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Appendix 6 Selecting priority sites for bitou bush control

Determining the species, populations and ecological communities at risk from bitou bush invasion is only the first stage in the process of abating the impact of bitou bush on biodiversity. The second stage requires an assessment of the locations at which the entities at risk occur (hereafter referred to as 'entity locations'). Entity location assessment involves determining the feasibility of control, the actual impact of bitou bush, the condition of the entity present and the other threats present.

While the entity location assessment process has not changed since the publication of the draft (see DEC 2004), the processes for determining and selecting priority sites for implementing the TAP have been changed. Also, an additional 95 species, one population and 17 ecological communities have been incorporated into the TAP, and thus additional site information for these entities is included here. Many of the sites marked as 'A' (requiring further assessment) in the draft have now also been modelled. Finally, sites presented in the draft TAP were not grouped when multiple species occurred at either the same site or within close proximity. This has been resolved here.

A6.1 Stage one – assessment of entity locations

In order to establish priority sites for bitou bush control, the locations of all species, populations and ecological communities considered to be at risk from bitou bush invasion (i.e. as identified in Appendices 3 and 5) were examined here (hereafter referred to as entity locations). The assessment of entity locations in the model uses three attributes: (E) the ability to achieve **effective** bitou bush control at the location; (AI) the **actual impact** of bitou bush at each location; and (C) the **condition** of the entity present at each location.

It should be noted that in this initial assessment stage, entity locations were modelled. The second assessment stage outlined below in Section A6.2 accounts for sites that encompass multiple entities within close proximity to each other (hereafter referred to as multi-species sites).

The model for assessing the entity locations is:

Entity location priority = effective control [E] + actual impact [AI] + condition [C]

Each attribute is scored with the highest score implying the highest priority. The score for each attribute is based on a subjective assessment for each entity at each site, being either Low, Low–Medium, Medium, Medium–High or High for each of the three attributes. These subjective scores were then converted into a numerical value shown in Table A6.1.

Table A6.1 Numerical value of each of the subjective assessment scores given to each of the three location attributes (i.e. E, AI and C - see text for more details).

subjective assessment values given to each of the three location attribute (i.e. E, AI and C)	numerical value
Low	1
Low – Medium	2
Medium	3
Medium – High	4
High	5

The scores for each attribute were added to give a total score (maximum of 15) that was converted to a priority rank (i.e. High, Medium or Low priority) based on the following division:

- Low priority (L) if an entity location scored ≤5
- Medium priority (M) if an entity location scored >5 and ≤10
- High priority (H) if an entity location scored >10

Entity locations were listed as requiring further assessment (A) where there was insufficient information.

E Effective

The ability to achieve effective bitou bush control at an entity location was based on the *density of bitou bush* present, and the feasibility of undertaking bitou bush control, particularly **with respect to protecting the entities at risk.** Locations with high densities of bitou bush where the feasibility of control is relatively high were given a high value. In contrast, locations with low densities of bitou bush where the feasibility of control is low (i.e. logistically difficult and/or expensive) were assessed as low. These are the extreme scenarios, with a range of combinations in between.

AI Actual impact

The actual impact of bitou bush at each entity location was determined by considering the degree of impact posed by bitou bush (and associated weeds - as outlined/specified in Section 7.2). The level of infestation of bitou bush and its proximity to the threatened entity were also considered here. Locations at which bitou bush and associated weed species were well established and in close proximity to the threatened entity were assessed as high.

C Condition

This attribute was separated into two components: the condition of the entity and the physical condition of the location.

Entity condition – The condition of the entity present (i.e. plant population health) at each entity location, and the importance of the entity location to the entity's overall status. Factors considered in rating entity locations included the size of the population (i.e. few or many individuals) in relation to the its natural occurrence (e.g. some species only occur in small populations, which are common), the area occupied or distribution of the population at the location, whether it occurred on the edge of the entity's range, and the overall health of the population present (i.e. individuals in poor health or where there are limited seedlings present, or all are old and sick plants, etc.).

Location condition – The condition of the location where the entity is present (i.e. based on the presence of threats other than bitou bush which may reduce the success of the control program). While the control of other weed species, particularly those that will replace bitou bush following control, must occur within the confines of this TAP (as specified in Section 7.2), reduction of all other threats is outside its scope. Thus, locations where there were major threats other than bitou bush and associated weed species were assessed as low.

Locations where the entity condition was high and the physical condition was high (i.e. limited other threats were present), were assessed as high.

The assessment of condition was determined in consultation with relevant threatened species recovery teams, species experts (including botanists) and people managing these sites in the field.

A6.2 Stage two – categorising sites for control

The first stage outlined above (assessment of entity locations), prioritises each entity location, however, the majority of locations could be grouped into larger sites based on their geographic locations or their relative proximity. Thus a second assessment stage is needed to amalgamate the entity location information into a single value for multi-species sites. This second stage uses five steps:

i) each entity location is **assigned a cell in a matrix** based on the combination of the **entity location priority** (H, M or L as determined in stage one, Section A6.1 above) and the **entity priority** (H, M or L as determined in Appendices 3 and 5)

ii) the entity locations were amalgamated into multi-species sites, and assigned a cell in the matrix

iii) sites were divided into **five control categories**

iv) each entity location in each site was assigned an **entity matrix value** according to the **cell within the matrix** that was assigned in step i). The **entity matrix values** were summed for all entities occurring at a site, giving a **site matrix score**

v) the **site matrix score** was used to **rank the sites** within each control category.

i assigning cells in the matrix to entity locations

The results of the species, population and ecological community models (see Appendices 3 and 5), and the site model can be presented as a matrix, in which every combination is expressed from a high priority species at a high priority location to a low priority species at a low priority location (Figure A6.1). For example, the *Wooli River* site is a high priority location for the high priority species *Sophora tomentosa*, and would therefore be assigned the cell marked with an x in the matrix in Figure A6.1 (i.e. HH).

		entity location priority		
		H	**M**	**L**
entity priority	**H**	x		
	M			
	L			

Figure A6.1 Matrix of entity location priority by entity priority (High (H), Medium (M) and Low (L) priority).

Sites marked with an ‘A’ could not be given a cell in the matrix due to insufficient information and are thus not accounted for.

ii assigning cells in the matrix to multi-species sites

As outlined above, every entity priority – entity location combination can be assigned one of nine cells in the matrix. When entity locations were grouped into multi-species sites, the highest value matrix cell for all entity locations was assigned as the overall matrix cell for the site. For example, the *Broken Head Nature Reserve* site encompasses 17 entity locations, representing six cells in the matrix: 2 x HH, 3 x HM, 2 x MH,

3 x MM, 3 x LH, 4 x LM. Thus, *Broken Head Nature Reserve* site is assigned a matrix cell of HH, being the highest value. Single-species sites keep their initial matrix cell.

iii five control categories

Accounting for multi-species sites in the matrix reduces the number of sites to 349 across coastal New South Wales. This process enables priorities for control to be determined for all sites from the matrix by assigning the sites encompassed by each cell a control category using the system presented in Figure A6.2. For example, the *Broken Head Nature Reserve* site was assigned to control category 1 (C1), as it was assigned a matrix cell of HH in step iii) – see above. Every site was assigned to a control category.

		entity location priority		
		H	M	L
entity priority	H	**HH**	**HM**	**HL**
	M	**MH**	**MM**	**ML**
	L	**LH**	**LM**	**LL**

translates to ➔

C1	**C2**	**C3**
C2	**C3**	**C4**
C3	**C4**	**C5**

Figure A6.2 The five control categories given to each cell in the matrix.

iv assigning entity matrix values

To assign priority to sites within each control category, each entity location was assigned an **entity matrix value** ranging from 5 to 1 according to the matrix cell assigned to the entity location in step i). For example, *Sophora tomentosa* at Wooli River was assigned to matrix cell HH, which gives an **entity matrix value** of 5. This process is illustrated below in Figure A6.3.

		entity location priority		
		H	M	L
entity priority	H	**HH**	**HM**	**HL**
	M	**MH**	**MM**	**ML**
	L	**LH**	**LM**	**LL**

translates to ➔

		entity location priority		
		H	M	L
entity priority	H	**5**	**4**	**3**
	M	**4**	**3**	**2**
	L	**3**	**2**	**1**

Figure A6.3 The entity matrix value (from 5 to 1) given to each entity location according to the matrix cell assigned in step i).

For multi-species sites, the **entity matrix values** for each entity location were added to give a total **site matrix score**. For example, the *Broken Head Nature Reserve* site encompassed 17 entity locations, which were assigned the following cells in the matrix from step ii):

2 x HH, 3 x HM, 2 x MH, 3 x MM, 3 x LH, 4 x LM.

Therefore the total **site matrix score** would be:

(2 x 5) + (3 x 4) + (2 x 4) + (3 x 3) + (3 x 3) + (4 x 2) = 56.

For single species sites, the total **site matrix score** is simply the **entity matrix value**.

v ranking sites within each control category

Given that each of the five control categories contain numerous sites, a process is needed to prioritise sites for implementation. In order to establish priorities for bitou bush control, the sites within each category were ranked using the total **site matrix score** (step iv).

Sites with a greater **site matrix score** were ranked highest, giving sites with high priority entities that contain the largest number of other entities at risk the greatest priority for control. A full list of the sites within each of the five categories ranked according to the process described above is presented in Appendix 7.