Vegetation Monitoring on North Island, Houtman Abrolhos, as an Indication of Grazing Impact from Tammar Wallabies

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1.0 Overview

A vegetation study was conducted to assess the impact of the Tammar Wallaby population on the natural vegetation community at North Island of the Houtman Abrolhos. Increasing vegetation decline became apparent following an increase in Wallaby population numbers in the south east of the island. Evidence of vegetation decline has included loss of foliage, ring barking of shrubs, plant deaths and an increase in the area of bare ground throughout the dunes. In order to quantify the impact on this vegetation community, changes in structure and composition over time were assessed. Comparison was made between vegetation plots that the Wallabies were excluded from and plots where Wallaby grazing was allowed to continue.

Data collected during this study indicates that the exclusion of Wallabies resulted in improved vegetation condition at sites 1 and 2, where Wallabies are most numerous. Unfenced plots at sites 1 and 2 recorded a continued decline in vegetation condition. This indicates that the large Wallaby population is likely to be the cause of vegetation decline in this area.

At sites 3 and 4 there was very little change in vegetation condition recorded throughout the period of this study. There was very little difference between fenced and unfenced plots. In this area the poor condition of the vegetation appears to be primarily due to fire history and subsequent loss of topsoil rather than Wallaby grazing.

2.0 Background

2.1 Vegetation Mapping

The dominant vegetation type within the survey area is dwarf scrub on consoldated dunes with *Exocarpos aphyllus, Myoporum insulare, Pimelea microcephala, Olearia axillaries, Rhagodia sp, Scaevola crassifolia* and *Threlkeldia diffusa*; small sections of the survey area consist of heath with *Olearia axillaries* and *Scaevola crassifolia*; sparse dwarf scrub with *Scavola crassifolia*; and open dwarf scrub with *Olearia crassifolia* and *Scavola crassifolia* (J. M. Harvey el al, 2001).

2.2 Wallaby Introduction

The Tammar Wallaby (*Macropus eugenii*) did not naturally occur on North Island. When Stokes visited North Island in 1840 he recorded that the species was not present (Stokes 1846 in Storr 1960). The species was introduced to North Island possibly during the 1950s then later died out and was reintroduced in 1987 (Abbott and Burbidge, 1995). It has been reported that five Wallabies were taken from the nearby Wallaby Islands and released onto North Island by fishers in 1985 (Fitzharding pers. comm.). Wallabies have now been recorded as being numerous, particularly in the dunes in the south east of the island (Morris, unpublished report, 2003).

2.3 Fire History

A wildfire burnt through vegetation on the eastern side of the island in 1935, adjacent to the area occupied by fishing camps. This wildfire area has not recovered to the previous vegetation cover. Due to the vegetation cover being lost during the fire, strong south westerly winds have resulted in a significant loss of soil depth over the limestone coral. The loss of soil included the seed bearing

topsoil, which is likely to have limited the extent of vegetation recovery within this wildfire area.

3.0 Method

Prior to the field survey a database search was conducted of previous collections within the locality "North Island Abrolhos" (Appendix 1).

The survey area is located in consolidated dunes in the south west of the island. Within this area two 5m x 5m plots were installed at four sites. At each site one plot was fenced and one was unfenced. Two of the sites were selected in the area where Wallabies have been recorded as being numerous. Two sites were selected within the area burnt during the 1935 wildfire. Each plot was surveyed according to the Bushland Plant Survey procedures described in Keighery, 1994. The plots were surveyed biannually, during autumn and spring, on 23/5/03, 26/9/03, 25/3/04, 13/9/04 and 5/6/05.

4.0 Results

Site 1a, Fenced Plot

An increase in vegetation cover and litter and a decrease in bare ground were recorded for the fenced plot at site one (Figure 1). This change in cover is obvious from the photo point monitoring (Appendix 2). The number of plant taxa within the plot also increased. This increase was greater during the first spring due to the presence of annuals, however the total number of perennial flora had increased from 4 in 2003 to 8 in 2005 (Figure 2). The prenials that became reestablished in the plot during the study period include *Threlkeldia diffusa, Olearia axillaris, Atriplex sp and Carpobrotus virescens* (Appendix 3).

Figure 1 Percentage cover over time plot 1a

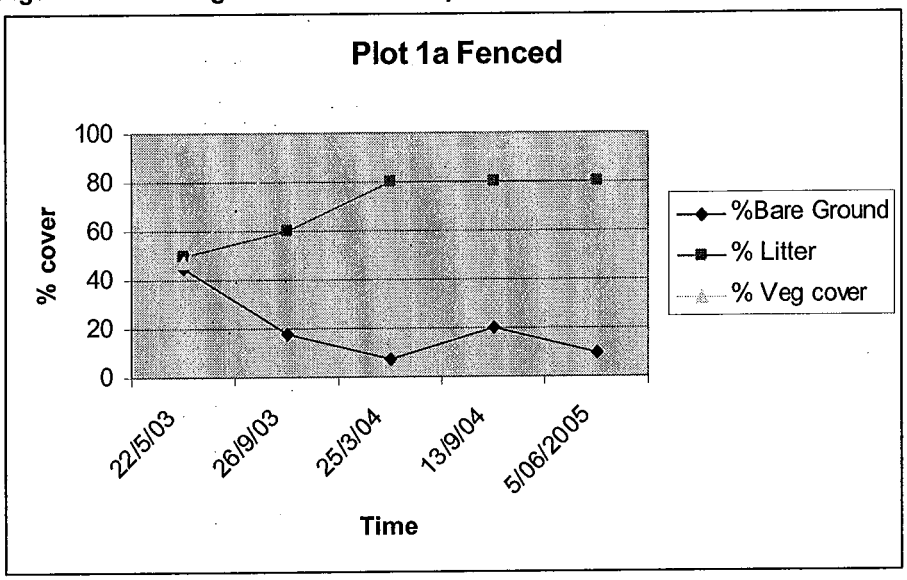
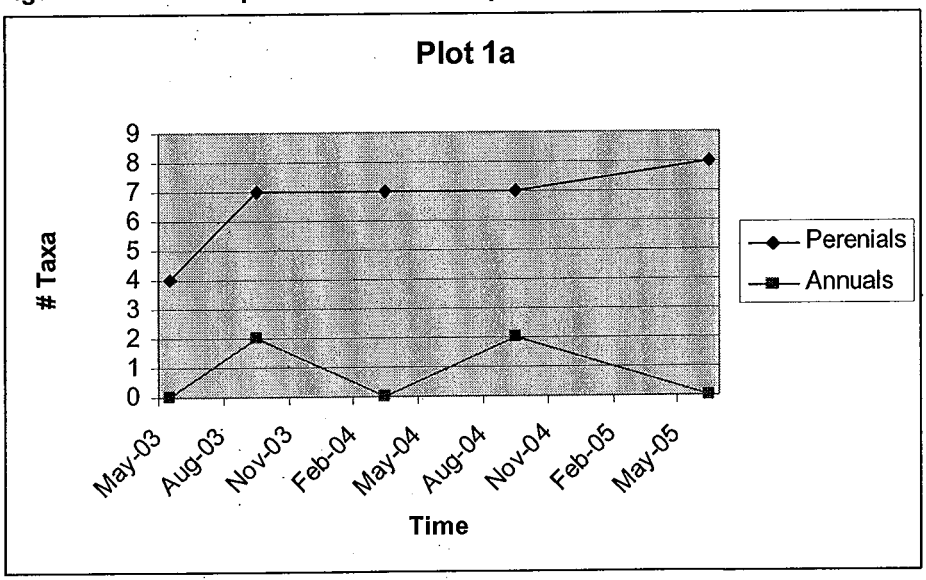


Figure 2 Number of plant taxa over time plot 1a



Site 1b, Unfenced Plot

A decrease in vegetation cover and litter and an increase in bare ground were recorded for the unfenced plot at site one (Figure 3). The number of perennial plant taxa within the plot remained the same from 2003 to 2005, although the number of annuals fluctuated with the seasons (Appendix 3).

Figure 3 Percentage cover over time plot 1b

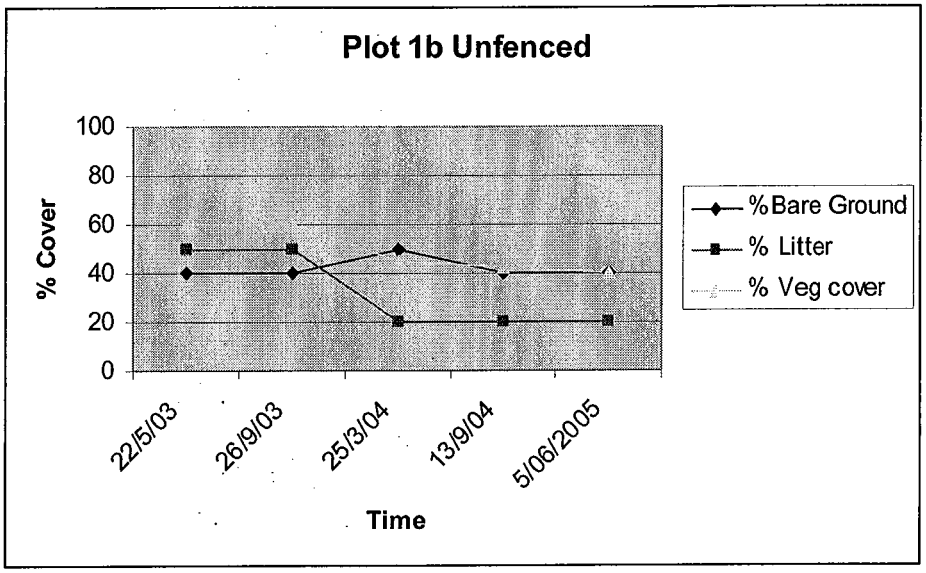
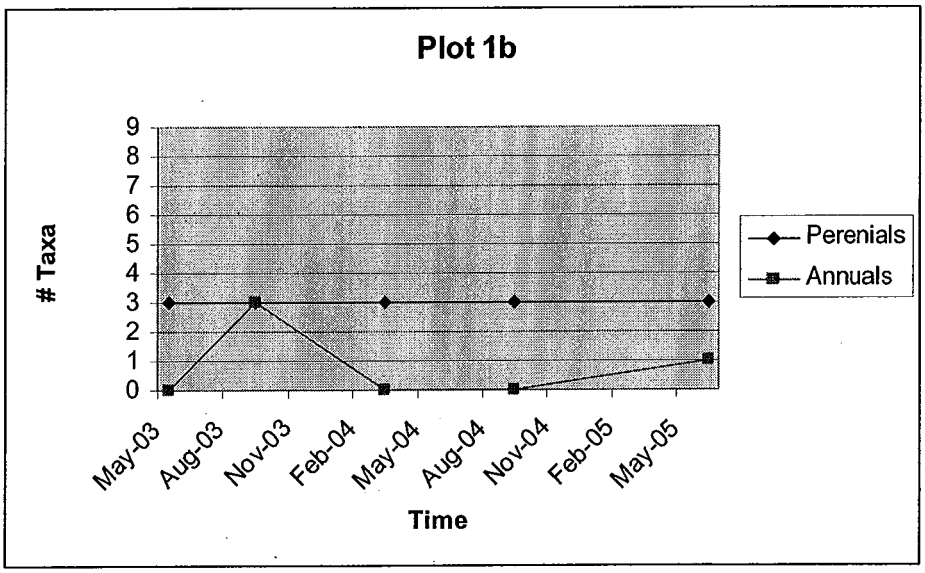


Figure 4 Number of plant taxa over time plot 1b



Site 2a, Fenced Plot

An increase in vegetation cover and litter and a decrease in bare ground were recorded for the fenced plot at site two (Figure 5). This change in cover is evident from the photo point monitoring (Appendix 2). The number of plant taxa within the plot also increased (Figure 6). This increase was greater during the first spring due to the presence of annuals, however the total number of perennial flora had increased from 3 in 2003 to 7 in 2005. The species that became reestablished in the plot during the study period include *Threlkeldia diffusa, Scaevola crassifolia, Nitraria billardierei and Carpobrotus virescens.*

Figure 5 Percentage cover over time plot 2a

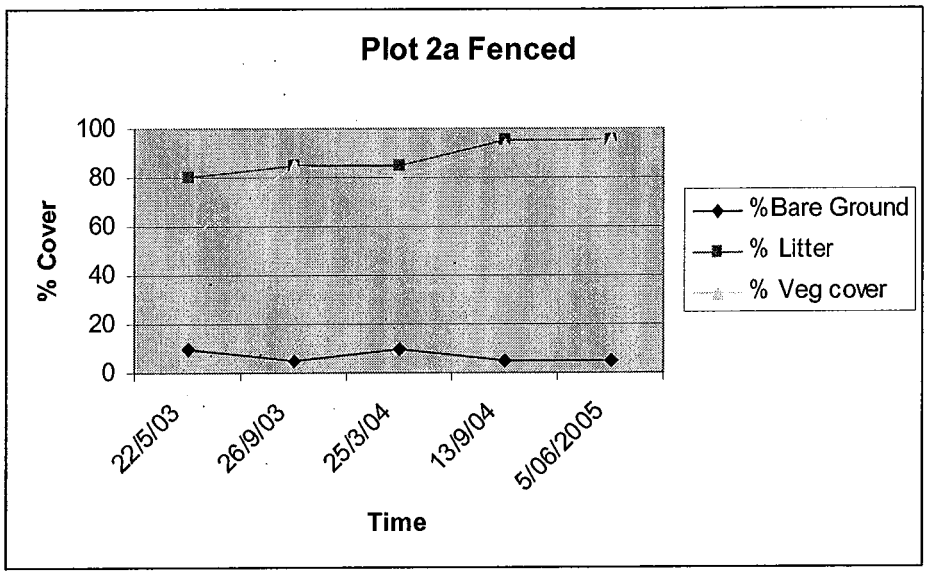
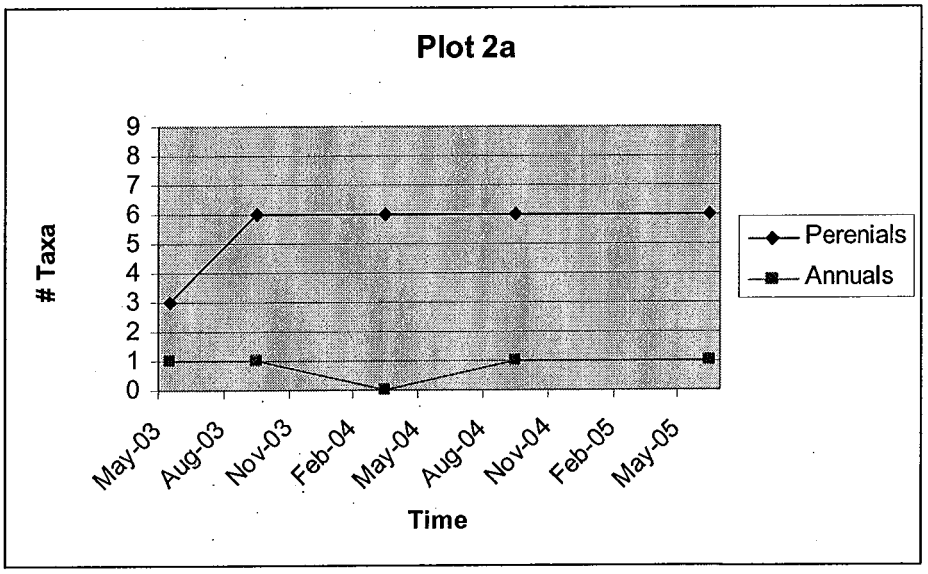


Figure 6 Number of plant taxa over time plot 2a



Site 2b, Unfenced Plot

A decrease in vegetation cover and litter were recorded for the unfenced plot at site two, while the amount of bare ground recorded remained relatively unchanged (Figure 7). The number of plant taxa within the plot fluctuated with the seasons (Figure 8). The increase was greater during the first spring due to the presence of annuals, however the total number of perennial flora remained the same from 2003 to 2005 (Appendix 3).

Figure 7 Percentage cover over time plot 2b

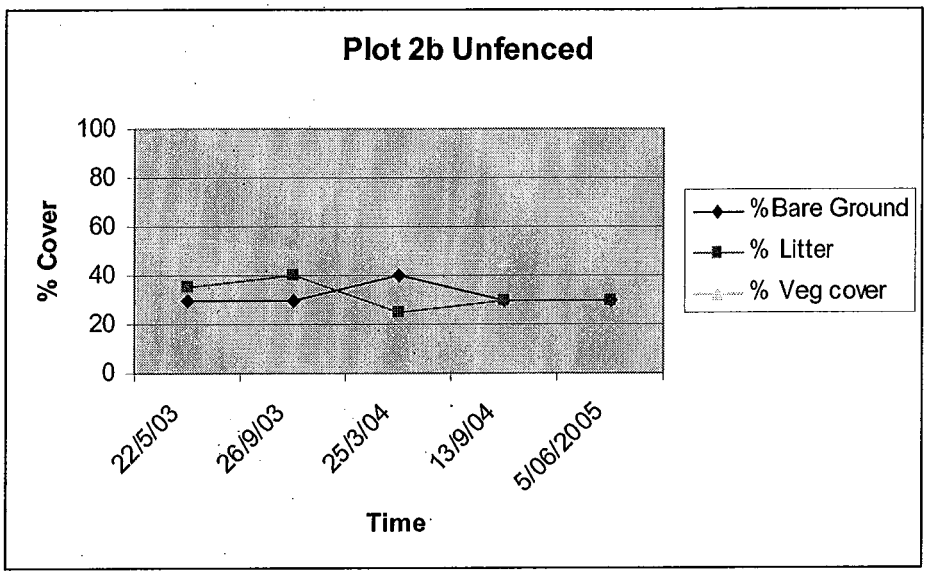
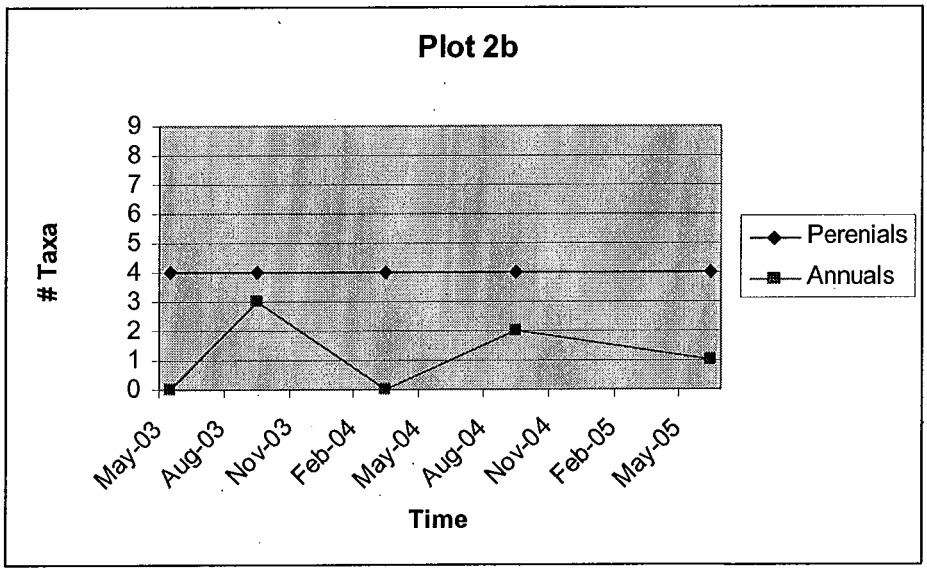


Figure 8 Number of plant taxa over time plot 2b



Site 3a, Fenced Plot

The percentage cover of vegetation, litter and bare ground fluctuated slightly with the seasons; however there was no significant change at site 3, throughout the period of this study (Figure 9). The number of plant taxa within the plot also remained similar (Figure 10).

Figure 9 Percentage cover over time plot 3a

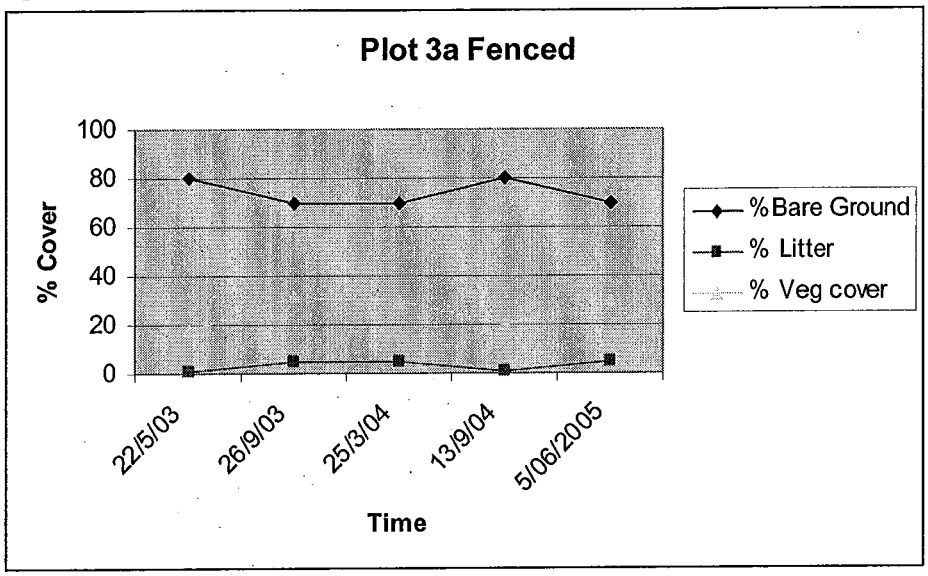
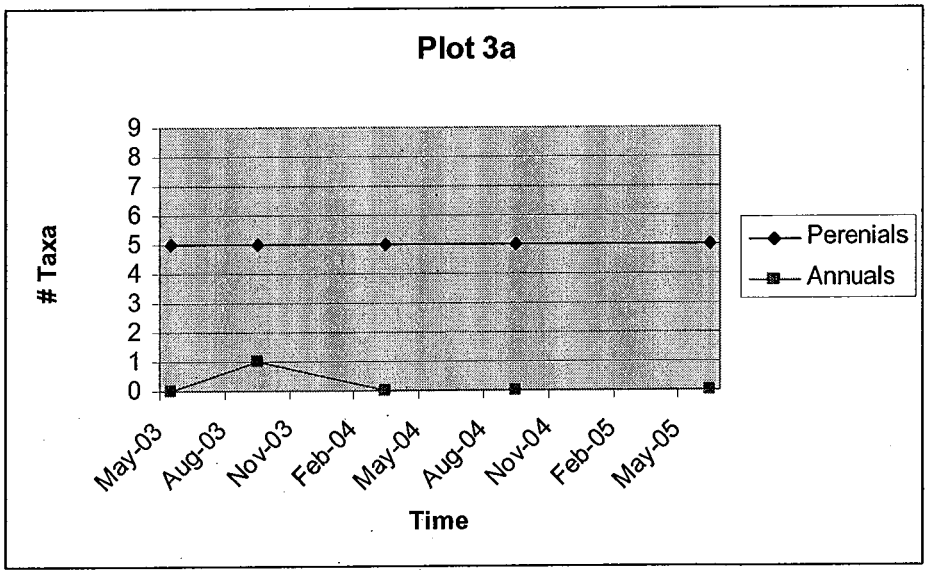


Figure 10 Number of plant taxa over time plot 3a



Site 3b, Unfenced Plot

The percentage cover of vegetation, litter and bare ground fluctuated slightly with the seasons, however there was no significant change at site 3, throughout the period of this study (Figure 11). The number of plant taxa changed very little throughout the study (Figure 12).

Figure 11 Percentage cover over time plot 3b

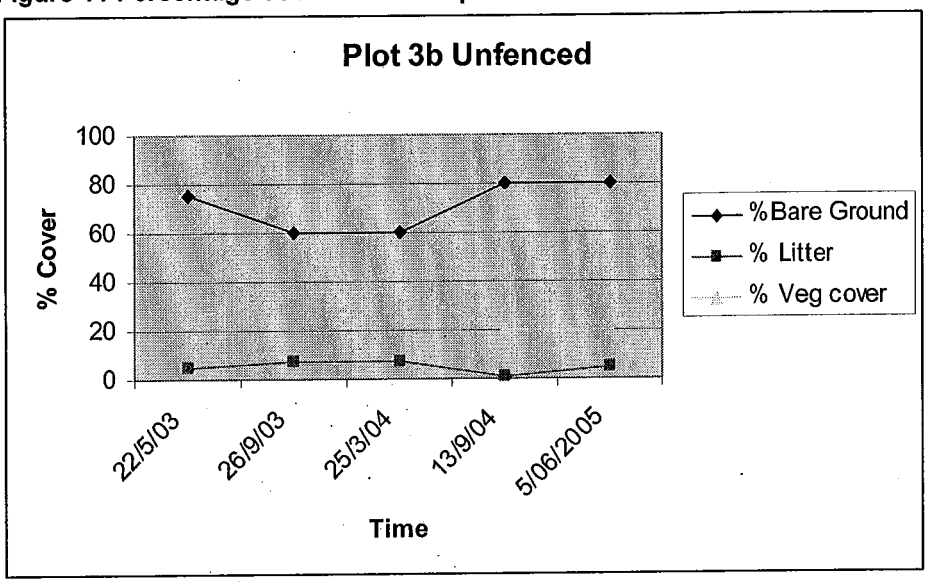
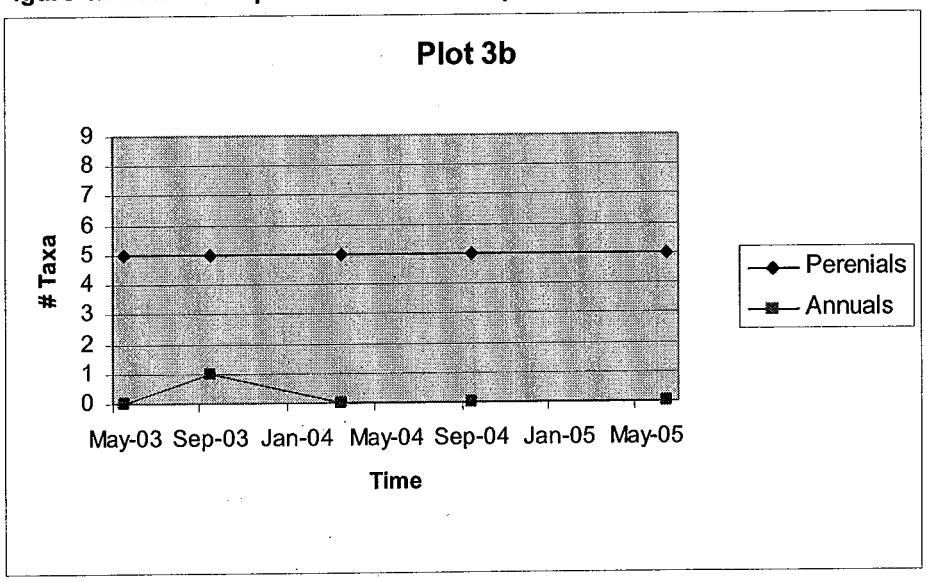


Figure 12 Number of plant taxa over time plot 3b



Site 4a, Fenced Plot

The percentage cover of vegetation, litter and bare ground fluctuated slightly with the seasons, however there was no significant change in percentage cover at site 4, throughout the period of this study (Figure 13). The number of perenial plant taxa within the plot increased from 3 to 4 in 2003 and the number of annuals fluctuated (Figure 14).

Figure 13 Percentage cover over time plot 4a

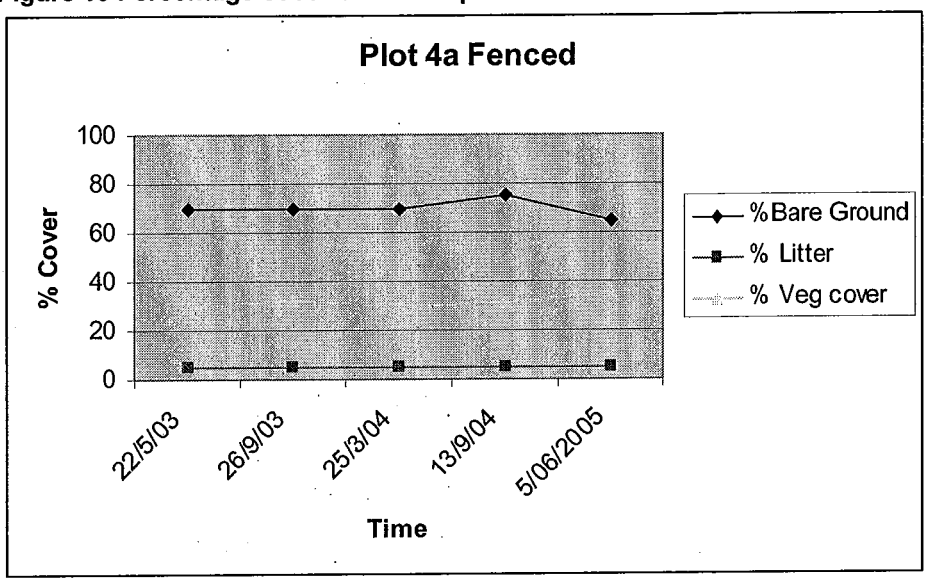
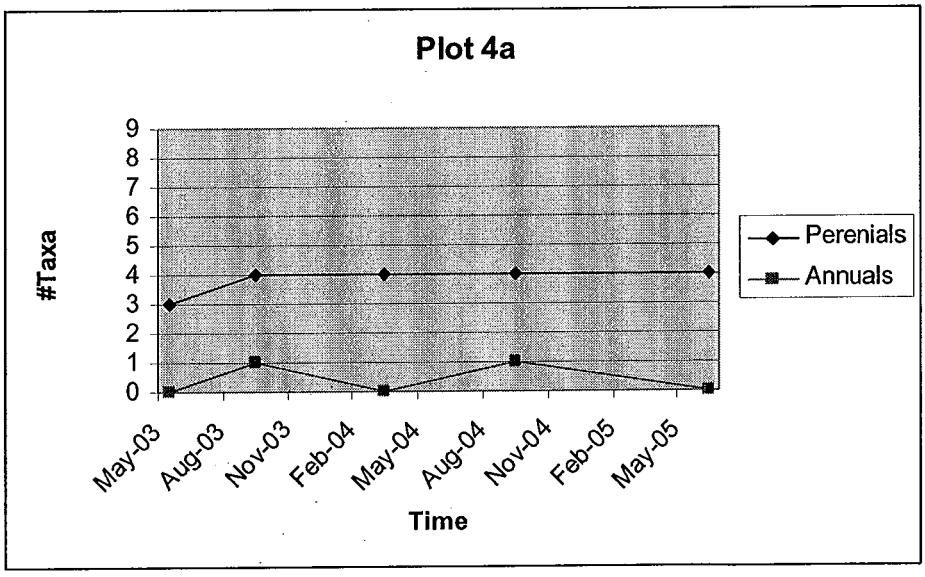


Figure 14 Number of plant taxa over time plot 4a



Site 4b, Unfenced Plot

The percentage cover of vegetation, litter and bare ground fluctuated slightly with the seasons; however there was no significant change in percentage cover at site 4, throughout the period of this study (Figure 15). The number of perennial plant taxa did not change throughout the study (Figure 16).

Figure 15 Percentage cover over time plot 4b

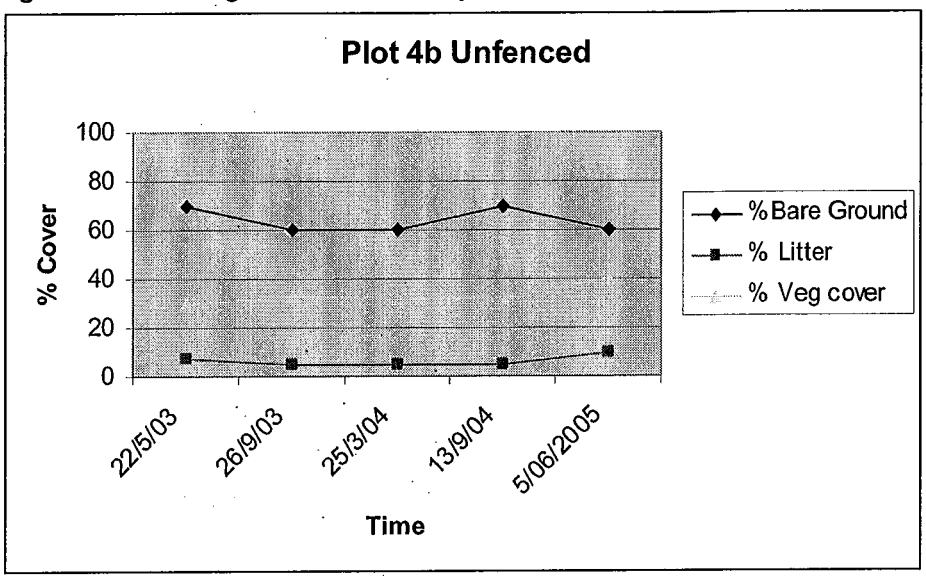
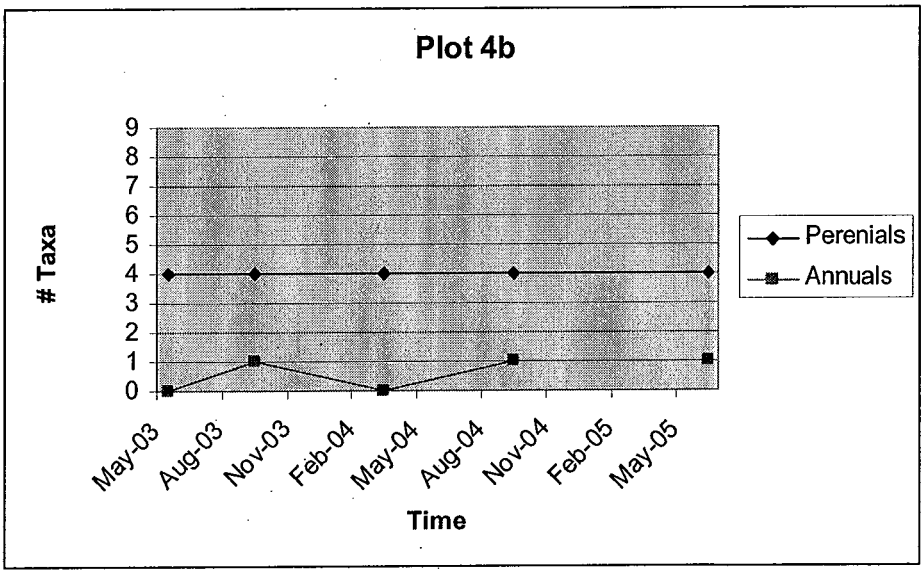


Figure 16 Number of plant taxa over time plot 4b



5.0 Discussion

An increase in cover of vegetation and litter and a decrease in bare ground was recorded for the fenced plots at sites 1 and 2. The number of perennial plant taxa also increased in these fenced plots. This indicates the vegetation condition improved over the period of the study. The increase in perennial plant taxa also indicates that the Wallabies may be selectively grazing some species, in particular the succulent species *Carpobrotus virescens* and *Threlkeldia diffusa*. These species were not recorded during the initial survey in 2003 but were recorded in both fenced plots in 2005. This may be due to the Wallabies preferentially grazing these plants during low rainfall periods.

For the unfenced plots at sites 1 and 2 a decrease in cover of vegetation and litter and an increase in bare ground were recorded. There was no increase in perennial plant taxa for the unfenced plots. In this vegetation community Wallabies have recently been recorded as being numerous.

These results indicate that the exclusion of Wallabies leads to an improvement in vegetation condition and that the large population of Wallabies is likely to be the reason for vegetation decline at these sites.

At sites 3 and 4 there was very little change in vegetation condition recorded throughout the period of this study. There was very little difference between fenced and unfenced plots. These sites are within an area that burnt during a wildfire in 1935. After the vegetation was removed by fire, strong winds removed a large amount of topsoil. The plant community has not recovered after the fire and is currently a sparse open heath. It appears likely that the Wallaby population is not having a significant impact on this vegetation community. The community did not recover following the fire during the period before the Wallabies were introduced in 1985. The poor vegetation condition is most probably due to the wildfire and loss of topsoil rather than Wallaby grazing limiting regeneration.

This study therefore indicates that the Wallaby population is impacting the vegetation at sites 1 and 2 but not significantly at sites 3 and 4. The results indicate that at sites 1 and 2 Wallaby grazing is not sustainable and is causing a decline in the vegetation condition. A reduction in grazing will be necessary to prevent further decline of the vegetation at sites 1 and 2. It is expected that if the vegetation continues to decline it will not provide enough cover to prevent strong winds removing the topsoil and the community may become similar to that which occurs in the area burnt by the wildfire at sites 3 and 4.

Recommendations

- Reduce the Tammar Wallaby population to a level at which grazing is sustainable. As the species does not naturally occur on the island it is likely that the vegetation community cannot sustain even a small population and total removal of the species will be required.

- Continue to monitor the vegetation plots to determine if Wallaby grazing has been sufficiently reduced and maintained at a sustainable level.

- If monitoring determines that the vegetation condition is continuing to decline despite current control measures, alternative methods to reduce the population be investigated.

- Seek to investigate and undertake rehabilitation of areas where vegetation condition is poor, particularly in the area that has not recovered from the 1935 wildfire.

References

Abbott I. and Burbidge A. A., (1995) The occurrence of mammal species on the islands of Australia: a summary of existing knowledge. CALMScience 1(3): 259 - 324

Havey, J.M., Alford, J.J., Longman, V.M. and Keighery, G.J. (2001). A flora and vegetation survey of the islands of the Houtman Abrolhos, Western Australia. CALMScience 3, 521-623

Morris, Sercombe & Chant (2003) A report on the Management of Tammar Wallabies on North Island, Houtman Abrohlos, CALM Unpublished Report.

Storr, G. M. (1960) The Physiography, vegetation and vertebrate fauna of North Island, Houtman Abrolhos. Journal of the Royal Society of Western Australia 43: 59 – 62.

Acknowledgements

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Appendix 1 – Database Records

Florabase Records

Family	Species	Annual	Alien
Aizoaceae	*Carpobrotus virescens*		
Amaranthaceae	*Ptilotus divaricatus var. rubescens*		
Asphodelaceae	*Bulbine semibarbata*	✓	
Asteraceae	*Actinobole condensatum*	✓	
	Brachyscome ciliaris	✓	
	Euchiton sphaericus	✓	
	Pseudognaphalium luteoalbum		✓
Brassicaceae	*Calkine maritime*	✓	✓
	Hornungia procumbens	✓	✓
	Lepidium lyratogynum		
Chenopodiaceae	*Atriplex amnicola*		
	Atriplex cinerea		
	Atriplex paludos subsp. baudinii		
	Enchylaena tomentosa var. tomentosa		
	Halosarcia halocnemoides		
	Rhagodia latifolia subsp latifolia		
Collemataceae	*Collema coccophorum*		
Crassulaceae	*Crassula colorata var colorata*	✓	
Cyperaceae	*Ficinia nodosa*		
Euphorbiaceae	*Euphorbia tannensis subsp eremophila*	✓	
Gentianaceae	*Centaurium spicatum*	✓	
Geraniaceae	*Erodium cicutarium*		✓
Goodeniaceae	*Scaevola crassifolia*		
Malvaceae	*Malva australiana*	✓	
Myoporaceae	*Myoporum insulare*		
Papilionaceae	*Melilotus indicus*	✓	✓
Plantaginaceae	*Plantago debilis*	✓	
Plumbaginaceae	*Muellerolimon salicorniaceum*		
Poaceae	*Austrodanthonia caespitosa*		
	Austrostipa crinita		
	Bromus diandrus	✓	✓
	Ehrharta longiflora		
	Eragrostis delsii	✓	
	Parapholis incurva	✓	✓
	Psora decipiens		

Santalaceae	*Exocarpos sparteus*		
Sapindaceae	*Dodonaea aptera*		
Solanaceae	*Nicotiana occidentalis subsp hesperis*	✓	
Teloschistaceae	*Caloplaca holocarpa*		
	Fulgensia bracteata		
Thymelaeaceae	*Pimelia microcephala subsp microcephala*		
Verrucariaceae	*Catapyrenium squamulosum*		
Utricaceae	*Parietaria debilis*	✓	
Zygophyllaceae	*Nitraria billardierei*		

Taxa recorded on the dunes not initially found in quadrat sites

Carpobrotus virescens (occurs in the dunes to the north of quadrat sites)
Pimelea microcephala subsp *microcephala* (this taxa showing evidence of heavy grazing)
Atriplex bunburyana (Wallaby seen grazing on this species)
Frankenia sp.
Atriplex cineerea

Taxa recorded on the saline flats

(Which show no evidence of grazing pressure)

Halosarcia halocreinoides
Halosarcia doleiformis
Muellerolimon salicorniaceum
Frankenia sp
Nitraria billardierei