

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

Citation: Thackway, R (2013). Organ Pipes National Park, Victoria. Ver. 2. VAST-2-tracking the transformation of vegetated landscapes. Australian Centre for Ecological Analysis and Synthesis, University of Queensland, Brisbane.

1. Name of the site/area

Organ Pipes National Park, ex cropping and pasture, Victoria.

Organ Pipes National Park covers an area of 121 ha and is located 32 km north-west of Melbourne, Victoria (37°40'S, 144°45'E). Initially, 65 hectares were donated to the National Parks Service to preserve geological features exposed by Jacksons Creek, including the so-called Organ Pipes. The land was proclaimed a National Park in 1972.

2. Last modified (version no 2)

Document last edited July 2013.

Additional information provided in chronology.

3. Location of site

State: Victoria

Bioregional context: IBRAv7 classification:

REG_NAME_7:	REG_CODE_7:	SUB_NAME_7:	SUB_CODE_7:
Southern Volcanic Plain	SVP	Victorian Volcanic Plain	SVP01

Geospatial coordinates: 37°40'25.24"S,144°46'23.81" E

4. Area of the site

3 ha

Sampling within the transformation site: six parallel transects, 40 m apart and 120–140 m long, were established across the site in 1989 to sample changes in vegetation with time. A total of 76 quadrats were sampled every 2 years in November between 1989 and 2003 (McDougall and Morgan 2005).

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

Treeless basalt plain predominantly grassland dominated by Kangaroo Grass *Themeda triandra* with an array of inter-tussock species (Groves 1965). Kemp and Irvine (1993) state that "The vegetation on the Keilor plains described by Sutton (1916) and Willis (1964) was an open tussock grassland, dominated by Kangaroo Grass (*Themeda triandra*), interspersed with small herbs, and scattered small woody species (Kemp & Irvine 1993)". DSE (2004) describe the vegetation of the area as treeless vegetation mostly less than 1 m tall dominated by largely graminoid and herb life forms. SEWPAC (2011) defines these native grasslands as "Natural Temperate Grassland is usually dominated by one or more of the following native tussock-forming grasses: kangaroo grass (*Themeda triandra*), wallaby grasses



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(*Austrodanthonia* spp.), spear grasses (*Austrostipa* spp.) and/or tussock grasses (*Poa* spp.)". A variety of native herbs, including wildflowers, may be interspersed amongst the native grass tussocks. In some circumstances, the native grasses may be sparse and the other native herbs are dominant, for instance after some fire regimes, and so these native herb fields are included as part of the national ecological community".

Landform is almost flat, with a minor northerly aspect. Soils are heavy red-brown clays that crack in prolonged dry weather (McDougall and Morgan 2005).

Site is characterised by fertile cracking basalt soils prone to seasonal waterlogging in areas. The area receives at least 500 mm annual rainfall (DSE 2004). The site is strongly affected by alternating cyclonic/anticyclonic weather systems. Typically, strengthening north winds are followed by a front, with a rapid change to south-westerly winds. Meteorological records at nearby Melbourne Airport indicate that strong north winds are more common in winter, and south westerlies more common in summer (Bureau of Meteorology, 1990). When north winds do occur in summer, they are very hot and dry (Kemp & Irvine 1993).

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

National Park.

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

Area of the plot: N/A

	Overstorey	Midstorey	Understorey and ground layer
Dominant Species	Nil	Nil	Open low grassland comprising the following dominant graminoids; Kangaroo grass <i>Themeda triandra</i> , wallaby grasses <i>Austrodanthonia</i> spp., spear grasses <i>Austrostipa</i> spp. and/or tussock grasses <i>Poa</i> spp. and the dominant herbs; Lemon Beauty-heads <i>Calocephalus citreus</i> , Sheep's Burr <i>Acaena echinata</i> , Scaly Buttons <i>Leptorhynchus squamatus</i> , Blue Devil <i>Eryngium ovinum</i> .
Species richness			18 Species are typical of at least part of EVC range 36 species of which 13 spp are medium to small Tufted Graminoids and 12 species are medium herb life form 330 basaltic
Growth form			Medium to Small Tufted Graminoid
Structural Formation Class			Open low grassland
FPC			Medium to small Tufted Graminoids 40% Medium herb 20%
Height			< 1 m



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The following environmental conditions characterise the site:

Ground cover: Bryophytes/lichens and soil crust around 20% cover.

Soils: Heavy red–brown clays that crack in prolonged dry weather. Soils are fertile and prone to seasonal waterlogging in some areas.

Fire: The severity and frequency of the regimes can markedly affect the appearance, species composition and functionality of the grassland.

Source: DSE 2004, Threatened Species Scientific Committee (n.d.), McDougall and Morgan (2005).

8. Brief history of the site/area

1830	Indigenous people manage the area
1835	Sheep grazing commenced (shepherds)
1851	Alienated from the Crown as freehold and fenced
1851-1965	Area managed for dairying, an orchard and cropping and grazing modified pastures
1965	Agricultural production abandoned
1965-1986	Area minimally managed
1972	Organ Pipes National Park declared
1986-1992	Commenced species reintroduced site with supplemental plantings. Area managed to control weed and further incursions
1989-2003	Repeated monitoring. Area lightly grazed by rabbits and macropods
1993	Site burnt [prescribed fire]; supplemental revegetation with indigenous local species
1995	Site was burnt [prescribed fire]
1997	Site was burnt [prescribed fire] followed by drought
2003	Ceased monitoring and enhancement to the site
2004-10	Minimal intervention

Huston (2004), McIntyre (2005) and Dorrough *et al.* (2008) observe that the severity and frequency of fire, grazing, cropping and pasture improvement and fertiliser regimes can markedly affect the vegetation structure, species composition and regenerative capacity (functionality). These management practices affect the resilience of native grass sward, forbs /herbs and the availability of bare ground which is inherent in natural grasslands associated with heavy red–brown basaltic clay soils that crack in prolonged dry weather. Huston (2004) noted that following the abandonment of agricultural land management practices it is common to observe a 'succession' of weed species in grassland restoration projects.



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

>25 kilometres

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

- A. McDougall, K.L., and Morgan, J.W. (2005). Establishment of native grassland vegetation at Organ Pipes National Park near Melbourne, Victoria: Vegetation changes from 1989 to 2003. *Ecological Management & Restoration* 6, 34-42.
- B. Huston M. A. (2004). Management strategies for plant invasions: manipulating productivity, disturbance, and competition. *Diversity and Distributions* 10: 167–178.
- C. Inferred by Richard Thackway
- D. Bureau of Meteorology – Average monthly rainfall anomaly data 1900-2011.
- E. Kemp, B. and Irvine, R (1993). Design and use of planting zones at the Organ Pipes National Park: Notes on research and planting for the first 20 years. *Victorian Naturalist* 110, 113-124.
- F. Keith McDougall pers. comm.
- G. McDougall K. L. (1989) *The Re-Establishment of Themeda triandra (Kangaroo Grass): Implications for the Restoration of Grassland*. Arthur Rylah Institute for Environmental Research Technical Report Series no. 89. Department of Conservation, Forests and Lands, Victoria.
- H. DSE (Department of Sustainability and Environment) (2004). EVC/Bioregion Benchmark for Vegetation Quality Assessment, Victorian Volcanic Plain bioregion. EVC 132_61: Heavier-soils Plains Grassland. http://www.dse.vic.gov.au/__data/assets/pdf_file/0011/99047/VVP_0132_61.pdf [accessed on 6 June 2013]
- I. SEWPAC (Department of Sustainability, Environment, Water, Population and Communities), (2011). Nationally Threatened Ecological Communities of the Victorian Volcanic Plain: Natural Temperate Grassland and Grassy Eucalypt Woodland. A guide to the identification, assessment and management of nationally threatened ecological communities Environment Protection and Biodiversity Conservation Act 1999. Canberra.
- J. Parks Victoria (1998). *Management Plan Organ Pipes National Park, February 1998*. East Melbourne. http://parkweb.vic.gov.au/__data/assets/pdf_file/0005/313367/Organ-Pipes-National-Park-Plan.pdf
- K. Wikipedia. Organ Pipes National Park http://en.wikipedia.org/wiki/Organ_Pipes_National_Park#cite_note-visitor-3 [accessed on 6 June 2013]
- L. Canning, S., and Thiele, F. (2010). Indigenous Cultural Heritage and History within the Metropolitan Melbourne Investigation Area. A report to the Victorian Environmental Assessment Council, February 2010. Australian Cultural Heritage Management (Victoria) Pty Ltd. Melbourne.
- M. Department of Conservation & Environment (1992). The Organ Pipes National Park - a guide for teachers and visitors. ISBN 0 7306 2635 0 [http://home.vicnet.net.au/~foopnp/Biblio/\(Organ%20Pipes%20Natioanal%20Park%20Teachers%20guide\).htm](http://home.vicnet.net.au/~foopnp/Biblio/(Organ%20Pipes%20Natioanal%20Park%20Teachers%20guide).htm)
- N. Dorrough J, Stol J and McIntyre S (2008). Biodiversity in the paddock: a land manager's guide. Future Farm Industries CRC, Canberra. <http://www.csiro.au/resources/biodiversityinthepaddock> [accessed on 6 June 2013]



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- O. McIntyre, S. (2005). Biodiversity attributes of different sward structures in grazed grassland. *Ecological Management and Restoration*, 6: 71-72.
- P. Threatened Species Scientific Committee (n.d.). Advice to the Minister for the Environment, Heritage and the Arts from the Threatened Species Scientific Committee (the Committee) on an Amendment to the List of Threatened Ecological Communities under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). <http://www.environment.gov.au/biodiversity/threatened/communities/pubs/46-listing-advice.pdf> [accessed on 6 June 2013]
- Q. Cannon, M. (1987). The exploration of Australia. Reader's Digest, Sydney.
- R. Groves, R.H. (1965). Growth of *Themeda australis* tussock grassland at St. Albans, Victoria. *Australian Journal of Botany* 13: 291-302.
- S. Sutton, C.S. (1916). A sketch of the Keilor Plains flora. *Victorian Naturalist* 33: 112-123.



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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	Temporal reliability	Land use (ALUM) ¹	LU ² and LMP ³	Source LMP	Reliability LMP	Spatial reliability LMP	Observed effects and impacts on ecological function and native vegetation	Source effects	Spatial reliability effects	Reliability attribute effects
1750-1820	C	4	Traditional indigenous uses 1.2.0	The Woiworong tribe and the Kulin nation are said to have inhabited the Yarra and Maribyrnong River systems.	J	7	1	Plains in the area were largely treeless	C	1	7
1790-1835	L	4	Traditional indigenous uses 1.2.0	Aboriginal people had contact with Europeans in the late eighteenth and early nineteenth century through random meetings with explorers and more regular interaction with early whalers and sealers. p12	L	7	1				
1824	Q	4	Traditional indigenous uses 1.2.0	Hume and Hovell traverse the area. p126-129	Q	7	1				
1835	L	4	Traditional indigenous uses 1.2.0	The emergence of a permanent settlement in what was to become 'Melbourne' began in 1835 with John Batman's treaty with the traditional owners. p12	L	7	1				
1835	C	4	Traditional indigenous uses 1.2.0	Survey maps created prior to allocation of freehold title	C	7	1	Based on nineteenth century survey maps of the area, these plains were largely treeless.	A	1	7
1835	C	5	Grazing native vegetation 2.1.0	Sheep grazing commenced largely without fences using shepherds	A	7	1	Nineteenth century survey maps of the area, these plains were largely treeless - supported predominantly grassland dominated by Kangaroo Grass with an array of inter-tussock species	A	1	7
1835	C	5	Grazing native vegetation 2.1.0	In general area settlers introduced new varieties of plants such as boxthorn hedges for fences and trees such as oaks, willows and pine	K	7	1				

¹ ALUM = Australian Land Use and Management classification

² LU = Land use

³ LMP = Land or vegetation Management Practice



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1835	S	5	Grazing native vegetation 2.1.0	Because of their open grassy nature and proximity to Melbourne, the Keilor Plains and the nearby valleys were rapidly exposed to grazing and agriculture following settlement in 1835.	E	7	1				
1851	J	4	Grazing native vegetation 2.1.0	The area of the Park was alienated from the Crown in 1851. p11	J	7	1				
1851-1965	J	4	Grazing native vegetation 2.1.0	The land around the Organ Pipes was used for dairying, an orchard and cropping, and grazed until the late 1960s. p11	J	7	1				
1852-1933	C	5	Grazing native vegetation 2.1.0	Conversion of Themeda grassland to cropping, sowing pasture, grazing modified pasture. Opportunistically cropped (oats) and managed as modified pasture	C	7	1	As disturbance persists, the diversity of native perennial forbs declines with those wildflower species most palatable to stock or sensitive to disturbance disappear earlier. Species composition shifts to favour cool-season C3 grasses (e.g. Spear and Wallaby Grasses) and species with an annual life-cycle (e.g. weeds such as Lesser Quaking-grass (Briza minor)). Consequently, in many woodland remnants, Kangaroo-grass has been replaced by Wallaby or Spear-grasses, or by weeds.	P	1	7
1910	D	4	Grazing modified pastures 3.2.0	Beginning of a period of below average rainfall	D	7	1				
1948	D	4	Grazing modified pastures 3.2.0	End of a period of below average rainfall	D	7	1				
1934-1948	K	4	Grazing modified pastures 3.2.0	The Bartlett family lived on the area from 1934 to 1948	K	7	1	"The land was never heavily pastured in our time as the rabbits were always bad owing to the shelter they had with boxthorn bushes and rocks," recalled Mr Arthur Bartlett.	M	1	7



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1955	D	4	Grazing modified pastures 3.2.0	Beginning of a period of above average rainfall	D	7	1				
1948-65	C	5	Grazing modified pastures 3.2.0	Opportunistically cropped (oats) and managed as modified pasture.	A	7	2	As disturbance persists, the diversity of native perennial forbs declines with those wildflower species most palatable to stock or sensitive to disturbance disappear earlier. Species composition shifts to favour cool-season C3 grasses (e.g. Spear and Wallaby Grasses) and species with an annual life-cycle (e.g. weeds such as Lesser Quaking-grass (<i>Briza minor</i>)). Consequently, in many woodland remnants, Kangaroo-grass has been replaced by Wallaby or Spear-grasses, or by weeds.	P	1	7
1965	C	5	Land in transition 3.6.0	Crop and pasture system ceased and the land abandoned.	A						
1965-1988	A		Land in transition 3.6.0	Area minimally managed	C	7	1	As disturbance persists, the diversity of native perennial forbs declines with those wildflower species most palatable to stock or sensitive to disturbance disappear earlier. Species composition shifts to favour cool-season C3 grasses (e.g. Spear and Wallaby Grasses) and species with an annual life-cycle (e.g. weeds such as Lesser Quaking-grass (<i>Briza minor</i>)). Consequently, in many woodland remnants, Kangaroo-grass has been replaced by Wallaby or Spear-grasses, or by weeds. p12	P	1	7
1971	A	4	Land in transition 3.6.0	Before the Park's declaration, the area had been used for grazing and other agricultural activities for 140 years ... p8	J	7	1	... most of the indigenous vegetation had been replaced by a wide variety of weeds p8	J	1	7



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1972	A	4	Nature conservation 1.1.0	OPNP was proclaimed in 1972, primarily for the geological features	A	7	1	90% of the site was largely dominated by weeds such as Boxthorn <i>Lycium ferocissimum</i> and Artichoke Thistle <i>Cynara cardunculus</i> and severely degraded by rabbit grazing. p34	A	1	7
1972	A	4	Nature conservation 1.1.0					When Organ Pipes National Park was declared in 1972, it was a depressing sight. Head-high artichoke thistles blanketed the creek flats and slopes, horehound had spread everywhere, boxthorn bushes crowded the slopes and plains, and other weed species filled the gaps. Erosion gullies scarred the steep slopes. Rubbish was piled here and there.	M	1	7
1980	D	4	Nature conservation 1.1.0	End of a period of above average rainfall	D	7	1				
1985	A	4	Nature conservation 1.1.0	A revegetation plan developed –aim to restore native plant based on soils, topography and aspect	E	7	1				
1987	C	4	Nature conservation 1.1.0	All of the seeds (used both for direct seeding and propagation of tubestock) and transplants were obtained from grassland remnants of similar topography and soils within 10 km of OPNP.	A	7	1				
1987	A	4	Nature conservation 1.1.0	If weed control were attempted at the commencement of the trial, broad-leaved species such as Catsear, Cape Weed and Oxtongue might have been targeted because they were common at the time of agricultural abandonment. p39	A	8	1				



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1988	A	4	Nature conservation 1.1.0	Revegetation commenced with supplemental plantings and ongoing management of endemic native Kangaroo and Wallaby grass species. 85 Species introduced by seed, sods and tubestock. Seed-bearing hay spread on the day of cutting at the rate of about 500 g/m ² (i.e. just enough to cover the ground so that no spaces were visible beneath). This rate was up to 10 times the density of culms harvested. The hay was then trampled to limit displacement by wind, and then left. No weed control took place prior to sowing.	A	8	1				
1988	C	4	Nature conservation 1.1.0			7	1	Newly established areas of Kangaroo Grass <i>Themeda triandra</i> are providing a more suitable environment for further re-introductions	G	4	7
1988	A	4	Nature conservation 1.1.0	Area lightly grazed by rabbits and macropods	A	7	1				
1989	A	4	Nature conservation 1.1.0	Herbicides were not used on the site apart from spot spraying of aggressive perennial weed species such as Chilean Needlegrass (<i>Nassella neesiana</i>) and Serrated Tussock (<i>N. trichotoma</i>). Disturbance to the soil was minimized throughout the treatment	A	7	1				



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1989	A	4	Nature conservation 1.1.0	Area lightly grazed by rabbits and macropods				Mean no. species per sq metre native:weed = 1.5:6.5 Mean total per cent cover native:weed = 32:62 At that time, the site was dominated by broad-leaved weeds, mainly Catsear <i>Hypochaeris radicata</i> . Wallaby grasses <i>Austrodanthonia</i> spp. were an occasional component of the vegetation, which was frequently slashed for fire protection	G	1	7
1989	A	4	Nature conservation 1.1.0	Commenced monitoring plant community Area lightly grazed by rabbits and macropods	A	7	1	Oats were found in most quadrats throughout the period of sampling despite often having a mean cover of less than 5%. However, its cover increased dramatically between 1999 and 2001 and remained steady to 2003 at about 20%. p38 Total weed cover within quadrats was about 60%. p38.	A	1	7
1989-2002	A	4	Nature conservation 1.1.0	Monitoring	A	7	1	Wallaby grasses also declined over the study period, although the reasons for this are unknown. Substantial increases in the frequency and cover of two weeds (Oats and Fumitory) followed the 1997 fire. These species have presumably taken advantage of the changed conditions (including the absence of fire) from 1997 onwards. p39	A	1	7



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1991	A	4	Nature conservation 1.1.0	Monitoring plant community. Area lightly grazed by rabbits and macropods	A	7	1	Mean no. species per sq metre native:weed = 2:8 Mean total per cent cover native:weed = 34:78 Mean total per cent cover native:weed = 32:62 Monitoring showed that there is great instability from year to year in species composition and that abiotic and biotic factors have a substantial effect on species abundance. Number of native species = 51	A	1	7
1992	C	1	Nature conservation 1.1.0	Monitoring plant community	A	7	1	It is interesting to note that in some areas where spacing plants too closely was suspected, self sown seedlings are filling the gaps.	E	1	7
1992	C	1	Nature conservation 1.1.0					The planting zones would have failed without the continuous weed control work done by the Park staff. The soil seed-bank is such that the above-ground removal of one weed such as Artichoke Thistle is usually followed by germination of another such as Phalaris Phalaris aquatica and Serrated Tussock Nassella trichotoma.	E	1	7
1993	A	4	Nature conservation 1.1.0	Monitoring plant community The site was burnt [prescribed fire] in March. Fire used to stimulate regeneration, and for weed management. Area was revegetated again with native spp Area lightly grazed by rabbits and macropods	A	7	1	Mean no. species per sq metre native:weed = 2:6 Mean total per cent cover native:weed = 30:42 Number of native species = 46 Frequent burning in the early stages of the project (1993, 1995) led to an initial increase in frequency and cover. p39	A	1	7
1994	A	4	Nature conservation 1.1.0	Spot spraying exotic tussock species, prescribed burning	A	7	1				



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1995	A	4	Nature conservation 1.1.0	Monitoring plant community The site was burnt [prescribed fire] in March. Fire used to stimulate regeneration, and for weed management. Area lightly grazed by rabbits and macropods	A	7	1	Mean no. species per sq metre native: weed = 2:6 Mean total per cent cover native: weed = 48:32 Frequent burning in the early stages of the project (1993, 1995) led to an initial increase in frequency and cover. p39	A	1	7
1997	A	4	Nature conservation 1.1.0	Monitoring plant community Area lightly grazed by rabbits and macropods The study site was burnt [prescribed fire] in March 1997 at the commencement of the drought. P38 Fire used to stimulate regeneration, and for weed management.	A	7	1	Mean no. species per sq metre native:weed = 2:6.5 Mean total per cent cover native:weed = 15:32 ... fire in 1997 was followed by a drought that led to substantial tussock mortality and little vegetative growth. This highlights that fire, while necessary to prevent competitive exclusion and litter build-up can also be a powerful agent structuring plant communities when it coincides with abiotic stress. p39	A	1	7
1997	D	4	Nature conservation 1.1.0	Beginning of a period of below average rainfall	D	7	1	Since 1997, the annual rainfall has generally been below average. The annual rainfall in 1997 was only 57% of the long-term mean.	A	1	7
1998	A	4	Nature conservation 1.1.0	Basalt rocks were imported from local development areas and partially buried in soil at the eastern end of the site in the late 1980s to recreate the typical soil surface of local grasslands and potentially to act as habitat for grassland fauna either (i) rescued from neighbouring residential development, or (ii) deliberately introduced as part of species recovery programs. P35.	A	7	1				



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1998	J	4	Nature conservation 1.1.0					Most of the Park's soils have been altered and degraded by erosion resulting from human activity. p13 The clay becomes waterlogged in wet weather and dries quickly in hot weather, shrinks, hardens and cracks. p13 The effects of vegetation clearing and weed and rabbit invasion were soil exposure and increased erosion. p13	J	1	7
1999	A	4	Nature conservation 1.1.0	Monitoring plant community Area lightly grazed by rabbits and macropods	A	7	1	Mean no. species per sq metre native:weed = 1.9:5.5 Mean total per cent cover native:weed = 28:20 Number of native species = 47 Total weed cover within quadrats had declined to only 20% in 1999. p38	A	1	7
1999-2003	A	4	Nature conservation 1.1.0	Monitoring plant community . Area lightly grazed by rabbits and macropods	A	7	1	Oats were found in most quadrats throughout the period of sampling despite often having a mean cover of less than 5%. However, its cover increased dramatically between 1999 and 2001 and remained steady to 2003 at about 20%. p38	A	1	7
2001	A	4	Nature conservation 1.1.0	Monitoring plant community Area lightly grazed by rabbits and macropods	A	7	1	Mean no. species per sq metre native:weed = 1.8:4.2 Mean total per cent cover native:weed = 35:48	A	1	7



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2003	A	4	Nature conservation A1.1.0	Monitoring plant community Area lightly grazed by rabbits and macropods – not controlled	A	7	1	<p>Mean no. species per sq metre native:weed = 1.6:6.5</p> <p>Mean total per cent cover native:weed = 28:64</p> <p>Number of native species = 33 of 85 species (seed, sods and tubestock) survived</p> <p>Weed cover has since increased to 60% i.e. same as that reached 1989. p38</p> <p>The species list is probably incomplete because small forbs were difficult to locate among the tall flowering stems of Oats that dominated the site. p37</p> <p>Native species richness in the re-established grassland did not change substantially over the 15 years of observations, suggesting that the native species that were established do not expand their range after initial planting. p39</p> <p>Over the same period the composition and frequency and abundance of 17 weed species were observed to show obvious changes. The nature of these changes were impacted by fire and drought.</p>	A	1	7
1989-2003	A	1	Nature conservation A1.1.0					<p>Native species richness in the reestablished grassland did not change substantially over the 15 years of observation, suggesting that few of the native species expanded their range after initial establishment. Indeed, some of the 33 native species recorded in 2003 were clearly still present only where they had been planted. p39</p>	A	1	7



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1989-2003	A	4	Nature conservation A1.1.0					Catsear, Cape Weed and Oxtongue ...all declined without specifically targeted intervention, possibly because disturbance to the soil was minimized, and all are now minor components of the site. p39	A	1	7
2003	A	4	Nature conservation A1.1.0					Despite the persistence of many weed species, the OPNP site looked like a native grassland for much of the project, until recently when Oats again became dominant. p38	A	1	7
2004	F	4	Nature conservation A1.1.0	Start of period of minimal intervention or enhancement to the site except for weed management	F	7	1	The dominant native species, Kangaroo Grass Themeda triandra, the native intertussock spear grasses Austrostipa spp. Large-headed Groundsel Senecio macrocarpus, have become common elements of the grassland but most other native species remain minor components.	A	1	7
2004-2010	F	4	Nature conservation A1.1.0	Ongoing minimal management intervention. Site considered by management agency to have achieved the goal of restored temperate native grassland	F	7	1	Progress toward the reference state has plateaued. To achieve ongoing improvements management strategies (e.g. fire regimes, weed control) that aim to maximize the outcomes of infrequent recruitment events to continue restore grasslands will be needed. Ongoing supplemental plantings will also need to be used to encourage the establishment of inter-tussock species if the diversity of native community is to continue toward the reference state.	F	1	7



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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.

12. License

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Attachment 1

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

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

