2005, 21/01/2006, 06/10/2010
- H. Tim Croft pers, comm.
- I. Indigenous Language Map <http://www.abc.net.au/indigenous/map/>



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Description of use and management and their effects on native vegetation over time (explanation of numbered codes in Attachment 1)

Year	Source year	Temporal reliability	Land use (ALUM <sup>1</sup> )	List of LU <sup>2</sup> and LMP <sup>3</sup>	Source LMP	Reliability LMP	Observed effects and consequences on ecological function and native vegetation	Source effects	Spatial reliability effects
1838	C	4	Managed resource protection 1.2.0	Meru indigenous people manage the area	I	7	Mixed age Eucalyptus - Allocasuarina open grassy woodland	C	7
1838	H	4	Managed resource protection 1.2.0	Explorers traversed the area via the Bremer River valley to the lakes – Lake Alexandrina	H	7			
1850	A	4	Grazing native vegetation 2.1.0	Pastoralists with shepherds. No fences.	A	7			
1883	B	4	Grazing native vegetation 2.1.0	Sections were surveyed into 80 acre "living areas" and thrown open to selectors. Sections 2010 and 2011 (~160 acres) in the County of Sturt in the Hundred of Kanmai	B	7	Mixed age Eucalyptus - Allocasuarina open grassy woodland	B	7
1890	D	5	Grazing native vegetation 2.1.0	Callington and Kanmantoo mines required large amounts of timber to fire their smelters. These mines even paid farmers for timber which they were happy to get rid of in any case, as more grass could be grown, and a scattering of trees were left for shelter	C	7	The original settlers cleared all the smaller trees and shrubs, but many of the larger trees were left.	D	8

<sup>1</sup> ALUM = Australian Land Use and Management classification

<sup>2</sup> LU = Land use

<sup>3</sup> LMP = Land or vegetation Management Practice



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1890	D	5	Grazing native vegetation 2.1.0	Unsuitable trees for mine timber were ringbarked and left to dry out? Trees cut green and snigged by bullocks?	C	7	Paddocks largely bare of timber. Stumps remained.	C	8
1900	D	5	Land in transition – treed 2.1.0	Area ploughed and sown to black oats	D	8			
1900-70	D	5	Grazing native pasture	continuous grazing	D	8	Isolated trees have gradually died out through exposure, fire or just old age. Regeneration of overstorey and understorey species prevented via grubbing out suckers and ringbarking Soil erosion ... type.	D	8
1930	C	5	Grazing modified pastures 3.2.0	Sheep number / ha Cattle number / ha		9			
1950	D			Commenced fertilising pastures using super - applied aerially	D	7			
1970	D	4	Land in transition – treed 2.3.0	Ceased applications of super fertiliser	D	7			
1972	D	4	Grazing modified pastures 3.2.0	Original 38 ha site purchase by B & E Lay	D	7	Valley salting observed and attributed to overclearing of the trees Vegetation was almost entirely exotic (annual) pasture grasses and weeds. Wild oats dominated, with cape weed and Salvation Jane (Patterson's Curse) in parts. The only native species present were four isolated trees, and some rushes in salty seepage areas.	D	7
1972-73	D	4	Land in transition – treed 2.3.0	All cattle removed	D	7	Health of canopies of the few old established trees was poor to defoliation by insects	C	7
1972-83	D	4	Land in transition – treed 2.3.0	No rabbits observed to be present on the site – Hares common	D	7			



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1974	D	4	Land in transition – treed 2.3.0	Original 32 ha site purchased by B Lay. Area mapped as two separate vegetation communities: Callitris and mallee grassy low woodland on the upper slopes and ridges; and Eucalypt and Allocasuarina grassy woodland on mid and lower slopes	A	7	Health of canopies of the few old established trees was poor due to defoliation by insects	A	7
1974	F	4	Land in transition – treed 2.3.0	Height and cover of the Euc and Allocasuarina community. Photo available from Lay family as a jpg file	E	7	Photo shows large and extensive biomass of improved pasture – black oats. Native tree restricted to the gullies.	C	7
1974	D	4	Land in transition – treed 2.3.0	Commenced planting a few hundred native plants - species were not necessarily indigenous to the area	D	7			
1974	D	4	Land in transition – treed 2.3.0	Commenced planting in the north east and south east to re-establish a 'natural' vegetation community. See Fig 2 SCAP paper	D	7			
1974	D	4	Land in transition – treed 2.3.0	Seed from several specimens of each species growing in the locality was collected to maintain local gene pools	D				
1974	D	4	Minimal Use - conservation	very wet year	D				
1974-77	C	4	Land in transition – treed 2.3.0	Major saw-fly larvae and scale infestations	D	7	Defoliation of the tree leaves	C	8



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1974-77	C	4	Land in transition – treed 2.3.0	Stray stock regularly removed	D	7	Caused deaths of seedling plants surviving the first summer	D	7
1974-81	D	4	Land in transition – treed 2.3.0	11000 planting sites combined with effective weed removal, minimal soil disturbance, and "puddling in" the plant before backfilling to ensure capillary continuity of the soil in the tube with the surrounding earth. Planting density averages 178-200% of estimated final density, to allow for natural selection.	D	7	Seedling survival averaged 60-78%.	D	7
1974-83	D	4	Land in transition – treed 2.3.0	Maintain a system of firebreaks (which also serve as access roads) and to control pest plants - African daisy and several thistles	D	7			
1974-83	D	4	Managed resource protection 1.2.0	Monitoring - record detailed book kept - including seed source, locality and time of all plantings as well as geocoding of plantings using 80m grids	D	7			
1974-83	C	4	Managed resource protection 1.2.0	Replaced seedlings in gaps which had died using the above method	C	7			
1978-83	C	4	Managed resource protection 1.2.0	Minimal saw-fly larvae and scale infestations as the bird populations have increased	D	7			



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1979	D	4	Land in transition – treed 2.3.0	7 ha added to the original 21 ha including a crossing the Bremer river	D				
1979	D	4	Managed resource protection 1.2.0				Dramatic improvement in the health of canopies of the few old established trees on the site	D	7
1979	D	4	Managed resource protection 1.2.0	Mouse - plague	D	7	Caused deaths of seedling plants surviving the first summer	D	7
1981	D	4	Managed resource protection 1.2.0	Waterlogging 680 mm rainfall	D	7	Caused deaths of seedling plants surviving the first summer	D	7
1982	D	4	Managed resource protection 1.2.0	Severe drought (192 mm rainfall ) and frosts	D	7	Caused deaths of seedling plants surviving the first summer	D	7
1982	D	4	Managed resource protection 1.2.0	Area gazetted as a heritage agreement	D	7	Native vegetation on the site is protected from clearing within constraints of a formal management agreement	C	7
1983	D	4	Managed resource protection 1.2.0	Planting of the tree and large shrub component is nearly complete	D	7			
1983	A	4	Managed resource protection 1.2.0	Monitoring and recording	A	7	First few seedlings from planted trees and shrubs observed regenerating naturally	A	7
1983	A	4	Managed resource protection 1.2.0	Monitoring and recording	A	7	Older plantings, as the slides will show, are now effectively suppressing the exotic pasture species, and native grasses such as <i>Enneapogon nigricans</i> , <i>Themeda australis</i> and <i>Aristida behriana</i> are now becoming conspicuous as ground cover species	A	7





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1983-2012	C	4	Managed resource protection 1.2.0	Regular control of weeds - type and density or number / ha. Weed control programme stepped up in 2006 with "Bushbids" funding	A	7	Controlled the establishment and spread of environmental weeds preventing spread.	A	7
1983-2012	C	4	Managed resource protection 1.2.0	Control of feral animals - type and density or number / ha. Feral animals were not recorded other than domestic mice.	A	7			
1983-2012	C	4	Managed resource protection 1.2.0	Regular control of kangaroos –western greys. Only one or two per year shot – others harvested by neighbours	A	7	Controlling kangaroos limited the effect of their browsing of regenerating trees and shrubs	A	7
1984	F	4	Managed resource protection 1.2.0				Aerial photo shows tree crowns already established and well-spaced (15-20% FPC)	C	7
1989	F	4	Managed resource protection 1.2.0	Height and cover of the Euc and Allocasuarina community. Photo available from Lay family as a jpg file	E	7	Photo shows well-developed Euc and Allocasuarina community i.e. height and cover (FPC). Photo shows a high biomass of black oats in the understorey. available from Lay family as a jpg file	C	7
1992	A	4	Managed resource protection 1.2.0	Massive summer rains (a 1:430 year event)	A	7	Major erosion along watercourses and subsequent regeneration of most species	A	7
2002-10	G	4	Managed resource protection 1.2.0	Six Google earth images 2002-10 showing	G		Images show no change in the spacing of trees. The spacing of the trees approximates that expected of a natural low open woodland	C	7
2004	A	4	Managed resource protection 1.2.0	Neighbour starts fire which burns out 25% of area	A	7			



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2006	A	4	Managed resource protection 1.2.0	Area gains a 10 year package of funding under the "bushbids" biodiversity stewardship programme	A	7			
2006-12	A	4	Managed resource protection 1.2.0	Major effort in controlling weeds and feral animals, with understorey plantings	A	7			
2007	A	4	Managed resource protection 1.2.0				Monadenia weed orchid and bridal creeper begin to invade area	A	7
2011	E	4	Managed resource protection 1.2.0	Height and cover of the Euc and Allocasuarina community. Photo available from Lay family as a jpg file	E	7	Photo shows large and extensive biomass of overstorey. Native vegetation established throughout the site.	C	7

### 11. Data Use and Accuracy Disclaimer

These data are compiled to the best of our knowledge and ability. The information contained in this document is subject to revision. The user accepts all risks and responsibility for loss, damages, costs and other consequences (direct or indirect) resulting directly or indirectly from using this information.

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### Attachment 1

#### Reliability standards used to compile historic and contemporary site-based chronologies.

Reliability level standards	Spatial precision (Scale)	Temporal precision (Year of observation)	Attribute accuracy (Land use, land management practices, effects on condition)
<b>HIGH</b> "Definite"	Reliable direct quantitative data. Examples: Site, plot and transect based records. <b>Code: 1</b>	Reliable direct quantitative data. Examples: Day-month-year, season-year and year. <b>Code: 4</b>	Reliable direct quantitative data. Examples: Inventory and counts, recorded observations from field survey and monitoring, farm records <b>Code: 7</b>
<b>MEDIUM</b> "Probable"	Direct (with qualifications) or strong indirect data. Examples: Land unit and soil-landscape reports. <b>Code: 2</b>	Direct (with qualifications) or strong indirect data. Examples: Mid 1850s <b>Code: 5</b>	Direct (with qualifications) or strong indirect data. Examples: Reconnaissance surveys, medium and moderate resolution remote sensing, regional mapping <b>Code: 8</b>
<b>LOW</b> "Possible"	Limited qualitative and possibly contradictory observations. More data needed. Examples: Land system, sub-bioregion and bioregion reports. <b>Code: 3</b>	Limited qualitative and possibly contradictory observations. More data needed. Examples: Early 1800s and first half of 19 <sup>th</sup> century. <b>Code: 6</b>	Limited qualitative and possibly contradictory observations. More data needed. Examples: Generalised descriptions and narratives, census-based surveys <b>Code: 9</b>

