

Vegetation Transect Monitoring Method

GREAT OCEAN ROAD COAST COMMITTEE



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BeaconEcological

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- **Alex Sedger** and **Georgie Beale** (Great Ocean Road Coast Committee) for reviewing the methodology.



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DISCLAIMER

The author advises that the information presented in this report, including any management advice, has been prepared with all due diligence and care, and based on the best available knowledge and research.

However the author takes no responsibility for any loss, injury or financial damage resulting from the reliance and/or application of management advice provided in the report.



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1 INTRODUCTION

The 2015 review of the Great Ocean Road Coast Committee (GORCC) *Native Vegetation and Weed Action Plan* (Beacon Ecological 2015) includes recommendations for vegetation monitoring to assist determining the effectiveness of weed control on GORCC managed land. The monitoring program was to be robust enough to determine changes in vegetation composition, particularly levels of weed infestation. It also had to be easy to use, and able to be implemented by GORCC conservation team members.

A review of suitable monitoring tools was undertaken with permanent pseudo-randomised line intercept transects and photopoints as per *Monitoring manual for Bitou Bush control and native plant recovery* (Hughes *et al* 2009) determined to the best meet the monitoring requirements. The transect assessments monitor shrub species only to allow for rapid and simple assessment and evaluation. Photopoints were also established at one end of each transect.

Graphs and photopoints of 2015 assessments are provided in Appendix 1 of this report.

2 DATA COLLECTION METHODOLOGY

The methodology has been separated into several sections including:

1. Placement of transects: How to set up transects using a pseudo-randomised transect methodology to ensure objective data collection.
2. Field Set Up and Data Collection: Details equipment required and how to collect data.
3. Data Management: How to collate the data and enter it into a form ready to be evaluated.

2.1 PLACEMENT OF TRANSECTS

Sampling units need to be placed without bias to account for the variation present across monitoring sites. Transects have been placed using a pseudo-random placement, using existing tracks within sites to be monitored as a base transect. Pseudo-random placement is determined by randomly placing transects at right angles along the track using a random number generator to determine transect distances. See Figure 1 for an example pseudo-random placement.

Transects have been oriented to run parallel to any gradients on the site, such as slope, i.e. transects would run up or down the slope. Variability on the site is then encompassed within each transect, rather than between transects. Transects have been placed to also run parallel to one another to ensure they do not sample the same area.





Figure 1. Example pseudo-random transect placement on the Jan Juc Clifftops. Note that a random number generator has been used to determine distances to place transects along the track.

2.2 FIELD SETUP AND DATA COLLECTION

Office component

1. Print out maps and GPS points of previously established transects to be monitored.
2. Collect the following items:
 - a. Printed data sheets (See Appendix 1). Note that you will need a separate data sheet for each transect.
 - b. Clipboard.
 - c. Compass.
 - d. Pens.
 - e. Camera.
 - f. Plant identification guide.
 - g. Plastic bags for plant samples to identify plants back in the office if required.
 - h. 50 metre tape measure.
 - i. Spare star pickets (length 50 centimetres).
 - j. Mallet for driving in any missing star pickets.

Field component:

1. Locate the start and end point your transect in the field using your site map and a GPS receiver or tape measure. Start points of transects have been marked with copper tag on the back of a fence post when starting on fence lines (Plate 1) or a star picket.



Plate 1. Copper tag on rear of post to identify transect,

2. Complete the top section of the datasheet which contain the site and transect information.
3. Run tape measure between start and end points.
4. Walk along the transect and record the beginning and end values of the intercept of each shrub species (both native and introduced) as it occurs on a vertical projection of the tape measure, (See Figure 2), stopping at the predetermined end point.
5. Record the species name and actual start and end tape measure values in the *Intercepts* column (See Figure 3 for example sheet). The actual distance between them goes into the total length column. **Note:** Overlapping cover of the same species should not be counted twice, but should be recorded as continuous cover. Gap of less than 10 cm of the same species are considered to be continuous cover (See measurement 'd' in Figure 2).

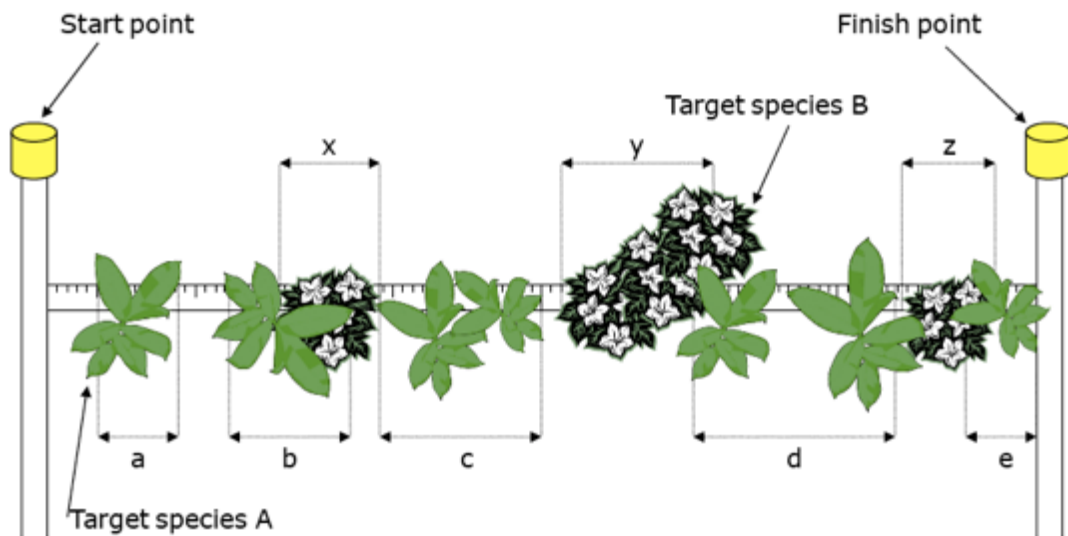


Figure 2. Example sampling transect. Note that target species can overlap cover on the transect. Also note that measurement 'd' is continuous as the gap between the foliage of two plants of the one species is less than 10 centimetres (Source Hughes *et al.* 2009).

6. Ensure you record the entire intercept length irrespective of any canopy overlap by a different species.
7. Calculate the Total length (m) of each intercept.

Line Intercept Transect Field Datasheet								
Site ID	A.3	Site Name	Jan Juc Clifftops	Observers	A. Brown & J. Doe		Date	V/15
Transect Number	2	Transect Length	50 metres	Transect Orientation (°)	270 (West)	GPS Location Position	E 38° 23' 234 S 144° 23' 234	
Target Species							Intercepts (start and end measurements)	Total Length (m)
Coast Beard Heath							0 - 4.6	4.6
BoneSeed							5.4 - 11	5.6
Sweet Pittosporum							10.0 - 12.1	2.1
BoneSeed							12.9 - 14.0	2.1
Coast Beard Heath							14.4 - 19.3	4.9
Coast Beard Heath							20.0 - 22.0	2.0
Coast Beard Heath							22.7 - 27.5	4.8

Figure 3. Example completed data sheet.

2.3 DATA MANAGEMENT

Data should be entered electronically into the data spreadsheet as soon as possible after collection. Line-intercept transects can be used to determine the percentage cover of target weeds and other plants in your monitoring area. To calculate the percentage cover using collected data:

1. Sum the individual cover distances for an individual species over the transect.

2. Divide this total cover distance by the total transect length to calculate the proportion of the transect covered by a species.
3. Multiply this value by 100 to calculate the percentage cover for the transect.

For example, take the individual distances for a Target Species A from Figure 2 (total transect length of 10 m):

$$a = 0.5 \text{ m} - 1.3 \text{ m} = 0.8 \text{ m}$$

$$b = 1.8 \text{ m} - 3.0 \text{ m} = 1.2 \text{ m}$$

$$c = 3.3 \text{ m} - 5.0 \text{ m} = 1.7 \text{ m}$$

$$d = 6.5 \text{ m} - 8.6 \text{ m} = 2.1 \text{ m}$$

$$e = 9.3 \text{ m} - 10.0 \text{ m} = 0.7 \text{ m}$$

The formula to calculate the percentage cover is:

$$\% \text{ cover} = (\text{Distance } a + b + c + d + e) \times 100\% / \text{total length of transect}$$

For the example above the percentage cover of the target species is:

$$\% \text{ cover} = (0.8 + 1.2 + 1.7 + 2.1 + 0.7) \times 100\% / 10 = 65\%$$

Repeat this calculation for all species within the quadrat and input them into the spreadsheet *GORCC Transect Monitoring.xls* with the date of data collection.



3 EVALUATING DATA

To evaluate the data once entered into the excel spread sheet the data needs to be analysed and then graphed.

3.1 ANALYSING DATA

Averages

To analyse the data, the average of each species across the transects at a site needs to be derived. Use the AVERAGE excel function to do this as in Figure 4. This provides the average cover of each species within the sampled area. If new species are recorded in subsequent years of monitoring these will need to be added to the spreadsheet.

AVERAGE		fx		=AVERAGE(I16,I13,I20,I27)				
Transect	Length	Orientation	Start GPS	End GPS	Photopoint	Species	18/02/2015 Metres	18/02/2015 Percentage
1						Management Site		
2						Ecological Vegetation Class		
3								
4								
5	1	50 150°	0269615, 5	0269648, 5	Start Point	Acacia longifolia subsp. sophorae	14.4	28.80%
6						Leucopogon parviflorus	20.7	41.40%
7						Rhagodia candolleana	3	6.00%
8						Leptosperum laevigatum	7.1	14.20%
9						Melaleuca lanceolata		0.00%
10						Olearia axillaris	2.5	5.00%
11						Acacia retinoides		0.00%
12						Acacia longifolia subsp. sophorae	22.4	44.80%
13	2	50 150°	0269619, 5	0269659, 5	Start Point	Leucopogon parviflorus	8.5	17.00%
14						Rhagodia candolleana	6	12.00%
15						Leptosperum laevigatum	5.85	11.70%
16						Melaleuca lanceolata		0.00%
17						Olearia axillaris		0.00%
18						Acacia retinoides	12.9	25.80%
19						Acacia longifolia subsp. sophorae	26.3	52.60%
20	3	50 150°	029648, 57	0269682, 5	Start Point	Leucopogon parviflorus	10.6	21.20%
21						Rhagodia candolleana	4.6	9.20%
22						Leptosperum laevigatum	4.3	8.60%
23						Melaleuca lanceolata	4.2	8.40%
24						Olearia axillaris	0.1	0.20%
25						Acacia retinoides		0.00%
26						Acacia longifolia subsp. sophorae	15.0	30.00%
27	4	50 m 150°	0269665, 5	0269698, 5	Start Point	Leucopogon parviflorus	16.3	32.60%
28						Rhagodia candolleana	3.3	6.60%
29						Leptosperum laevigatum	9.1	18.20%
30						Melaleuca lanceolata		0.00%
31						Olearia axillaris		0.00%
32						Acacia retinoides		0.00%
33						AVERAGE		
34						Acacia longifolia subsp. sophorae		27%
35						Leucopogon parviflorus		28.05%
36						Rhagodia candolleana		8.45%
37						Leptosperum laevigatum		13.18%
38						Melaleuca lanceolata		2.10%
39						Olearia axillaris		1.30%
40						Acacia retinoides		6.45%
41						STANDARD DEVIATION		
42						Acacia longifolia subsp. sophorae		11.60%
43						Leucopogon parviflorus		11.07%
44						Rhagodia candolleana		2.74%
45						Leptosperum laevigatum		4.06%
46						Melaleuca lanceolata		4.20%
47						Olearia axillaris		2.47%
48						Acacia retinoides		12.90%

Figure 4. Calculating the average cover of recorded species.

Standard Deviation

Standard deviation is also useful to know when looking at averages. The standard deviation is a measure of how spread out the numbers are that make up your average. In this case, a low standard deviation signifies the cover of a species across the transects are all close to the average. A higher standard deviation signifies that the cover values of each species are spread out. The standard deviation can

indicate how evenly distributed species are across the sample area. Generally, 68% of all values will be located within one standard deviation of the average, 95% within two and 99.7% within three. Use the standard deviation function from excel as in Figure 5 below.


Transect	Length	Orientation	Start GPS	End GPS	Photopoint	Species	18/02/2015 Metres	18/02/2015 Percentage
1	50	150°	0269615, 5	0269648, 5	Start Point	Acacia longifolia subsp. sophorae	14.4	28.80%
						Leucopogon parviflorus	20.7	41.40%
						Rhagodia candolleana	3	6.00%
						Leptosperum laevigatum	7.1	14.20%
						Melaleuca lanceolata		0.00%
						Olearia axillaris	2.5	5.00%
						Acacia retinoides		0.00%
2	50	150°	0269619, 5	0269659, 5	Start Point	Acacia longifolia subsp. sophorae	22.4	44.80%
						Leucopogon parviflorus	8.5	17.00%
						Rhagodia candolleana	6	12.00%
						Leptosperum laevigatum	5.85	11.70%
						Melaleuca lanceolata		0.00%
						Olearia axillaris		0.00%
						Acacia retinoides	12.9	25.80%
3	50	150°	029648, 57	0269682, 5	Start Point	Acacia longifolia subsp. sophorae	26.3	52.60%
						Leucopogon parviflorus	10.6	21.20%
						Rhagodia candolleana	4.6	9.20%
						Leptosperum laevigatum	4.3	8.60%
						Melaleuca lanceolata	4.2	8.40%
						Olearia axillaris	0.1	0.20%
						Acacia retinoides		0.00%
4	50 m	150°	0269665, 5	0269698, 5	Start Point	Acacia longifolia subsp. sophorae	15.0	30.00%
						Leucopogon parviflorus	16.3	32.60%
						Rhagodia candolleana	3.3	6.60%
						Leptosperum laevigatum	9.1	18.20%
						Melaleuca lanceolata		0.00%
						Olearia axillaris		0.00%
						Acacia retinoides		0.00%
AVERAGE						Acacia longifolia subsp. sophorae		39.05%
						Leucopogon parviflorus		28.05%
						Rhagodia candolleana		8.45%
						Leptosperum laevigatum		13.18%
						Melaleuca lanceolata		2.10%
						Olearia axillaris		1.30%
						Acacia retinoides		6.45%
STANDARD DEVIATION						Acacia longifolia subsp. sophorae		13.120,127
						Leucopogon parviflorus		11.07%
						Rhagodia candolleana		2.74%
						Leptosperum laevigatum		4.06%
						Melaleuca lanceolata		4.20%
						Olearia axillaris		2.47%
						Acacia retinoides		12.90%

Figure 5. Calculating the standard deviation of the cover of recorded species.

Repeat these steps for all subsequent monitoring events, moving right across the spreadsheet.

3.2 GRAPHING THE DATA

This section outlines how to graph the data to view changes in cover over time.

1. Select the data required to be graphed then select insert column chart from the chart menu:
- 
2. A graph showing the selected data should then appear. Colours, styles and labels of the graph can then be altered by selecting graph features and editing them.
 3. To add the standard deviation to the graph right click on the columns and select *Format Data Series*.
 4. Select *Error Bars*, then *Both* from the *Display* category and *Cap* from the *End style* category (Figure 6).
 5. Select *Custom* from the Error Amount category and click *Specify Value*.

6. For both the *Positive Error Value* and *Negative Error Value* select the standard deviation calculated for the averages from the spread sheet. The standard error should now be shown on each bar value of the graph.

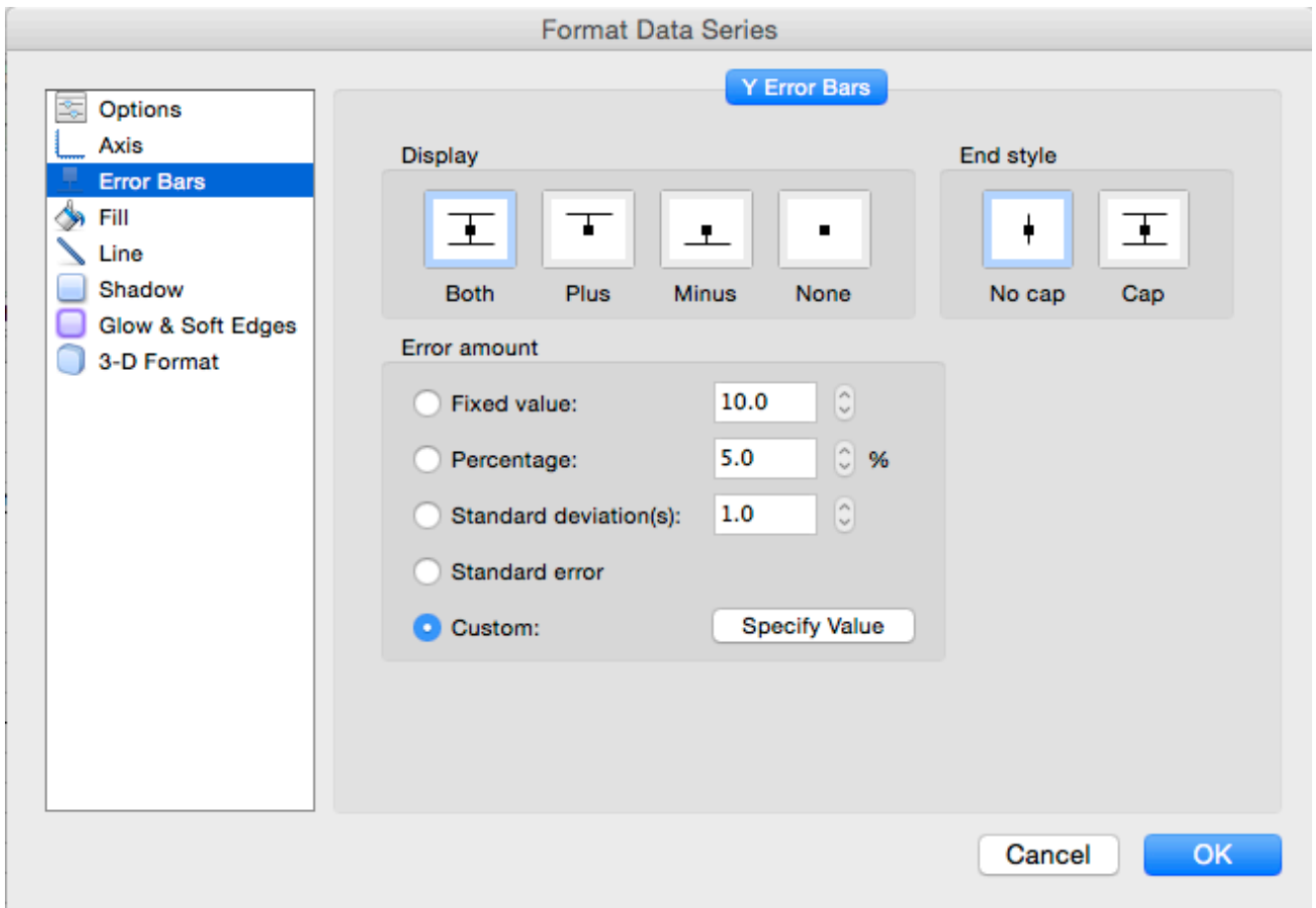


Figure 6. Format data series.

4 PHOTOPPOINTS

Permanent photopoints were established at each transect by hammering a star-picket into the ground five metres from one end of the transect. The star picket is the photopoint reference and is positioned in the centre of the photo. A white band was placed on each reference picket at approximately one metre above ground level as a height reference. Photos were taken from approximately 165 centimetres above ground level. Photopoint photos are provided in Appendix 3 of this documents and as .jpg files.

REFERENCES

Beacon Ecological 2015. *Great Ocean Road Coast Committee Native Vegetation and Weed Action Plan*. Unpublished report for the Great Ocean Road Coast Committee.

Hughes, NK, Burley, AL, King, SA and Downey, PO 2009 *Monitoring manual for bitou bush control and native plant recovery*, Department of Environment, Climate Change and Water NSW, Hurstville.

APPENDICES

APPENDIX 1. DATA RECORDING SHEET

Line Intercept Transect Field Datasheet

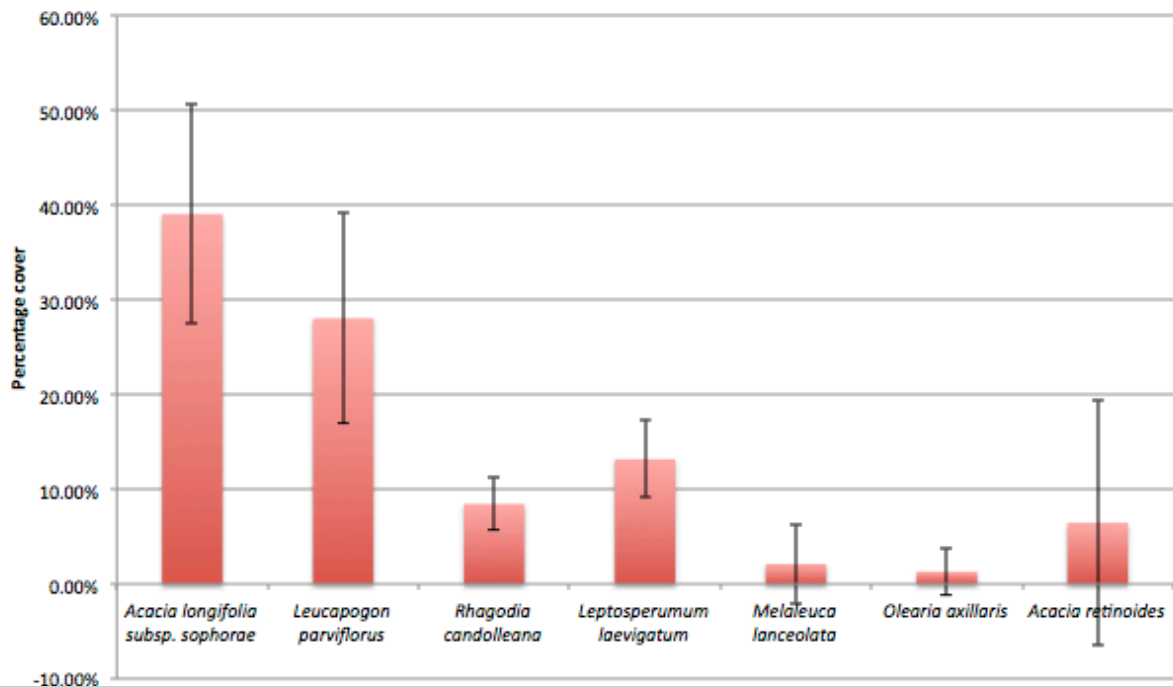
Site ID	Site Name	Observers	Date	
Transect Number	Transect Length	Transect Orientation (°)	GPS Location Position	
Target Species			Intercepts (start and end measurements)	Total Length (m)



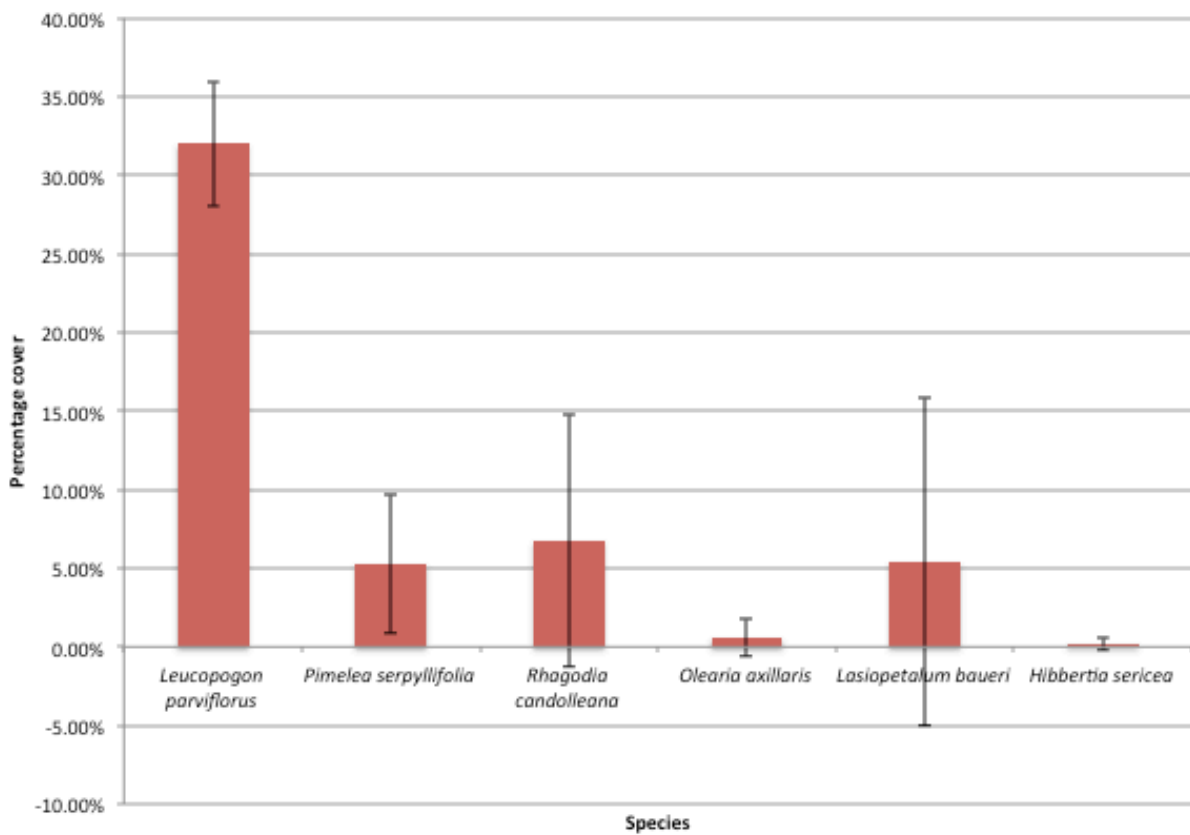
Target Species	Intercepts (start and end measurements)	Total Length (m)

4.1 APPENDIX 2. GRAPHED DATA FROM 2015 MONITORING

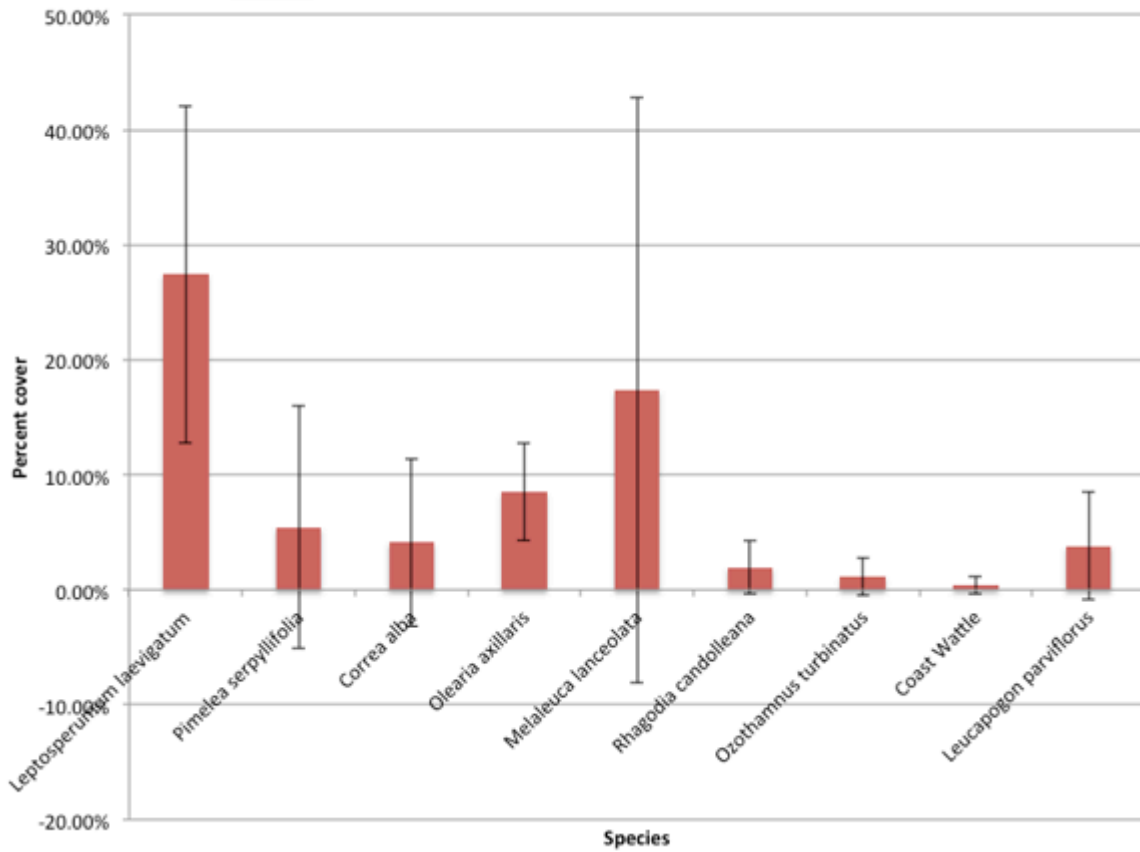
Pt Impossible Carpark. Aim: Monitor effectiveness of Coast Tea-tree control.



Jan Juc Clifftops. Aim: Monitor cover of Coast Beard-heath

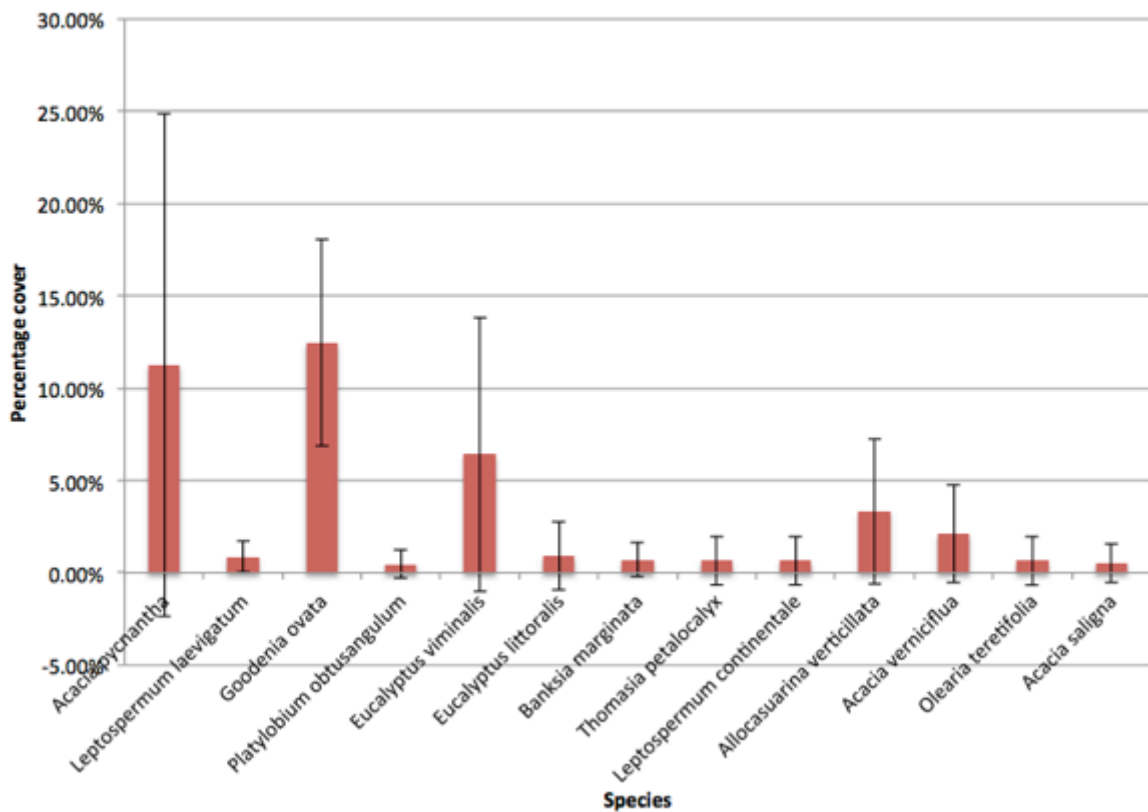


O'Donoghues. Aim: Monitor change in Coast Tea-tree

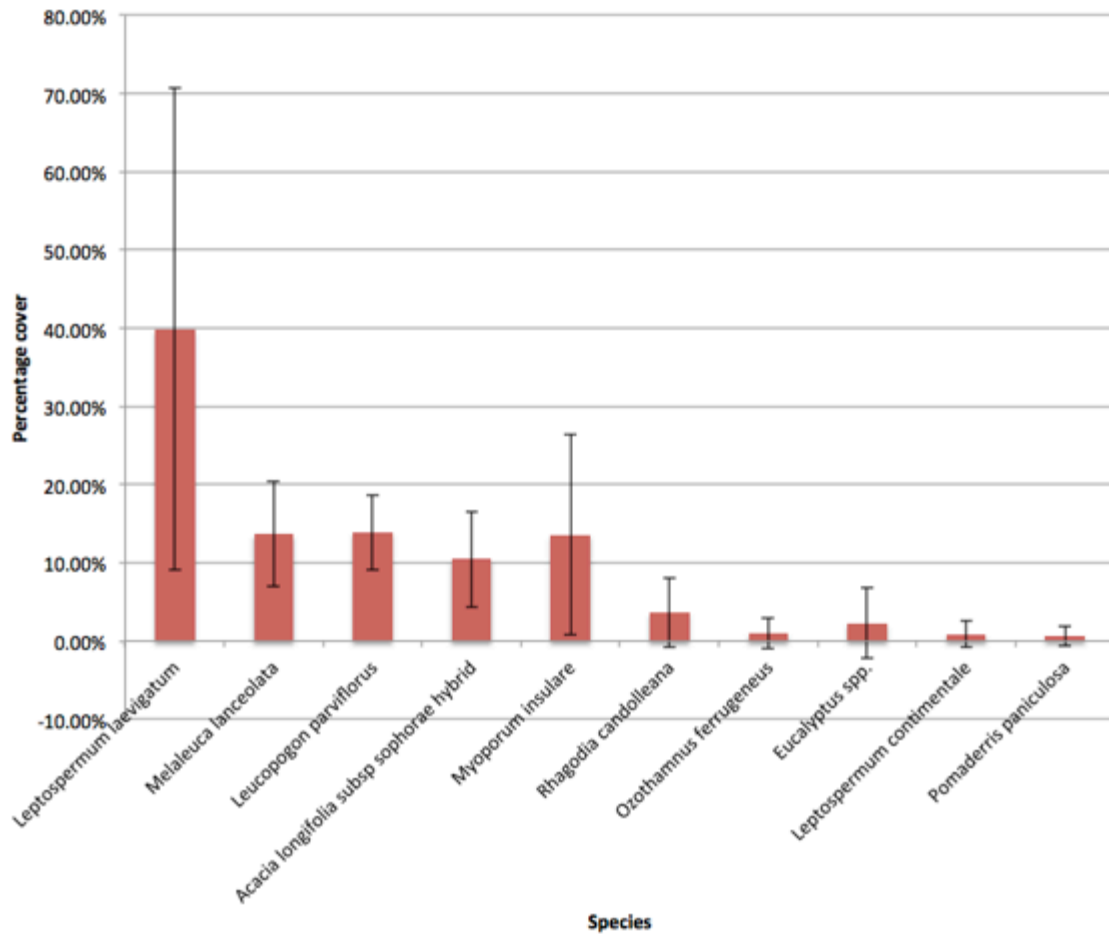


Number Format

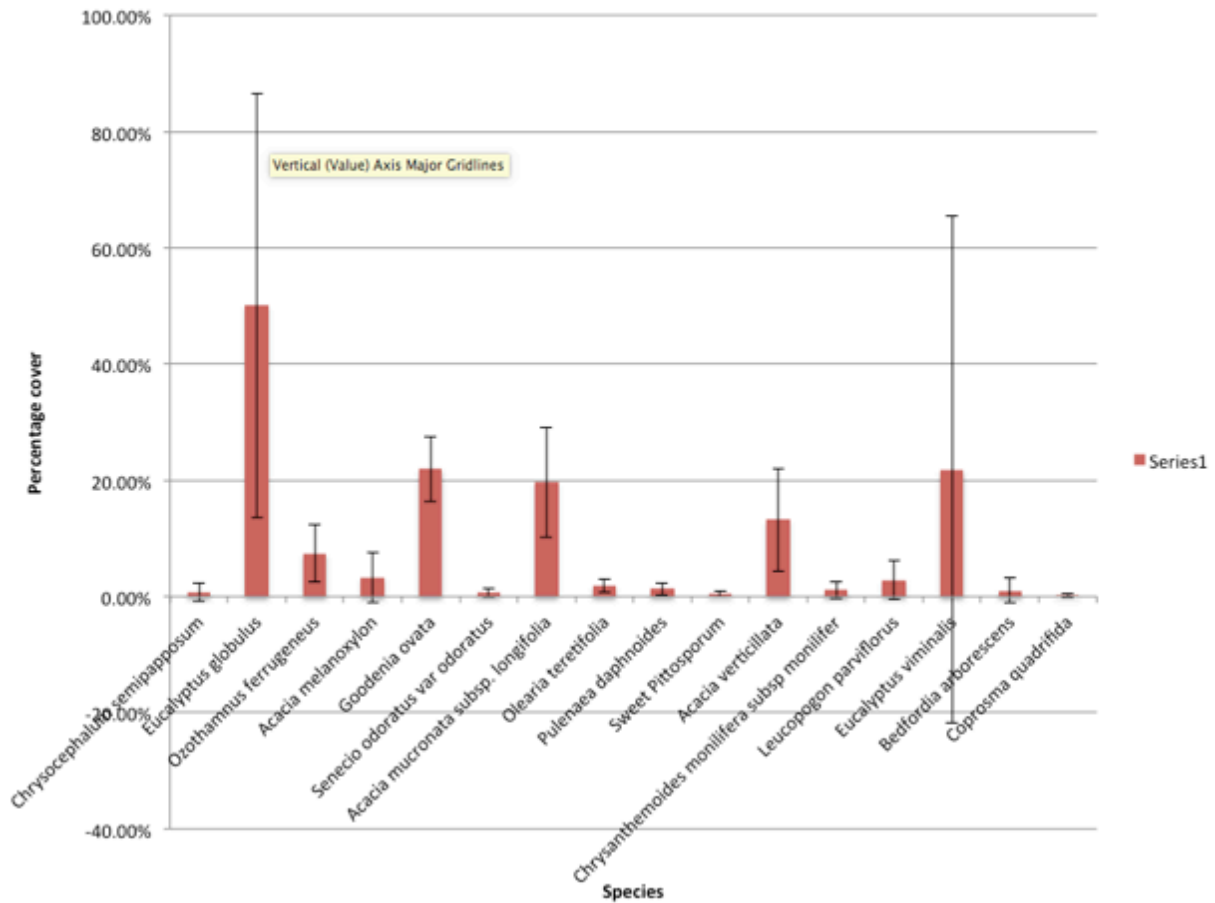
Soapy Rocks. Aim: Monitor change in species composition post weed control



Split Point West. Aim: Monitor change in weed cover



Queens Park. Aim: Monitor weed cover.



APPENDIX 2. PHOTOPOINTS FROM 2015 MONITORING.

Point Impossible Carpark Monitoring site



Transect 1.



Transect 2.



Transect 3.



Transect 4.

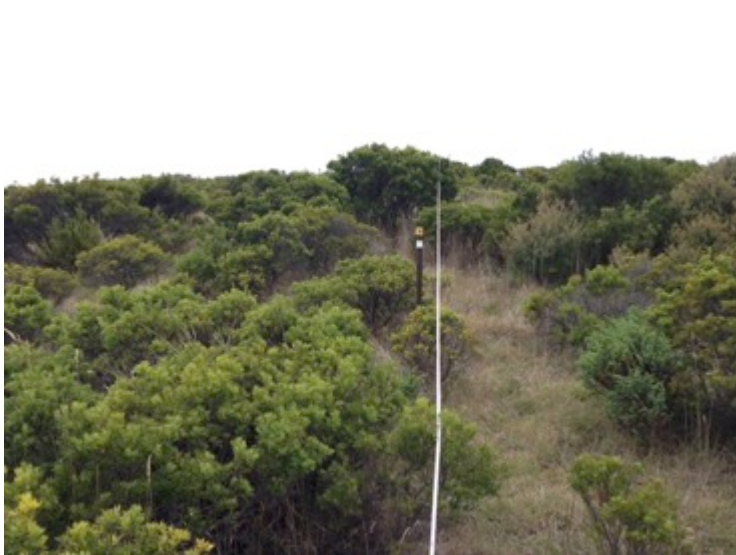
Jan Juc Clifftops Monitoring site



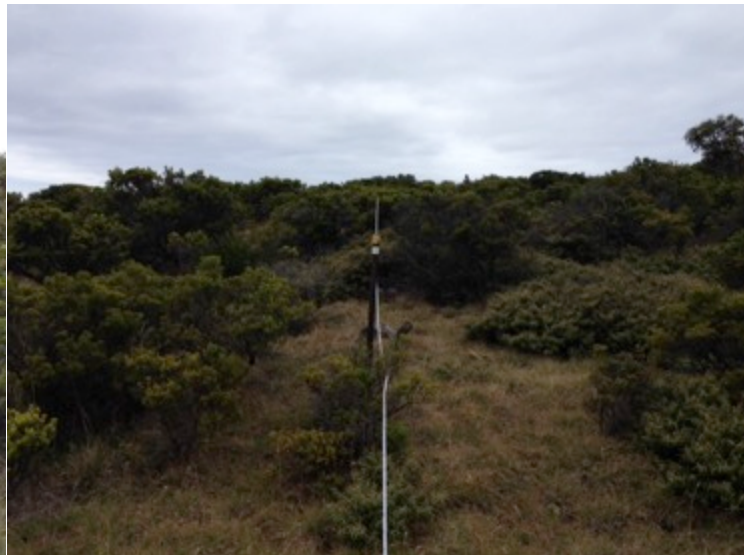
Transect 1.



Transect 2.



Transect 3.



Transect 4.

O'Donohues Monitoring site



Transect 1.



Transect 2.



Transect 3.

Transect 4.

Soapy Rocks Monitoring site



Transect 1.

Transect 2.



Transect 3.



Transect 4.

Split Point West Monitoring site



Transect 1.



Transect 2.



Transect 3.



Transect 4.

Queens Park Monitoring site



Transect 1.



Transect 2.



Transect 3.



Transect 4.