

Coastal Vegetation of the Bellingen Local Government Area

Mapping Project



prepared for
Bellingen Shire Council

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Executive Summary

The Bellingen Coastal Vegetation Mapping Project, performed by Flametree Ecological Consulting on behalf of Bellingen Shire Council, has achieved the following outcomes:

- Identification and mapping of vegetation communities on public land in the coastal parts of the Bellingen LGA (the Study Area)
- Identification and mapping of Endangered Ecological Communities in the Study Area
- Mapping of the incidence and severity of infestations of weed species at selected points in the Study Area
- Mapping of vegetation condition (weed levels) over the whole of the Study Area
- Mapping of vegetation in the Study Area in terms of priority for management actions (in particular, bush regeneration)
- Discovery of a population of the Endangered Scented Acronychia
- Development of a quantitative method of rapidly assessing vegetation condition, to allow monitoring of any future changes
- Development of specific management recommendations for vegetation in the Study Area

Cover photo: Scented Acronychias near Hungry Head

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1. Introduction

1.1 Background

Prior to completion of the present project, the vegetation of the coastal parts of the Bellingen LGA had not been comprehensively mapped. Bellingen Shire Council therefore engaged Flametree Ecological Consulting to map the vegetation of the coastal parts of the LGA. In particular, Council requested that Flametree:

- Map current and potentially threatened species and Endangered Ecological Communities
- Assess the condition of vegetation communities
- Assess threats to vegetation communities and identify indicators of ecological change
- Map appropriate management units to facilitate vegetation management
- Document vegetation monitoring methodologies to measure change in condition and/or extent of vegetation communities

1.2 Location of Study Area

Bellingen LGA is in northern NSW, Australia. The Study Area (i.e. the area mapped) consists of public land in the coastal parts of Bellingen LGA, with the exception of National Park.

1.3 Major landform components of Study Area

For practical purposes, the Study Area can be readily divided into the following smaller parcels:

- 1) Tuckers Rocks-Mylestom
- 2) North Beach
- 3) The Urunga Sandmass, i.e. the broad sandy peninsula between Urunga Lagoon and the coast
- 4) Hungry Head
- 5) Wenonah Headland (Third Headland)

1.4 Previous studies

Two parts of the Study Area have been the subject of vegetation mapping or surveying in the past: Wenonah Headland (Allen *et al.* 1994) and Hungry Head Reserve (Ecopro 1996, Floyd 1999). In addition, the level of Bitou Bush infestation of the coastal parts of the LGA was mapped in 2001 (Gerrand 2001, Thomas 2002).

2. Methods

2.1 Vegetation community and Threatened flora mapping

2.1.1 Background research

We consulted the online NSW Wildlife Atlas (DEC 2006a) to determine which Threatened flora species had been recorded within 20km of the Study Area, and assessed the likelihood – on the basis of habitat preferences – of these species occurring in the Study Area.

2.1.2 Mapping in the field

We walked over most of the Study Area, using a handheld GPS (Garmin eTrex Legend) to record the locations of community boundaries¹, and noting the level of weed infestation of the vegetation communities we passed through (see Section 2.2). As we walked, we looked out for Threatened flora species that we considered possible occurrences in the Study Area (Table 7, below). We walked more extensively in areas where aerial photos and/or preliminary field inspections revealed greater diversity of vegetation types, such as between Hungry Head and Urunga Lagoon. Conversely, we walked less extensively in areas where aerial photos and/or preliminary field inspections revealed the vegetation to be relatively homogeneous, such as in the dune systems of North Beach (south of Mylestom) and south of Wenonah Headland.

2.1.3 Classifying vegetation communities

We classified vegetation communities on the basis of canopy floristics and, to a lesser extent, community structure and topographic position. We did not perform detailed floristic surveys as part of our classification. In some instances, such as monospecific stands of Broad-leaved Paperbark or Swamp Oak, classification was clear-cut and easy. In other cases, however, such as where we encountered a subtly changing mixture of eucalypt species, community definitions were more nebulous.

2.1.4 Mapping using GIS

Where the boundaries of a vegetation community polygon were visible in aerial photographs, we drew the polygon onto the GIS program Mapinfo by tracing over the Council's aerial photography layer². Thus, any discrepancies between the aerial photography layer and other GIS layers used by the Council (such as cadastral layers) will carry over into the vegetation mapping. Where community boundaries were not visible in aerial photographs, we used field observations and, where appropriate, contours to draw polygons. Mapping in these instances is likely to be less accurate than where boundaries were visible in aerial photographs.

2.2 Vegetation condition mapping

2.2.1 Talking with local bush regenerators

We spoke to local bush regenerators Annie Thiering (Urunga Lagoon east, Second Headland and Wenonah Head), Anika Faber (Tuckers Rocks and Urunga Lagoon west), Judy Cooney (Hungry Head) and Colin Matthews (Wenonah Head) about the occurrence of weeds in the Study Area, and where weed control or plantings had been undertaken.

2.2.2 Mapping in the field

For each vegetation community we walked through, we recorded all weeds³ present, and gave them an abundance score of from 0.5 to 3 (Table 1). We initially attempted to score using integers only, as in the 2001 Bitou Bush mapping (Thomas 2002); however, we found that this level of resolution was impractically coarse. We generally discounted

¹ Locations were recorded in WGS 84 map datum (equivalent to the GDA 94 map datum used in the most recent [3rd edition] NSW 1:25,000 topographic maps), map zone 56, and are accurate to within 10m.

² There was a high degree of concordance between field observations of community boundaries, and boundaries as visible in aerial photographs.

³ We defined a weed as any plant species that would not have been present in the Study Area prior to 1750

weeds that were confined to roadsides, and showed no sign of invading adjacent vegetation (e.g. Elastic Grass).

Table 1. Explanation of weed abundance scores

Score	Explanation
0	Species not recoded along route walked
0.5	Only 1 or a very few individuals present along route walked
1	More than a very few individuals present, but species occurring on less than 20% of land area along route walked
1.5	Species occurring on between 20% and 40% of land area along route walked
2	Species occurring on between 40% and 60% of land area along route walked
2.5	Species occurring on between 60% and 80% of land area along route walked
3	Species occurring on over 80% of land area along route walked

We classified the weeds as either Ground Weeds, Woody Weeds or Vine Weeds. Ground Weeds are weeds that do not develop woody trunks, nor ascend far above ground level (e.g. Glory Lily, Freckle Face, Broad-leaved Paspalum); Woody Weeds are weeds that develop woody trunks (e.g. Bitou Bush, Senna, Lantana, Groundsel Bush); and Vine Weeds are weeds that do not develop woody trunks, but are capable of ascending into the canopy (e.g. *Ipomoea cairica*, Madeira Vine). In the case of Woody Weeds and Vine Weeds, we also gave a growth stage score of from 1 to 3 (Table 2). These scores reflect the reality that different weed growth stages present different levels of management difficulty. For instance, an area where there is a 50% abundance of 3m-high Senna bushes presents a greater challenge than an area where there is a 50% abundance of Senna seedlings.

Table 2. Explanation of weed growth stage scores

Growth Stage Score	Explanation	
	<i>Woody Weeds</i>	<i>Vine Weeds</i>
1	Weeds not yet woody (i.e. seedlings)	Weeds mainly at or near ground level
2	Weeds woody, but generally lower than 1.5m	Weeds reaching up to half way up tree-trunks
3	Weeds woody, and many above 1.5m	Weeds reaching above half way up tree-trunks

For each vegetation community we walked through, as well as giving abundance and (where applicable) growth stage scores for each individual weed species, we also gave overall abundance and growth stage scores for each of the three weed categories (Ground, Woody, and Vine). These were assigned as in Table 1: it should be stressed that they were not simply the sum of scores for individual weeds in each category.

2.2.3 Deriving weed scores

As a way of summarising the overall “weediness” of the vegetation communities we walked through, we derived a “weed score” as follows:

$$\text{Weed score} = (\text{Ground Weed abundance score}) + (\text{Woody Weed abundance score} \times \text{Woody Weed growth stage score}) + (\text{Vine Weed abundance score} \times \text{Vine Weed growth stage score})$$

Thus, a community with a Ground Weed abundance score of 2, a Woody Weed abundance score of 2, a Woody Weed growth stage score of 2, a Vine Weed abundance score of 1 and a Vine Weed growth stage score of 1 would have a weed score of:

$$\begin{aligned}
 & 2 + (2 \times 2) + (1 \times 1) \\
 = & 2 + 4 + 1 \\
 = & 7
 \end{aligned}$$

2.3.4 Converting weed scores to weed levels for the purposes of mapping

For the purposes of mapping, we assigned each vegetation community polygon a weed level (Table 3). In converting weed scores to weed levels, we chose cut-off scores of 4 and 8 because these scores resulted in roughly equal numbers of vegetation community polygons in each level. Thus, the mapped weed levels are relative rather than absolute indications of “weediness”.

Table 3. Relationship between weed scores and weed levels

Weed level	Weed score
1 (low)	Less than 4
2 (medium)	From 4 to 7.5
3 (high)	8 and above

2.2.5 Mapping weed levels using GIS

Where possible, we assigned each vegetation community polygon a weed level on the basis of field observations. In some cases, however, we had walked through the same polygon in two separate places, recording different weed scores. In these instances we generally averaged the scores and assigned the polygon the corresponding weed level; on one or two occasions, where, based on our knowledge of the condition of the vegetation in the polygon, we regarded one of the weed scores as unrepresentative of the overall “weediness” of the polygon, we disregarded that score in assigning the polygon a weed level. In instances where there was a genuine difference between the condition of different parts of a single vegetation community polygon (e.g. where bush regeneration had been carried out at one end of the polygon, but not at the other), we split the polygon into two or more polygons.

2.2.6 Mapping the severity of selected weeds

We used weed abundance and growth stage scores to map the severity of selected weeds or groups of weeds at given points. To calculate weed severity for Woody Weeds and Vine Weeds, we multiplied abundance score by growth stage score, assigning the resulting score a severity level (Table 4). For Ground Weeds (i.e. Glory Lily), which were not assigned growth form scores, the relationship between weed abundance scores and severity levels is shown in Table 5. It should be noted that the cut-offs between weed severity levels were not chosen to give an even spread of data points in each level; in other words, they represent “absolute” rather than relative weed severity.

Table 4. Relationship between weed severity scores and severity levels for Woody Weeds and Vine Weeds

Severity level	Severity score
Zero (i.e. weed not recorded)	0
Low	0.5 – 3
Medium	3.5 – 6

High	6.5 – 9
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Table 5. Relationship between weed abundance scores and severity levels for Ground Weeds (i.e. Glory Lily)

Abundance score	Severity level
0	Zero (i.e. weed not recorded)
0.5 – 1	Low
1.5 – 2	Medium
2.5 – 3	High

2.3 Management priority mapping

2.3.1 Mapping the value of vegetation as habitat for Threatened fauna

We consulted the online NSW Wildlife Atlas (DEC 2006a) to determine which Threatened fauna species had been recorded in the Bellingen LGA, and assessed the likelihood – on the basis of habitat preferences – of these species occurring in the Study Area. We then gave each vegetation community polygon a habitat value score of from 1 (high) to 3 (low) according to its value as habitat for Threatened fauna. We based the scores on the abundance and quality of the following habitat features:

- Tree hollows (denning/roosting/nesting sites for arboreal animals)
- Fleshy-fruited plants (food for fruit-eating species such as Fruit-pigeons and Barred Cuckoo-shrikes)
- Nectar-producing plants (particularly winter-flowering species, such as Broad-leaved Paperbark and Swamp Mahogany: these provide food for nectar-eating species such as the Eastern Pygmy-possum and Flying-foxes)
- Koala food trees (particularly Tallowwood and Forest Red Gum)
- Allocasuarina seeds (food for Glossy Black-cockatoos)
- Wetlands (habitat for wetland birds)
- Intertidal areas (habitat for waders)

2.3.2 Deriving management priority scores and levels

In order to assess the priority of managing the various vegetation polygons, we derived a “management priority score” as follows:

Management priority score = weed level + habitat value score + 0 (if polygon is an EEC) or + 2 (if polygon is not an EEC)

This resulted in management priority scores ranging from 2 (highest priority) to 8 (lowest priority). In terms of weed levels, our assignment of priorities was based on the bush regeneration practice of focusing initial efforts on vegetation in good condition, leaving vegetation in worse condition until later. Thus, polygons with lower weed levels were higher priorities for management than weedier polygons. In terms of habitat value scores, our assignment of priorities assumed that vegetation of high value to Threatened fauna is a higher priority for management than vegetation of low value to Threatened fauna. Finally, our assignment of priorities assumed that Endangered Ecological Communities, all things being equal, were higher priorities for management than non-Endangered Ecological Communities.

We converted management priority scores into management priority levels as shown in Table 6.

Table 6. Relationship between management priority scores and management priority levels.

Management Priority Score	Management Priority Level
2	Highest
3	High
4-5	Medium
6-8	Low

3. Results

3.1 Background research

3.1.1 Previous records of Threatened species

3.1.1.1 Flora

A search of the NSW Wildlife Atlas revealed that no Threatened flora species had previously been recorded from the Study Area; however, two Threatened flora species – Scented Acronychia and Rusty Plum – had been recorded from close by. Threatened flora species recorded within 20km of the Study Area, together with details of their habitat and an assessment of the likelihood of their occurrence in the Study Area, are shown in Table 7.

Table 7. Threatened flora species previously recorded from within 20km of the Study Area. Source: DEC 2006a and b

Family	Species	Common Name	NSW Status	Habitat	Atlas records in Study Area?	Atlas records nearby?	Likelihood of occurrence in Study Area
Apocynaceae	<i>Parsonsia dorrigoensis</i>	Milky Silkpod	V	Subtropical and warm-temperature rainforest, on rainforest margins, and in moist eucalypt forest up to 800 m, on brown clay soils.	No	No	Unlikely
Asclepiadaceae	<i>Marsdenia longiloba</i>	Clear Milkvine	E1	Rainforest, adjoining lowland eucalypt forest and, sometimes, rock outcrops	No	No	Possible
Asclepiadaceae	<i>Tylophora woollsii</i>	-	E1	Moist eucalypt forest, moist sites in dry eucalypt forest and rainforest margins	No	No	Possible
Cyperaceae	<i>Eleocharis tetraquetra</i>	Square-stemmed Spike-rush	E1	Damp locations on stream edges and in and on the margins of freshwater swamps	No	No	Possible
Euphorbiaceae	<i>Chamaesyce psammogeton</i>	-	E1	Coastal sand dunes and exposed sites on headlands	No	No	Possible
Fabaceae (Caesalpinioideae)	<i>Senna acclinis</i>	-	E1	Grows in or on the edges of subtropical and dry rainforest.	No	No	Possible
Fabaceae (Faboideae)	<i>Pultenaea maritima</i>	-	V	Mainly in grasslands along the coast	No	No	Possible
Fabaceae (Mimosoideae)	<i>Acacia chrysotricha</i>	Newry Golden Wattle	E1	Grows in rainforest and wet sclerophyll forest, in steep narrow gullies, in quartzite soils	No	Near Pacific Highway south of Urunga	Unlikely
Lindsaeaceae	<i>Lindsaea incisa</i>	-	E1	Dry eucalypt forest on sandstone and moist shrubby eucalypt forest on metasediments: usually in waterlogged or poorly drained sites along creeks	No	No	Possible
Menispermaceae	<i>Tinospora tinosporoides</i>	Arrowhead Vine	V	Wetter subtropical rainforest, including littoral rainforest, on fertile basalt-derived soils	No	No	Unlikely
Orchidaceae	<i>Oberonia titania</i>	-	V	Littoral and subtropical rainforest and paperbark swamps; also eucalypt-forested gorges and mangroves.	No	No	Possible

Family	Species	Common Name	NSW Status	Habitat	Atlas records in Study Area?	Atlas records nearby?	Likelihood of occurrence in Study Area
Orchidaceae	<i>Phaius australis</i>	Southern Swamp Orchid	E1	Swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas.	No	No	Possible
Orchidaceae	<i>Sarcobilus fitzgeraldii</i>	Ravine Orchid	V	Grows mainly on rocks, amongst organic matter, in cool, moist, shady ravines, gorges and on cliff faces in dense subtropical rainforest at altitudes between 500 and 700 m. Occasional clumps are found on the bases of fibrous-barked trees.	No	No	Unlikely
Orchidaceae	<i>Sarcobilus bartmannii</i>	-	V	Favours cliff faces on steep narrow ridges supporting eucalypt forest and clefts in volcanic rock from 500 to 1,000 m in altitude. Also found occasionally at the bases of fibrous trunks of trees, including cycads and grass-trees.	No	No	Unlikely
Poaceae	<i>Alexfloydia repens</i>	-	E1	Understorey of <i>Casuarina glauca</i> forest and along the uppermost fringe of mangroves	No	No	Possible
Poaceae	<i>Arthraxon hispidus</i>	Hairy-joint Grass	V	In or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps	No	No	Possible
Rutaceae	<i>Acronychia littoralis</i>	Scented Acronychia	E1	Littoral rainforest	No	On eastern side of Pacific Highway near Wenonah Headland	Possible
Rutaceae	<i>Zieria prostrata</i>	Headland Zieria	E1	Low grassy heath and shrubland on four coastal headlands near Coffs Harbour	No	No	Possible
Rutaceae	<i>Zieria smithii</i> (Low growing form of <i>Z. smithii</i> , Diggers Head)	Diggers Head Zieria	Endangered population	Occurs in low heath with Kangaroo Grass (<i>Themeda australis</i>) on a coastal headland	No	No	Strictly speaking, impossible, as population is by definition confined to Diggers Head

Family	Species	Common Name	NSW Status	Habitat	Atlas records in Study Area?	Atlas records nearby?	Likelihood of occurrence in Study Area
Santalaceae	<i>Thesium australe</i>	Austral Toadflax	V	Grassland or grassy woodland where Kangaroo Grass is a predominant ground cover	No	No	Possible
Sapotaceae	<i>Amorphospermum whitei</i>	Rusty Plum	V	Rainforest and adjacent understorey of eucalypt forest	No	Near golf course at Urunga	Possible
Simaroubaceae	<i>Quassia</i> sp. 'Moonee Creek'	Moonee Quassia	E1	Shrubby layer below tall moist eucalypt forest and tall dry eucalypt forest, including forest edges, mostly at lower altitudes	No	No	Possible

3.1.1.2 Fauna

Of the Threatened fauna previously recorded in the Bellingen LGA, 34 species are known or – in light of the habitat present – possible occurrences in the Study Area. Specialised habitat requirements of these species are presented in Table 8.

Table 8. Specialised habitat requirements of Threatened fauna species that are known or possible occurrences in Study Area. Source: DEC 2006a and b, Strahan 1995

Species	Specialised habitat requirements
Square-tailed Kite	Woodlands and forests
Australasian Bittern	Wetlands
Black Bittern	Intertidal zones, wetlands
Beach Stone-curlew	Intertidal zones, beaches
Glossy Black-cockatoo	Tree hollows, Allocasuarina seeds
Barred Cuckoo-shrike	Fleshy-fruited plants
Black-necked Stork	Wetlands
Wompoo Fruit-dove	Fleshy-fruited plants
Rose-crowned Fruit-dove	Fleshy-fruited plants
Diamond Firetail	Grassy woodlands
Comb-crested Jacana	Wetlands
Mangrove Honeyeater	Nectar-producing plants, mangroves
Turquoise Parrot	Grassy woodlands
Powerful Owl	Tree hollows, forests
Grass Owl	Grasslands, sedgeland or wetlands
Masked Owl	Tree hollows, forests
Sooty Owl	Tree hollows, wet forests
Eastern Pygmy-possum	Nectar-producing plants
Spotted-tailed Quoll	Forests, denning sites (tree hollows, hollow logs, rocky areas etc.)
Brush-tailed Phascogale	Tree hollows
Yellow-bellied Sheath-tail-bat	Tree hollows
Eastern Freetail-bat	Tree hollows
Yellow-bellied Glider	Tree hollows, nectar-producing plants, eucalypts
Squirrel Glider	Tree hollows, nectar-producing plants
Koala	Koala food trees
Long-nosed Potoroo	Dense ground cover
Black Flying-fox	Nectar-producing plants, fleshy-fruited plants
Grey-headed Flying-fox	Nectar-producing plants, fleshy-fruited plants
Eastern False Pipistrelle	Tree hollows
Little Bentwing-bat	Tree hollows, caves, buildings
Eastern Bentwing-bat	Caves, buildings
Large-footed Myotis	Tree hollows, buildings bridges, water bodies
Eastern Long-eared Bat	Tree hollows
Greater Broad-nosed Bat	Tree hollows

3.2 Fieldwork

3.2.1 Routes walked

The routes we walked while carrying out fieldwork for this report are shown on Council's GIS layer "Coastal_Survey_routes2_Multipile_Pline".

3.2.2 Data on community boundaries, weed incidences etc.

Council's GIS layer "Weed_Incidences" contains data on the incidence of weed species along the routes we walked. Data points are usually located at vegetation polygon boundaries, with the weed incidences referring to only a single polygon (which of the possible polygons is referred to can be ascertained from the "Community_Name" column in the Weed_Incidences" Mapinfo Table). Although the data are in point form, the figures are a summary of weed incidences in the given polygon along the whole of the route walked through that polygon. In some instances, we recorded point data at boundaries between putative "communities" which we later decided to lump together as a single community. In these cases, data points are not located at mapped community boundaries.

3.3 Mapping of vegetation communities

We classified the vegetation of the Study Area into eighteen communities (Figure 1a-e; Vegetation_Community layer on Council's GIS). The communities are described below.

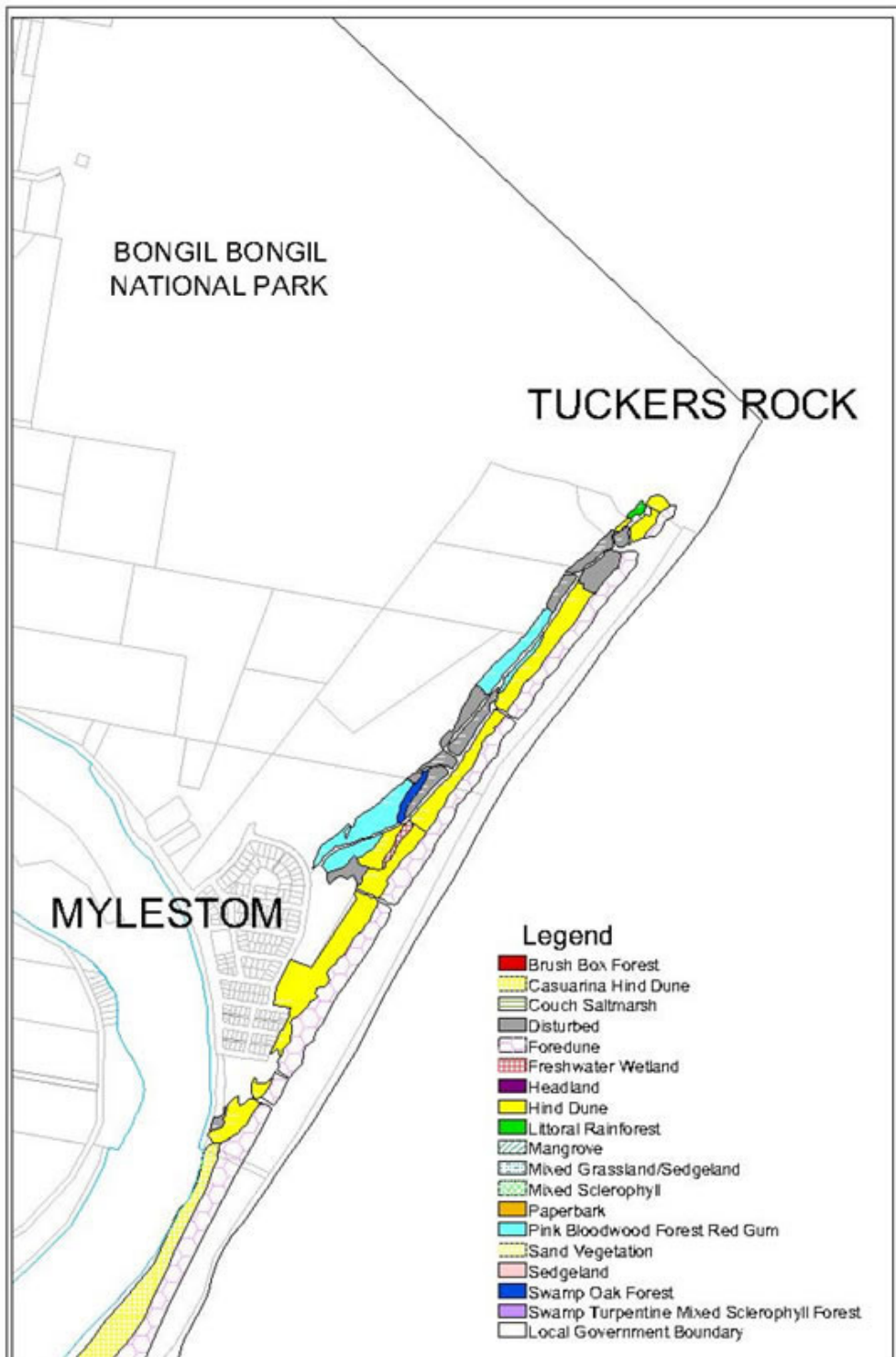
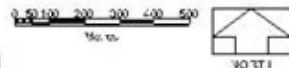


Figure 1A
Vegetation Communities - Tuckers Rock/Mylestom



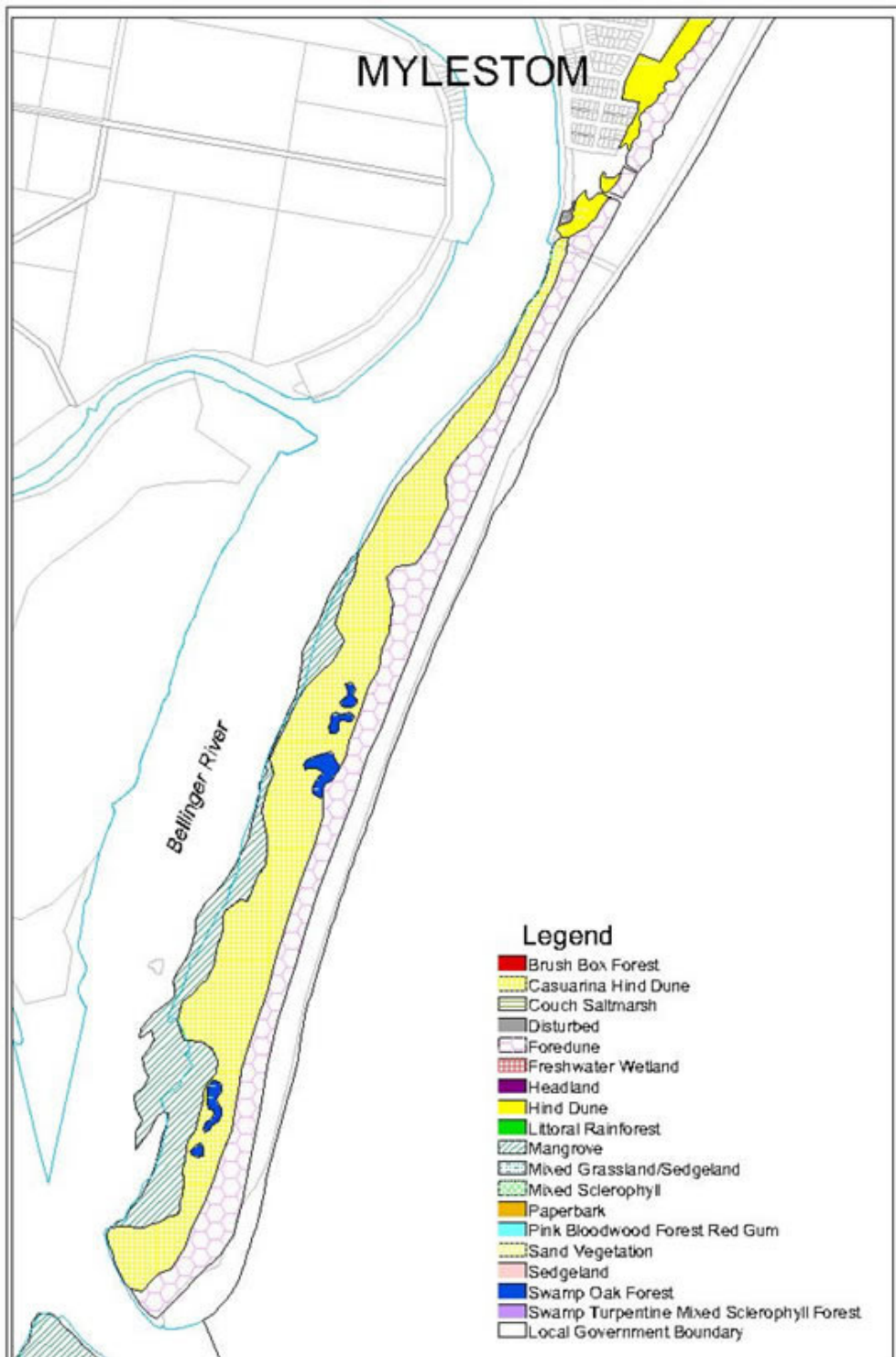
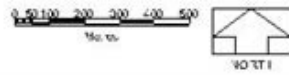


Figure 1B
Vegetation Communities - North Beach



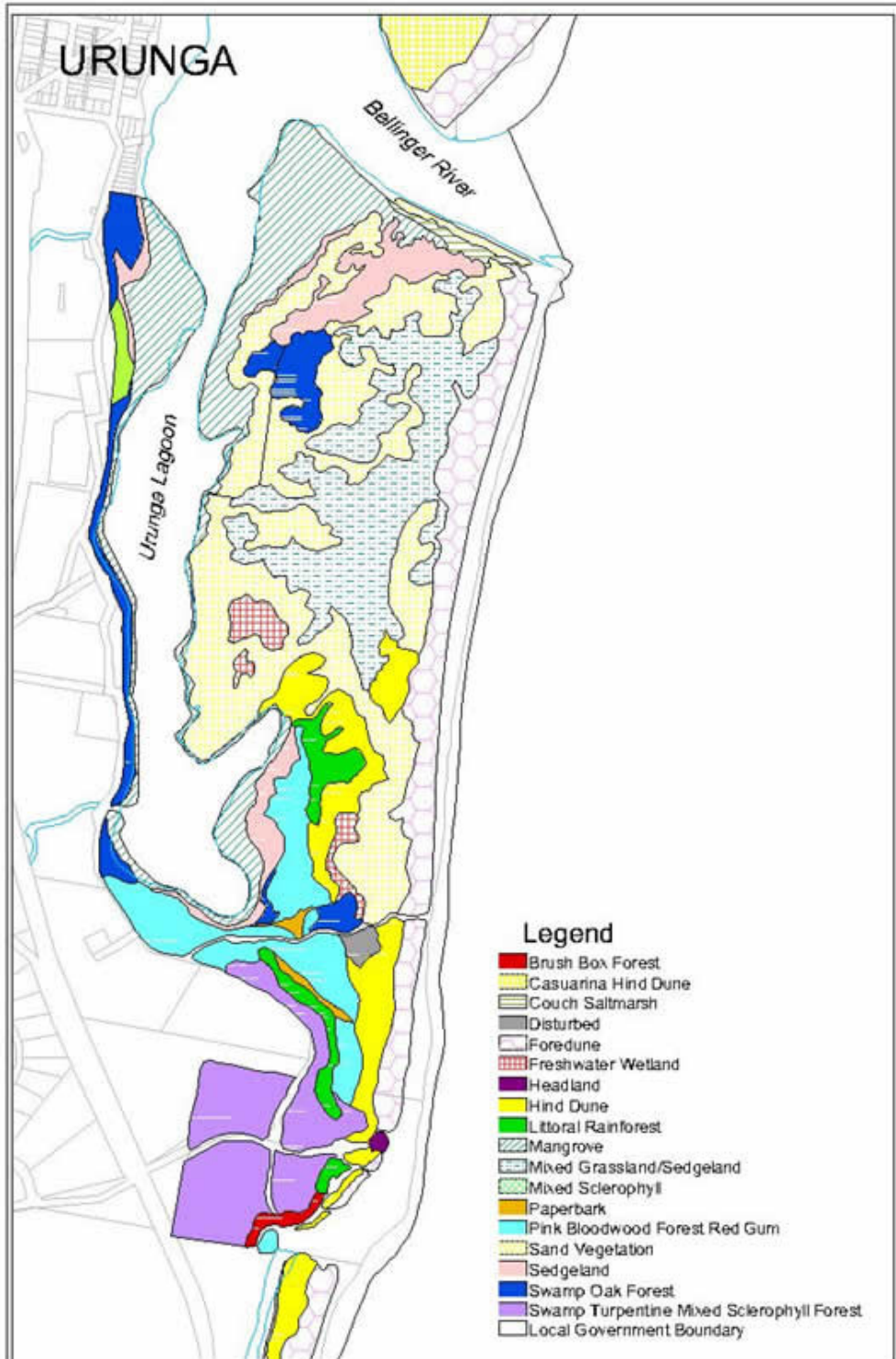
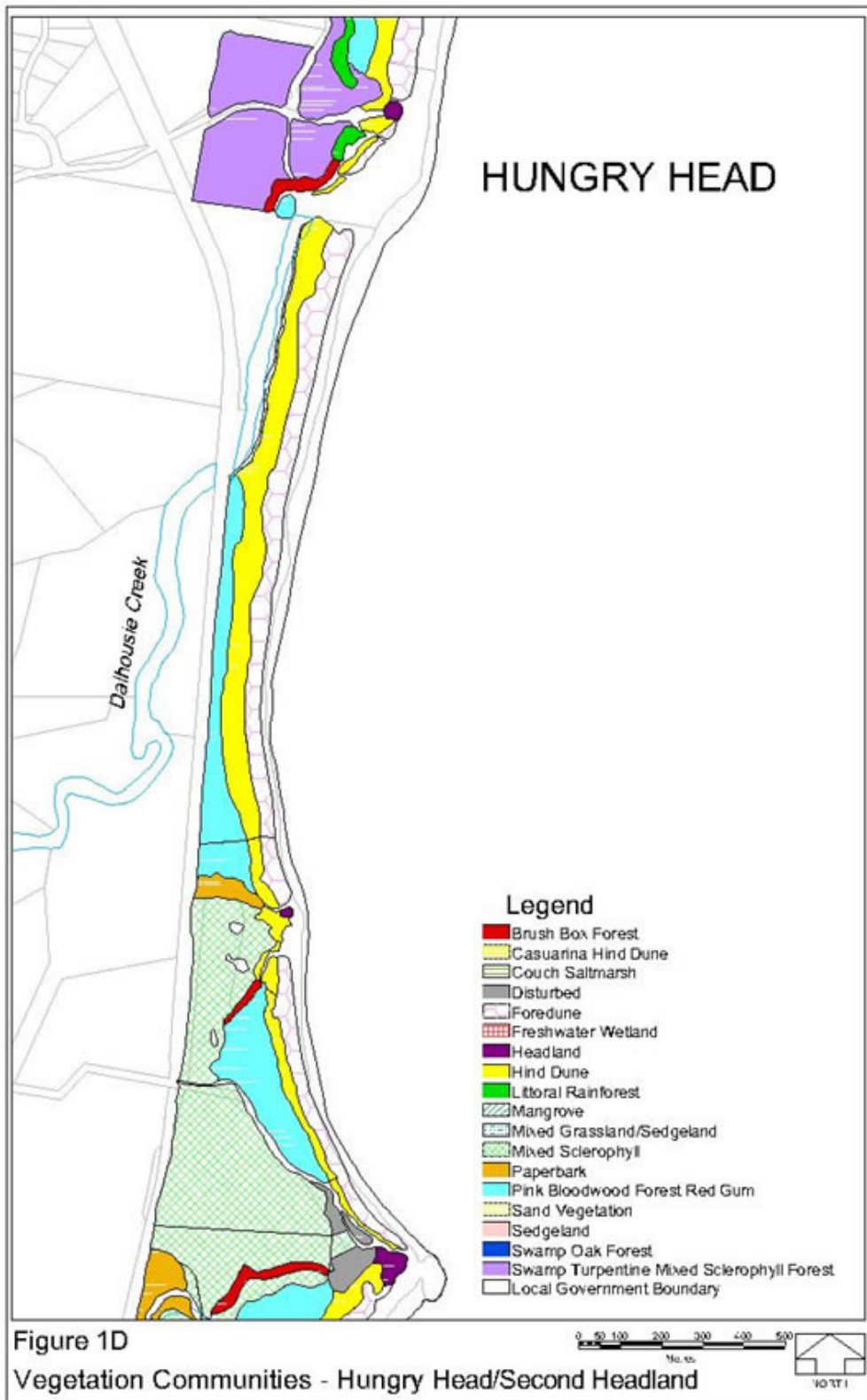
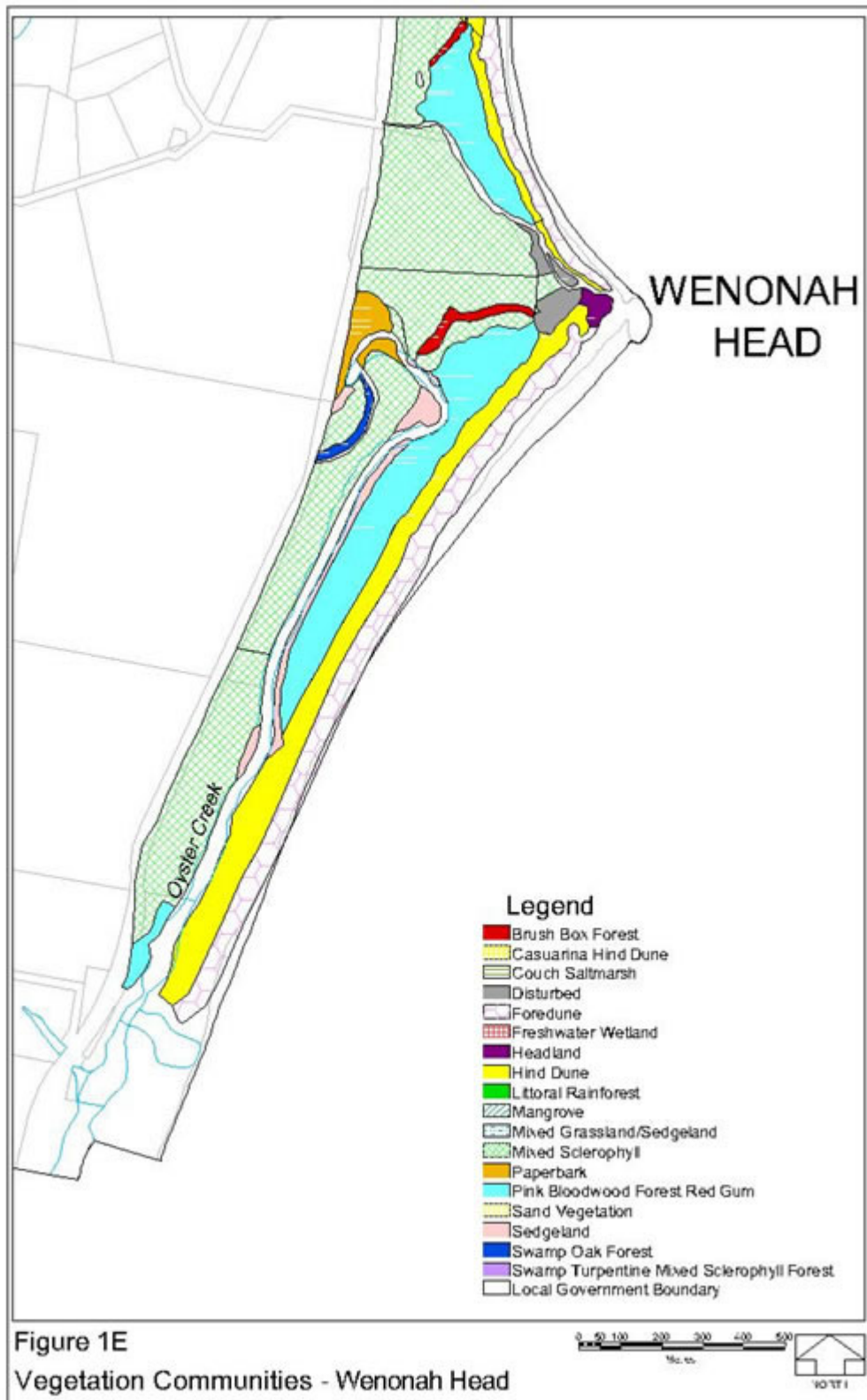


Figure 1C

Vegetation Communities - Urunga Sandmass & Lagoon







3.3.1 Foredune (Figures 2 and 5)

Foredune vegetation begins on the beach and ends, generally, at the crest of the most seaward dune. It is easily distinguished from adjacent Hind Dune Vegetation by its topographic position and the absence of Coast Banksia, Tuckeroo and other shrubs associated with the latter community. On the Urunga Sandmass, Fore-dune Vegetation can be distinguished from adjacent Sand Vegetation by the absence of Coast Banksia, *Leucopogon parviflorus*, and Blady Grass. Fore-dune Vegetation could be split into two communities – a low grassland of Spinifex close to the sea’s edge, and a shrubland on and near the most seaward dune.

Table 9. Characteristics of Fore-dune Vegetation.

Structure	Grassland or shrubland to 2m
Occurrence	Along beaches of entire coastline
Topographic position	Beaches and seaward slope of coastal sand-dunes
Substrate	Sand
Dominant species	Spinifex, Coast Wattle, Bitou Bush
Other species	Glory Lily, Native Coastal Morning Glory
Main weeds	Bitou Bush, Glory Lily, <i>Ipomoea cairica</i>
Threats	Weed invasion; four-wheel-driving
Distinguishing features	Topographic position; presence of Spinifex and Native Coastal Morning Glory; absence of Coast Banksia
Habitat value to Threatened fauna	Low
EEC?	No



Figure 2. Fore-dune Vegetation north of Hungry Head.

3.3.2 Hind Dune (Figures 3 and 4)

Hind Dune vegetation occurs, generally, on the crest and down the landward side of coastal sand-dunes. In the vicinity of Urunga Lagoon, however, it also occurs on more landward sand-dunes. It is distinguished from other communities by its topographic position, its structure (shrubland) and by the presence of either or both Coast Banksia and Tuckeroo. Littoral Rainforest elements (e.g. Beach Alectryon, Three-veined Laurel, Beach Acronychia) are often present in the understorey, and in places (such as south of Mylestom Caravan Park, and south of Second Headland) this community is difficult to distinguish from Littoral Rainforest. Our rule for separating the two communities was that Littoral Rainforest had to have a continuous canopy over an area of at least 30m by 30m. In the absence of fire, however, many areas of Hind Dune vegetation will eventually develop into Littoral Rainforest. Hind Dune vegetation can be distinguished very easily from Casuarina Hind Dune vegetation by the absence of Coast She-oak; and from Pink Bloodwood Forest Red Gum Forest – its usual landward neighbour – by the absence of Pink Bloodwood.

Table 10. Characteristics of Hind Dune Vegetation.

Structure	Shrubland to 8m
Occurrence	Widespread
Topographic position	Along the crests and sheltered sides of sand-dunes
Substrate	Sand, with some admixture of organic material
Dominant canopy species	Coast Banksia and/or Tuckeroo
Other canopy species	Beach Alectryon
Understorey species	Coast Wattle, Beach Acronychia, Three-veined Laurel and other Littoral Rainforest species
Ground-layer species	Blady Grass, Ferns
Main weeds	Bitou Bush, Glory Lily, Lantana, Senna
Threats	Weed invasion; fire without follow-up weed removal
Distinguishing features	Topographic position; structure; presence of Coast Banksia and/or Tuckeroo combined with absence of eucalypts
Habitat value to Threatened fauna	Nectar-producing plants (Banksias), some fleshy-fruited plants
EEC?	No; but has potential to transform into Littoral Rainforest if not burnt



Figure 3. Hind Dune Vegetation with rainforest elements near Tuckers Rocks.



Figure 4. Hind Dune Vegetation near the Urunga Sandmass; this patch contains few rainforest elements.

3.3.3 Casuarina Hind Dune (Figure 5)

Casuarina Hind Dune vegetation is similar to Hind Dune vegetation, but is distinguished by the presence of Coast She-oak, which outside this community occurs in the Study Area only on rocky headlands. Casuarina Hind Dune vegetation is found along the dunes of North Beach, south of Mylestom, where Coast She-oaks (and some other species) have been planted in an attempt at vegetation rehabilitation after sand mining. Littoral Rainforest understory species are largely absent from this community.

Table 11. Characteristics of Casuarina Hind Dune Vegetation.

Structure	Shrubland or low open forest to 10m
Occurrence	North Beach only
Topographic position	Extending from crest and down landward side of coastal dunes
Substrate	Sand with some organic material
Dominant canopy species	Coast She-oak
Other canopy species	Coast Banksia
Understorey species	Bitou Bush, Senna, <i>Acacia saligna</i>
Ground-layer species	Blady Grass
Main weeds	Bitou Bush, Glory Lily, Lantana, Senna, Groundsel Bush
Threats	Weed invasion
Distinguishing features	Presence of Coast She-oak; location
Habitat value to Threatened fauna	Nectar (Banksias)
EEC?	No



Figure 5. Casuarina Hind Dune Vegetation (background) and Bitou Bush-dominated Foredune Vegetation (foreground) on North Beach.

3.3.4 Pink Bloodwood Forest Red Gum Forest (Figure 6)

Pink Bloodwood Forest Red Gum Forest occurs in low-lying areas inland of Hind Dune Vegetation, and has many understorey species in common with the latter community (e.g. Tuckeroo, Beach Alectryon, Three-veined Laurel and other Littoral Rainforest species). Pink Bloodwood Forest Red Gum Forest is distinguished from Hind Dune vegetation by the presence of Pink Bloodwood, and from other eucalypt-dominated communities by the absence of eucalypts other than Pink Bloodwood and Forest Red Gum. A case could be made for separating Pink Bloodwood Forest Red Gum Forest into two communities: a lower, more coastal forest in which Coast Banksia and/or Black She-oak are prominent; and a taller, more inland forest in which Coast Banksia and/or Black She-oak are relatively scarce. Where it occurs on floodplains, Pink Bloodwood Forest Red Gum Forest constitutes the Endangered Ecological Community: “Sub-tropical Coastal Forest on Floodplains.”

Table 12. Characteristics of Pink Bloodwood Forest Red Gum Forest.

Structure	Open forest from 10m to 30m high
Occurrence	Widespread
Topographic position	Low-lying areas inland of dune systems
Substrate	A mixture of sand, organic and alluvial material
Dominant canopy species	Pink Bloodwood
Other canopy species	Forest Red Gum, Coast Banksia, Black She-oak, Broad-leaved Paperbark
Understorey species	Many, including Tuckeroo, Beach Acronychia, Beach Alectryon, Three-veined Laurel and other Littoral Rainforest species
Ground-layer species	Blady Grass, Midgen Berry
Main weeds	Bitou Bush, Glory Lily, Lantana, Senna
Threats	Weed invasion; fire without follow-up weed removal
Distinguishing features	Presence of Pink Bloodwood with or without Forest Red Gum, but with no or few other eucalypts
Habitat value to Threatened fauna	Nectar-producing plants, tree hollows, fleshy-fruited plants, Allocasuarina seeds, Koala food trees
EEC?	Yes: Sub-tropical Coastal Floodplain Forest



Figure 6. Pink Bloodwood Forest Red Gum Forest near Urunga Lagoon.

3.3.5 Disturbed (Figure 7)

Disturbed Vegetation occurs where the natural canopy has been broken up or removed, either by human activity (e.g. around Tuckers Rocks and Mylestom) or fire (e.g. at Wenonah Head). Disturbed vegetation often has high levels of weed infestation.

Table 13. Characteristics of Disturbed Vegetation.

Structure	Varied
Occurrence	Widespread but patchy
Topographic position	Varied
Substrate	Varied
Dominant canopy species	Varied; Coast Banksia often present
Main weeds	Bitou Bush, Glory Lily, Lantana, Senna, Groundsel Bush, <i>Acacia saligna</i>
Threats	Weed invasion; fire without follow-up weed removal
Distinguishing features	Signs that natural canopy has been removed or broken up, either by human activity or fire
Habitat value to Threatened fauna	Generally low; some nectar-producing plants (Banksias)
EEC?	No



Figure 7. Disturbed Vegetation (by bushfire) at Wenonah Head. Headland Vegetation on headland in background.

3.3.6 Rushland (Figures 8 and 12)

Rushland is readily distinguished from other communities by the absence or rarity of trees and shrubs, the dominance of rushes such as *Juncus kraussii*, and the relative scarcity of grasses. It occurs in periodically inundated intertidal areas inland of Mangroves. The Rushland in the Study Area constitutes an Endangered Ecological Community: Coastal Saltmarsh.

Table 14. Characteristics of Rushland.

Structure	Rushland to 2m
Occurrence	Around Urunga Lagoon and along McGrath's Creek, south of Wenonah Head
Topographic position	Periodically inundated intertidal areas inland of Mangroves
Substrate	Alluvial material
Dominant species	Rushes such as <i>Juncus kraussii</i>
Other species	<i>Phragmites australis</i>
Main weeds	Groundsel Bush
Threats	Weed invasion e.g. by Groundsel Bush and <i>Juncus acutus</i> ; fire without follow-up weed removal; changes to tidal flows; water pollution
Distinguishing features	Absence or rarity of trees and shrubs, dominance of sedges and relative scarcity of grasses
Habitat value to Threatened fauna	Foraging habitat for some wetland birds
EEC?	Yes: Coastal Saltmarsh



Figure 8. Rushland dominated by *Juncus kraussii* (in middleground, behind water). Note Couch Saltmarsh in foreground.

3.3.7 Urunga Sand Vegetation (Figure 9)

Urunga Sand vegetation is restricted to low sandy ridges between Urunga Lagoon and the coast. It consists of a mixture of grassland, Banksia shrubland, and bare patches of sand, and is distinguished from other sand-based communities (in particular, Hind Dune vegetation) by the patchiness of the canopy layer, and the absence or scarcity of Littoral Rainforest species (such as Tuckeroo, Beach Alectryon, etc).

Table 15. Characteristics of Urunga Sand Vegetation

Structure	Varied: grassland, shrubland to 8m, or bare sand.
Occurrence	Low sandy ridges between Urunga Lagoon and coast
Topographic position	Low sandy ridges
Substrate	Sand with some organic material
Dominant canopy species	Coast Banksia
Other canopy species	Black She-oak, Broad-leaved Paperbark, Swamp Oak
Understorey species	<i>Leucopogon parviflorus</i> , Coast Wattle
Ground-layer species	Blady Grass
Main weeds	Bitou Bush, Groundsel Bush, Senna
Threats	Weed invasion; fire without follow-up weed removal; four-wheel-driving
Distinguishing features	Location and topographic position; patchiness of canopy layer; dominance in canopy (where

	present) of Coast Banksia combined with absence of Littoral Rainforest species in understorey; presence of Blady Grass
Habitat value to Threatened fauna	Generally low; some nectar-producing plants (Banksias), <i>Allocasuarina</i> seeds
EEC?	No



Figure 9. Urunga Sand Vegetation (middleground) near the end of the Urunga Boardwalk. Note Coast Wattle, *Leucopogon parviflorus*, and Couch Saltmarsh in foreground.

3.3.8 Headland Vegetation (Figures 7 and 10)

Headland Vegetation in the Study Area can be distinguished from other communities by its topographic position (rocky headlands) and by the presence of native grasses other than Blady Grass (in particular, Kangaroo Grass). Headland vegetation occurs at three sites in the Study Area (Hungry Head, Second Headland and Wenonah Head) and constitutes an Endangered Ecological Community: Themeda Grassland on Seacliff and Coastal Headland.

Table 16. Characteristics of Headland Vegetation

Structure	Grassland or shrubland to 1.5m.
Occurrence	Hungry Head, Second Headland and Wenonah Head
Topographic position	Summits and sides of rocky headlands
Substrate	Metasedimentary rock
Dominant canopy species	Coast Banksia, Bitou Bush
Other canopy species	Coast She-oak
Understorey species	-

Ground-layer species	Lomandras, native grasses including Kangaroo Grass
Main weeds	Bitou Bush
Threats	Weed invasion; fire without follow-up weed removal
Distinguishing features	Topographic position; presence of Kangaroo Grass and other native grasses other than Blady Grass
Habitat value to Threatened fauna	Low
EEC?	Yes: Themeda Grassland on Seacliff and Coastal Headland



Figure 10. Headland Vegetation on Wenonah Head.

3.3.9 Paperbark Forest (Figure 11)

Paperbark Forest occurs in low-lying, poorly-drained areas and can be readily distinguished from all other communities in the Study Area by the dominance of Broad-leaved Paperbark. Where it occurs on coastal floodplains, Paperbark Forest is an Endangered Ecological Community: Swamp Sclerophyll Forest on Coastal Floodplains.

Table 17. Characteristics of Paperbark Forest

Structure	Forest to 30m
Occurrence	Widespread
Topographic position	Low-lying, poorly-drained areas subject to occasional flooding
Substrate	A mixture of alluvial and organic material

Dominant canopy species	Broad-leaved Paperbark
Other canopy species	Forest Red Gum, Pink Bloodwood, Swamp Mahogany
Understorey species	Swamp Oak
Ground-layer species	Blady Grass, <i>Hibbertia scandens</i>
Main weeds	Bitou Bush, Lantana, Senna
Threats	Weed invasion; fire without follow-up weed removal
Distinguishing features	Dominance of Broad-leaved Paperbark
Habitat value to Threatened fauna	Nectar-producing plants (paperbarks and eucalypts), some tree hollows
EEC?	Yes: Swamp Sclerophyll Forest on Coastal Floodplains



Figure 11. Paperbark Forest north of Hungry Head.

3.3.10 Swamp Oak Forest (Figure 12)

Swamp Oak Forest occurs in low-lying, poorly-drained areas and can be readily distinguished from all other communities in the Study Area by the dominance of Swamp Oak. Where it occurs on coastal floodplains, Swamp Oak Forest is an Endangered Ecological Community: Swamp Oak Floodplain Forest on Coastal Floodplains.

Table 18. Characteristics of Swamp Oak Forest

Structure	Forest to 20m
Occurrence	Widespread
Topographic position	Low-lying, poorly-drained areas subject to occasional flooding

Substrate	A mixture of alluvial and organic material
Dominant canopy species	Swamp Oak
Other canopy species	Broad-leaved Paperbark
Understorey species	-
Ground-layer species	Swamp Lily, sedges
Main weeds	Bitou Bush, Lantana, Senna, Groundsel Bush, <i>Ipomoea cairica</i>
Threats	Weed invasion; fire without follow-up weed removal
Distinguishing features	Dominance of Swamp Oak
Habitat value to Threatened fauna	Generally low
EEC?	Yes: Swamp Oak Floodplain Forest



Figure 12. Swamp Oak Forest near Urunga Lagoon. Note Rushland in Foreground.

3.3.11 Freshwater Wetland (Figure 13)

Most Freshwater Wetlands in the Study Area are likely to dry up occasionally, so distinguishing them from other grass- or sedgeland communities (such as Mixed Grassland/Sedgeland) may present difficulties. We were fortunate in that we conducted fieldwork during and after a period of heavy rainfall, when wetlands were readily apparent. Perhaps the most reliable distinguishing feature between Freshwater Wetlands and Mixed Grassland/Sedgeland is that Blady Grass is generally absent from wetlands. It is worth noting that at least one of the Freshwater Wetlands in the Study Area – the wetland near the carpark on the coast between Urunga Lagoon and Hungry Head – is the result of extractive sandmining. Where they occur on coastal floodplains, Freshwater

Wetlands constitute an Endangered Ecological Community: Freshwater Wetlands on Coastal Floodplains.

Table 19. Characteristics of Freshwater Wetland

Structure	Grassland or sedgeland to 1.5m
Occurrence	Urunga Sandmass; there is also a small ephemeral wetland in poor condition just north of Mylestom
Topographic position	Low-lying, poorly-drained areas subject to regular flooding.
Substrate	A mixture of alluvial and organic material
Dominant species	A variety of rushes (e.g. <i>Juncus kraussii</i>), sedges, reeds and grasses; aquatic plants such as <i>Bacopa monnieri</i> are present in more permanent wetlands
Main weeds	Few; Whisky Grass on edges
Threats	Weed invasion; infilling by wind-blown sand
Distinguishing features	Presence of standing water; dominance of sedges and/or reeds and/or rushes; absence of Blady Grass
Habitat value to Threatened fauna	Foraging habitat for wetland birds
EEC?	Yes: Freshwater Wetland on Coastal Floodplain



Figure 13. Small Freshwater Wetland on Urunga Sandmass. Note Urunga Sand Vegetation in Background.

3.3.12 Mixed Sclerophyll Forest (Figure 14)

Mixed Sclerophyll Forest is distinguished from other eucalypt communities in the Study Area by its topographic position (higher ground on rocky substrates) and the presence of

at least one sclerophyll tree species other than Pink Bloodwood and Forest Red Gum. The best example occurs where the road to Wenonah Head crosses the railway tracks; here there is a varied canopy of Pink Bloodwood, Forest Red Gum, Tallowwood, Broad-leaved Paperbark, Blackbutt and an Ironbark.

Table 20. Characteristics of Mixed Sclerophyll Forest.

Structure	Forest to 30m
Occurrence	Around Wenonah Head, and along McGraths Creek to the south
Topographic position	Higher ground with reasonable drainage
Substrate	Metasedimentary rock
Dominant canopy species	Pink Bloodwood, Forest Red Gum, Tallowwood, Broad-leaved Paperbark, Red Bloodwood, Blackbutt
Other canopy species	An Ironbark, Red Mahogany
Understorey species	Hopbush in burnt areas
Ground-layer species	Blady Grass, ferns
Main weeds	Bitou Bush, Lantana
Threats	Weed invasion; fire without follow-up weed removal
Distinguishing features	Topographic position; absence of Swamp Turpentine and presence of at least one sclerophyllous tree species other than Pink Bloodwood and Forest Red Gum
Habitat value to Threatened fauna	Nectar-producing plants, tree hollows, Koala food trees
EEC?	No



Figure 14. Mixed Sclerophyll Forest near junction of railway line and road to Wenonah Head.

3.3.13 Swamp Turpentine Mixed Sclerophyll Forest (Figure 15)

Swamp Turpentine Mixed Sclerophyll Forest occurs on poorly-drained areas of higher ground in the vicinity of Hungry Head, and can be distinguished from other forest communities by the mixed sclerophyll canopy and the presence of Swamp Turpentine. An interesting feature of this community is a large Broad-leaved Paperbark growing just south of the “Crook Back Clinic” on Hungry Head Road: this tree bears an ancient surveyor’s mark cut into the bark, so must have already been a large tree when the area was first surveyed, more than a hundred years ago.

Table 21. Characteristics of Swamp Turpentine Mixed Sclerophyll Forest.

Structure	Forest to 20m
Occurrence	Around Hungry Head
Topographic position	Poorly-drained higher ground
Substrate	Metasedimentary rock topped by a clay lens of low permeability
Dominant canopy species	Pink Bloodwood, Forest Red Gum, Broad-leaved Paperbark, Swamp Turpentine
Other canopy species	-
Understorey species	Coast Banksia, Black She-oak
Ground-layer species	Blady Grass, Lomandras, ferns
Main weeds	Bitou Bush, Lantana
Threats	Weed invasion; fire without follow-up weed removal
Distinguishing features	Mixed sclerophyll canopy combined with presence of Swamp Turpentine

Habitat value to Threatened fauna	Nectar-producing plants, tree hollows, Koala food trees
EEC?	No



Figure 15. Swamp Turpentine Mixed Sclerophyll Forest near Hungry Head.

3.3.14 Littoral Rainforest (Figure 16)

Four patches of Littoral Rainforest occur in the Study Area: at Tuckers Rocks, Urunga Lagoon and Hungry Head (two patches). It is distinguished from potentially similar communities such as Brush Box Forest and certain patches of Hind Dune vegetation by the presence of an expanse of unbroken canopy in which Brush Box is not clearly dominant. The Littoral Rainforest in the Study Area is generally in good condition, with the exception of the small patch behind the Hungry Head Surf Life Saving Club. This patch, which is notable for being the southernmost limit of the Red Bean (Lonie 2000), is heavily infested with weeds. The Littoral Rainforest patch just north of Hungry Head provides habitat for a small population of Scented *Acronychia* – the only Threatened flora species recorded during surveys for this report. A previous study (Allen *et al.* 1996) recorded Rainforest inland of Wenonah Head. Littoral Rainforest no longer occurs in this area, having been wiped out by a recent (post 2001) bushfire. The former Littoral Rainforest now consists of dead trees emerging above an extremely weedy understorey of Bitou Bush, Lantana and Vine Weeds (Figure 23, below). This example highlights the danger posed to Littoral Rainforest by fire.

Table 22. Characteristics of Littoral Rainforest.

Structure	Forest to 30m
Occurrence	Tuckers Rocks, Urunga Lagoon, Hungry Head
Topographic position	Sheltered sites at the base of dunes
Substrate	Sand

Dominant canopy species	Varied, including Tuckeroo, Cheese Tree, Plum-pine, Red Bean, Brush Box, Hard Quandong, Guioa, Brush Cherry, Yellow Tulip, Beach Acronychia, Three-veined Laurel, Beach Alectryon, Snow Wood, Lilly Pilly etc.
Other canopy species	-
Understorey species	Young canopy species
Ground-layer species	Basket Grass
Main weeds	Bitou Bush, Glory Lily, Lantana, Senna, Freckle Face (behind Surf Life Saving Club at Hungry Head only), Wild Tobacco
Threats	Weed invasion; fire
Distinguishing features	Expanse of unbroken canopy in which Brush Box is not clearly dominant
Habitat value to Threatened fauna	An abundance of fleshy-fruited plants
EEC?	Yes: Littoral Rainforest



Figure 16. Littoral Rainforest near Urunga Lagoon.

3.3.15 Mangrove (Figure 17)

Mangrove Forest is easily distinguished from other communities by its position (in the tidal zone of estuaries) and its dominance by Grey Mangrove.

Table 23. Characteristics of Mangrove Forest.

Structure	Forest to 18m
Occurrence	Urunga Lagoon, Dalhousie Creek and Oyster

	Creek
Topographic position	Intertidal zones of estuaries
Substrate	Alluvial material
Dominant canopy species	Grey Mangrove
Other canopy species	-
Understorey species	-
Ground-layer species	-
Main weeds	-
Threats	Changes to tidal regimes
Distinguishing features	Topographic position and dominance by Grey Mangrove
Habitat value to Threatened fauna	Habitat for some birds e.g. Beach Stone-curlew, Black Bittern, Mangrove Honeyeater
EEC?	No



Figure 17. Mangrove Forest at Urunga Lagoon.

3.3.16 Brush Box Forest (Figure 18)

Brush Box Forest occurs at Tuckers Rocks, Hungry Head and Wenonah Head, on steep south-facing slopes on rock. It is easily distinguished from neighbouring communities, such as Littoral Rainforest, by the dominance of Brush Box in the canopy layer and by the relative openness of the canopy. If protected from fire, Brush Box forest has the potential to develop into Littoral Rainforest.

Table 24. Characteristics of Brush Box Forest.

Structure	Forest to 30m
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Occurrence	Tuckers Rocks, Hungry Head and Wenonah Head
Topographic position	Steep, sheltered south-facing slopes
Substrate	Metasedimentary rock
Dominant canopy species	Brush Box
Other canopy species	Coast Banksia, Sydney Blue Gum (Wenonah Head only)
Understorey species	Rainforest species such as Tuckeroo, Guioa, Three-veined Laurel, Native Guava, Flintwood, Scentless Rosewood, Bolwarra, Hard Quandong, Midgen Berry
Ground-layer species	Bracken, other ferns, Scrambling Lily
Main weeds	Bitou Bush, Lantana, Senna
Threats	Weed invasion; fire without follow-up weed removal
Distinguishing features	Dominance of Brush Box in canopy
Habitat value to Threatened fauna	Fruiting understorey species
EEC?	No



Figure 18. Brush Box Forest near Hungry Head.

3.3.17 Mixed Grassland / Sedgeland (Figure 19)

This community is restricted to the Urunga Sandmass, and is distinguished from Freshwater Wetland by its slightly more elevated position and by the presence of Blady Grass. Mixed Grassland/Sedgeland is, as its name indicates, a mixture of two distinct communities that interpenetrate each other closely and are consequently impossible to map separately. Lower-lying, swampy areas of Mixed Grassland/Sedgeland are occupied

by sedges, and constitute an Endangered Ecological Community: Freshwater Wetland on Coastal Floodplain. Slightly higher, drier areas (the difference in elevation is a matter of centimetres) are occupied by Blady Grass with occasional scattered shrubs (these areas grade into Sand Vegetation), and do not constitute an Endangered Ecological Community. As seen in Figure 19, Mixed Grassland/Sedgeland on the Urunga Sandmass appears to be in the early stages of invasion by Groundsel Bush.

Table 25. Characteristics of Mixed Grassland/Sedgeland

Structure	Grassland/Sedgeland to 1.5m, with occasional scattered shrubs to 8m
Occurrence	Urunga Sandmass
Topographic position	Low-lying areas away from the intertidal zone
Substrate	A mixture of sand, organic and alluvial material
Dominant canopy species	Coast Banksia (where canopy is present)
Other canopy species	Swamp Oak, Broad-leaved Paperbark, Swamp Oak
Understorey species	<i>Leucopogon parviflorus</i>
Ground-layer species	Blady Grass, sedges (e.g. <i>Isolepis nodosa</i> , <i>Cyperus polystachyos</i>) and rushes (e.g. <i>Juncus kraussii</i>)
Main weeds	Bitou Bush, Senna, Groundsel Bush, Whisky Grass
Threats	Weed invasion; fire without follow-up weed removal; four-wheel driving
Distinguishing features	Structure; topographic position; presence of Blady Grass
Habitat value to Threatened fauna	Wetland areas are foraging habitat for some birds
EEC?	Yes (Sedgeland only): Freshwater Wetland on Coastal Floodplain



Figure 19. Mixed Grassland / Sedgeland on the Urunga Sandmass. Note Sand Vegetation in extreme foreground, Blady Grass in foreground, and sedges in middleground. Note also paler green of seedling Groundsel Bush amongst sedges.

3.3.18 Couch Saltmarsh (Figures 9 and 10)

The only occurrence of Couch Saltmarsh substantial enough to be mapped is at the northern end of the Urunga Sandmass, at the extreme limit of the intertidal zone. Couch Saltmarsh can be easily distinguished from all other communities by the dominance of Prickly Couch. Couch Saltmarsh is an Endangered Ecological Community: Coastal Saltmarsh.

Table 26. Characteristics of Couch Saltmarsh.

Structure	Low sandy grassland to 10cm
Occurrence	Northern end of Urunga Sandmass, near boardwalk
Topographic position	The extreme limit of the intertidal zone
Substrate	A mixture of sand, organic and alluvial material
Dominant species	Prickly Couch
Main weeds	None
Threats	Weed invasion e.g. by Groundsel Bush and <i>Juncus acutus</i> ; fire without follow-up weed removal; changes to tidal flows; water pollution; trampling by walkers
Distinguishing features	Dominance of Prickly Couch
Habitat value to Threatened fauna	Foraging habitat for some coastal birds
EEC?	Yes: Coastal Saltmarsh

3.4 Mapping of Threatened species

We recorded one Threatened species during fieldwork for this report: there is a population of around 15 Scented Acronychias growing near the edge of the Littoral Rainforest just north of Hungry Head, at Easting 502592, Northing 6623577. The location of this population is marked on Council's GIS layer "Useful_Points".

3.5 Mapping of Endangered Ecological Communities

Seven Endangered Ecological Communities occur in the Study Area: Sub-tropical Coastal Floodplain Forest, Coastal Saltmarsh, Littoral Rainforest, Swamp Sclerophyll Forest on Coastal Floodplain, Swamp Oak Floodplain Forest, Themeda Grassland on Seacliff and Coastal Headland, and Freshwater Wetland on Coastal Floodplain. Endangered Ecological Communities and potential Endangered Ecological Communities are shown in Figure 20a-e and on Council's GIS layer "EECs".

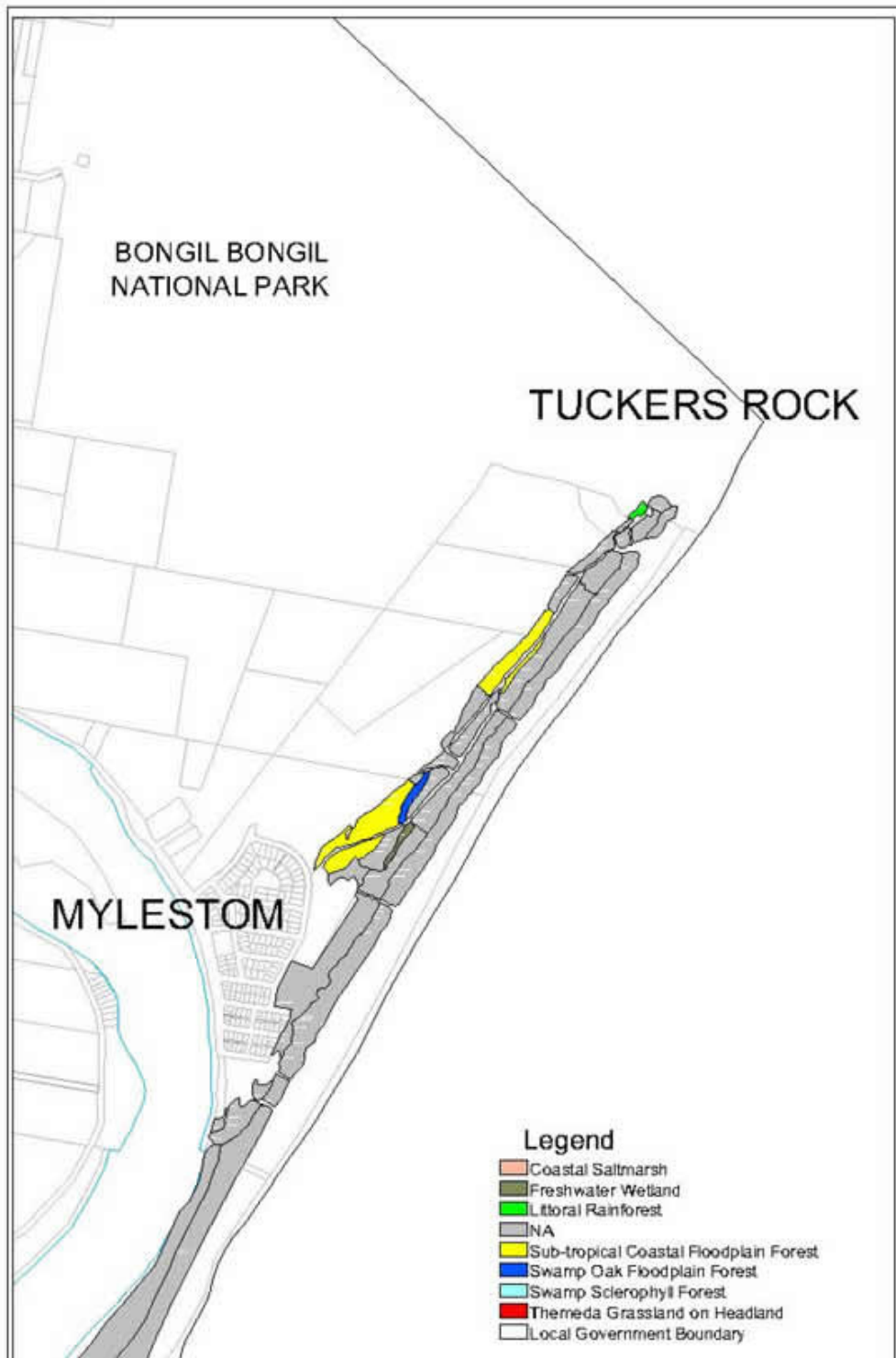


Figure 20A
 Endangered Ecological Communities - Tuckers Rock/Mylestom



Figure 20B
 Endangered Ecological Communities - North Beach

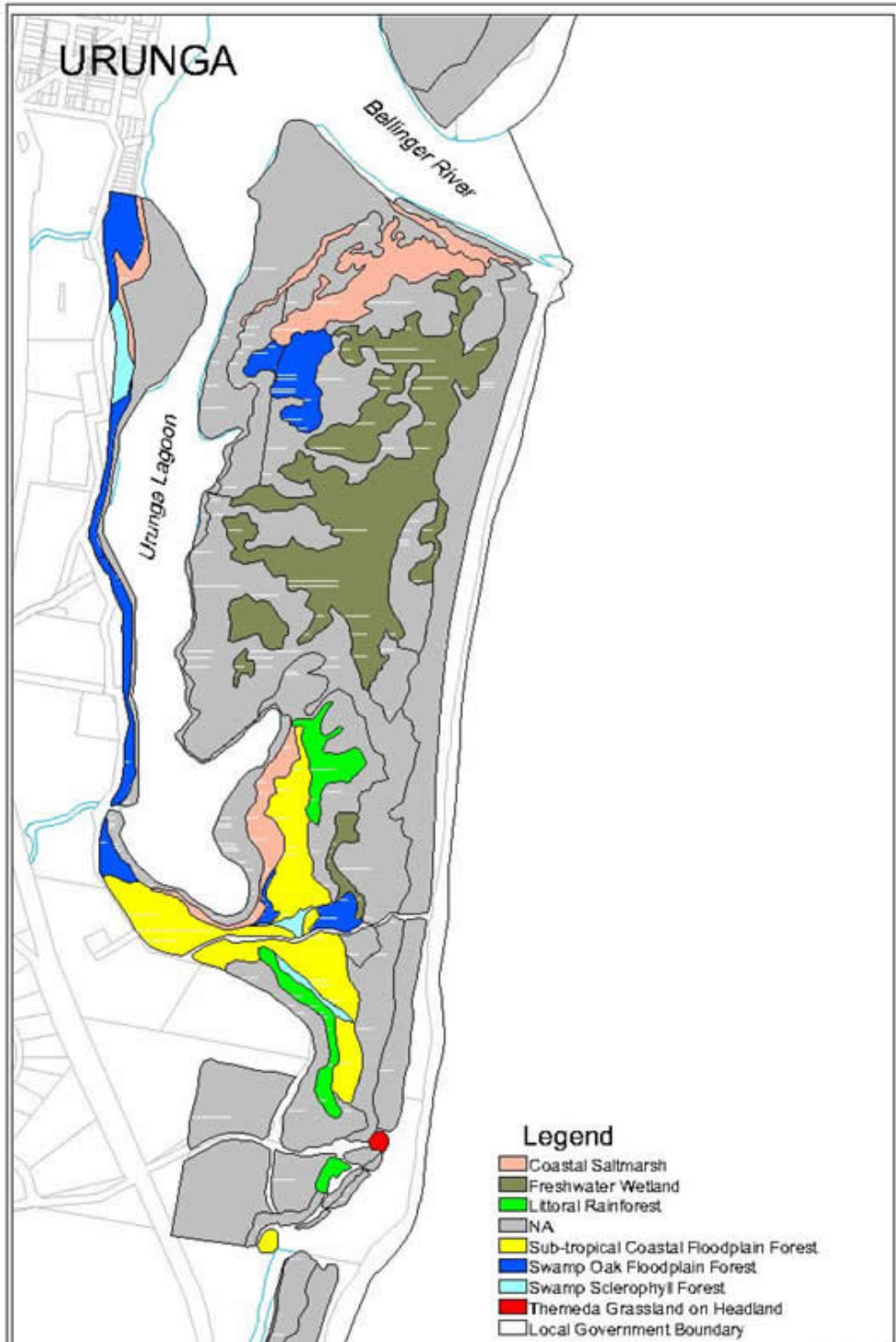
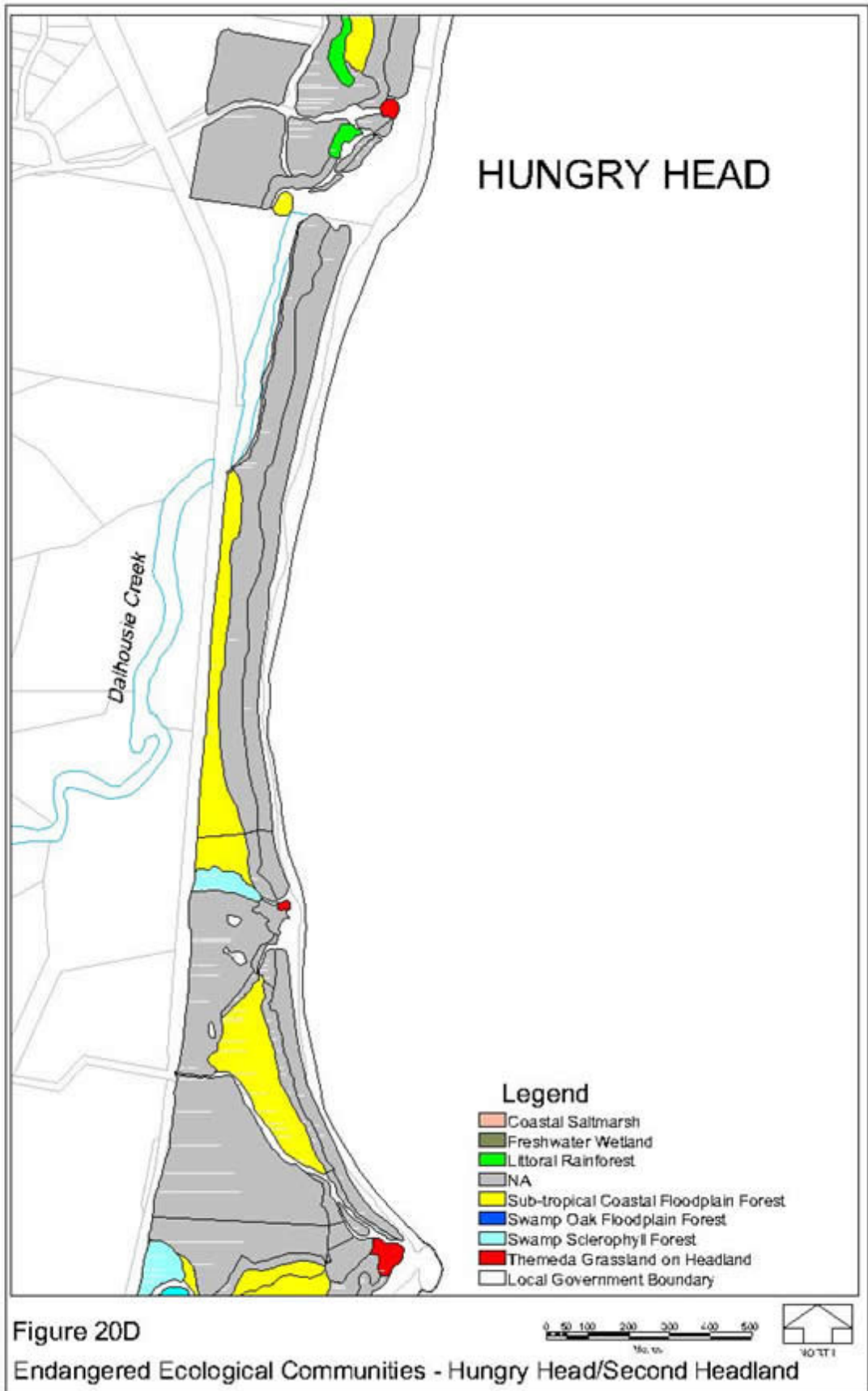
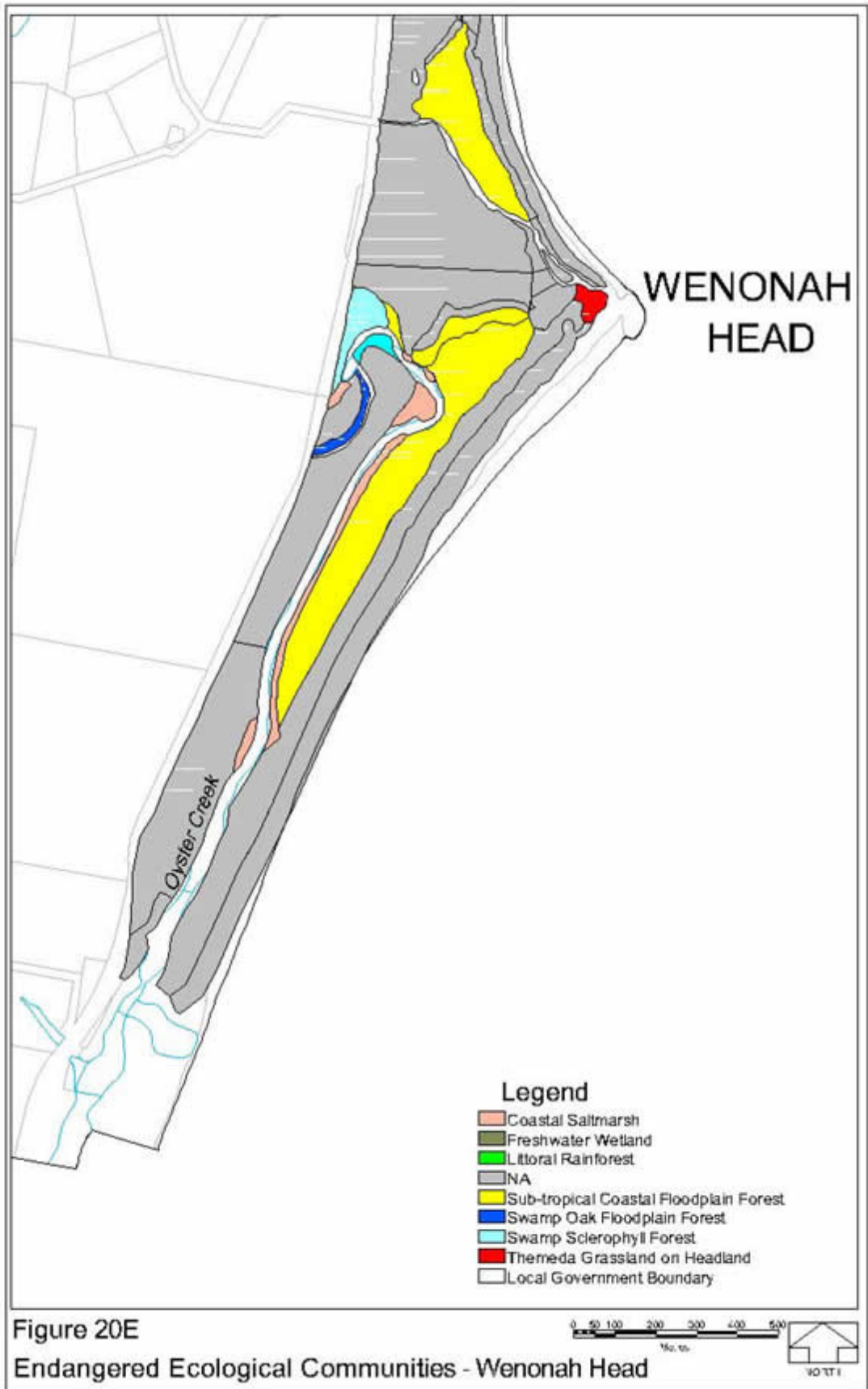


Figure 20C

Endangered Ecological Communities - Urunga Sandmass & Lagoon





3.6 Mapping of vegetation condition

Weed levels in the Study Area are shown in Figure 21a-e and on Council's GIS layer "Vegetation_Condition". Point data on weed incidences are shown on Council's GIS layer "Weed_Incidences". The severity, at given points, of Bitou Bush, Glory Lily, Lantana, Senna, Groundsel Bush and Vine Weeds are shown on Council's GIS layers "Bitou_Bush_Severity", "Glory_Lily_Severity", "Lantana_Severity", "Senna_Severity", "Groundsel_Bush_Severity", and "Vine_Weed_Severity", respectively.

We recorded 41 species of weeds from bushland in the Study Area. Of these, 5 species stood out as posing major threats to the integrity of native vegetation: Bitou Bush, Glory Lily, Senna, Lantana and Groundsel Bush. The occurrence within the Study Area of each of the weed species recorded is shown in Table 27.

Table 27. Occurrence within Study Area of weed species recorded

Species	Occurrence
Bitou Bush	All communities in all parts of Study Area; particularly dominant in coastal communities
Glory Lily	Most communities, especially along coastal dunes. Not common on Urunga Sandmass or in communities away from the coast. Not recorded south of Wenonah Head.
Senna	Most communities, but scarce on coastal dunes. Not recorded south of Hungry Head.
Lantana	Most communities, throughout Study Area; scarce on coastal dunes.
Groundsel Bush	Restricted to North Beach and the Urunga Sandmass, with an isolated occurrence inland from Wenonah Head. Apparently in the early stages of outbreak.
<i>Ipomoea cairica</i>	Widespread but patchy throughout Study Area.
Bidens	Patchy; near roads and tracks; Wenonah Head and Tuckers Rocks.
<i>Conyza</i> spp.	Patchy; near roads and tracks; Hungry Head, Urunga Lagoon and Tuckers Rocks.
Giant Parramatta Grass	Near roads and tracks at Tuckers Rocks.
<i>Acacia saligna</i>	Tuckers Rocks, Mylestom and North Beach; presumably originally planted, for dune stabilisation/rehabilitation.
Setaria	Limited; Tuckers Rocks and Mylestom.
Molasses Grass	Limited; Tuckers Rocks and Mylestom.
Wild Tobacco	Most communities except coastal dunes; widespread throughout Study Area.
Mother of Millions	Around Mylestom
Coral Tree	Mylestom, North Beach and west of Urunga Lagoon
Ragweed	Patchy but widespread, mainly in disturbed areas
Broad-leaved Paspalum	Patchy but widespread; shady dryland communities
Camphor Laurel	Mylestom and North Beach
Wandering Jew	Patchy; Mylestom, North Beach and near Hungry Head
<i>Solanum seaforthianum</i>	Around Mylestom
Ochna	Patchy; Mylestom, Urunga Sandmass, Hungry Head
Blackberry Nightshade	Mylestom

Species	Occurrence
<i>Ipomoea indica</i>	Widespread but patchy in a range of communities; Mylestom, west of Urunga Lagoon, Wenonah Head
Asparagus Fern	Mylestom, west of Urunga Lagoon
Madeira Vine	Mylestom, West of Urunga Lagoon
Broad-leaved Pepper	Mylestom
Mexican Sunflower	Mylestom
Dragon Fruit	Mylestom
Fine-leaved Asparagus Fern (Climbing Asparagus Fern)	Mylestom
Cottonbush	Hungry Head and Wenonah Head; forests
Ginger Lily	Littoral Rainforest at Hungry Head
Crofton Weed	Pink Bloodwood Forest Red Gum Forest at Hungry Head
<i>Passiflora edulis</i>	Mainly around Hungry Head, in Swamp Turpentine Mixed Sclerophyll Forest
Acetosa	Dunes at Hungry Head
Japanese Honeysuckle	Dunes at Hungry Head
Inkweed	Urunga Lagoon and Hungry Head
<i>Passiflora subpeltata</i>	Hungry Head and Wenonah Head
Freckle Face	Littoral Rainforest behind Hungry Head Surf Club
Burrgrass	North Beach
Small-leaved Privet	North Beach
<i>Tecoma capensis</i>	Mylestom

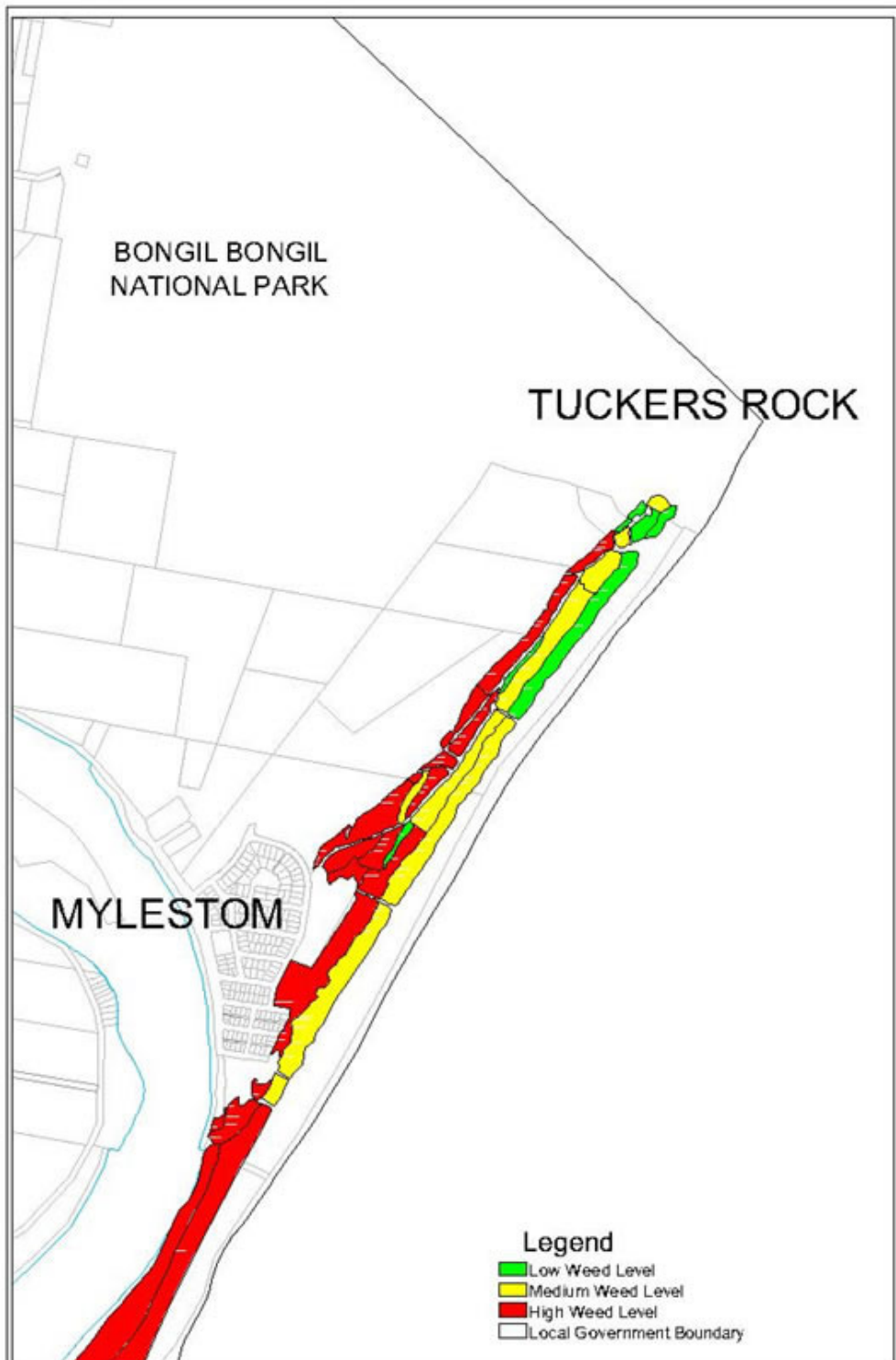


Figure 21A
Vegetation Condition - Tuckers Rock/Mylestom



Figure 21B
Vegetation Condition - North Beach



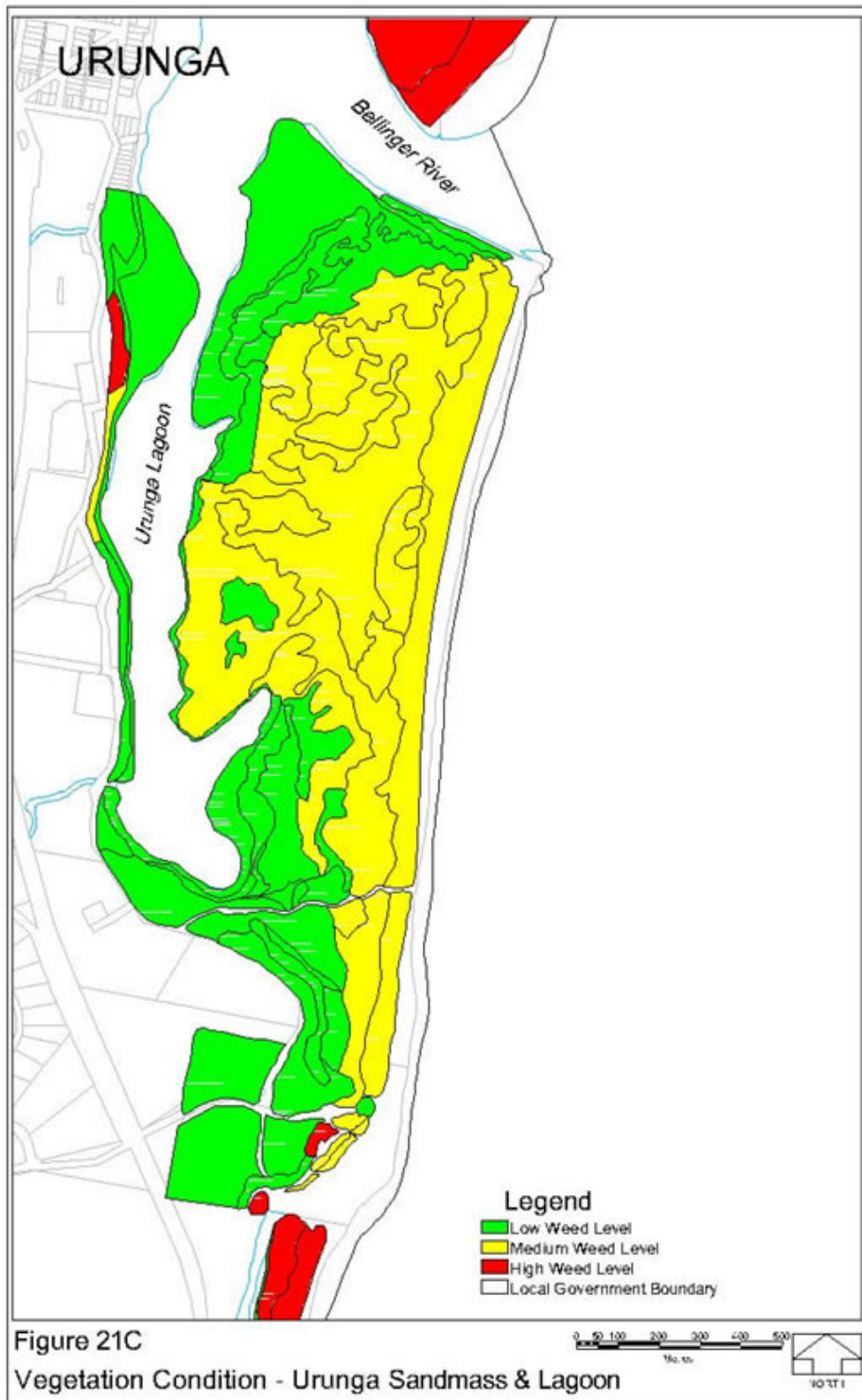
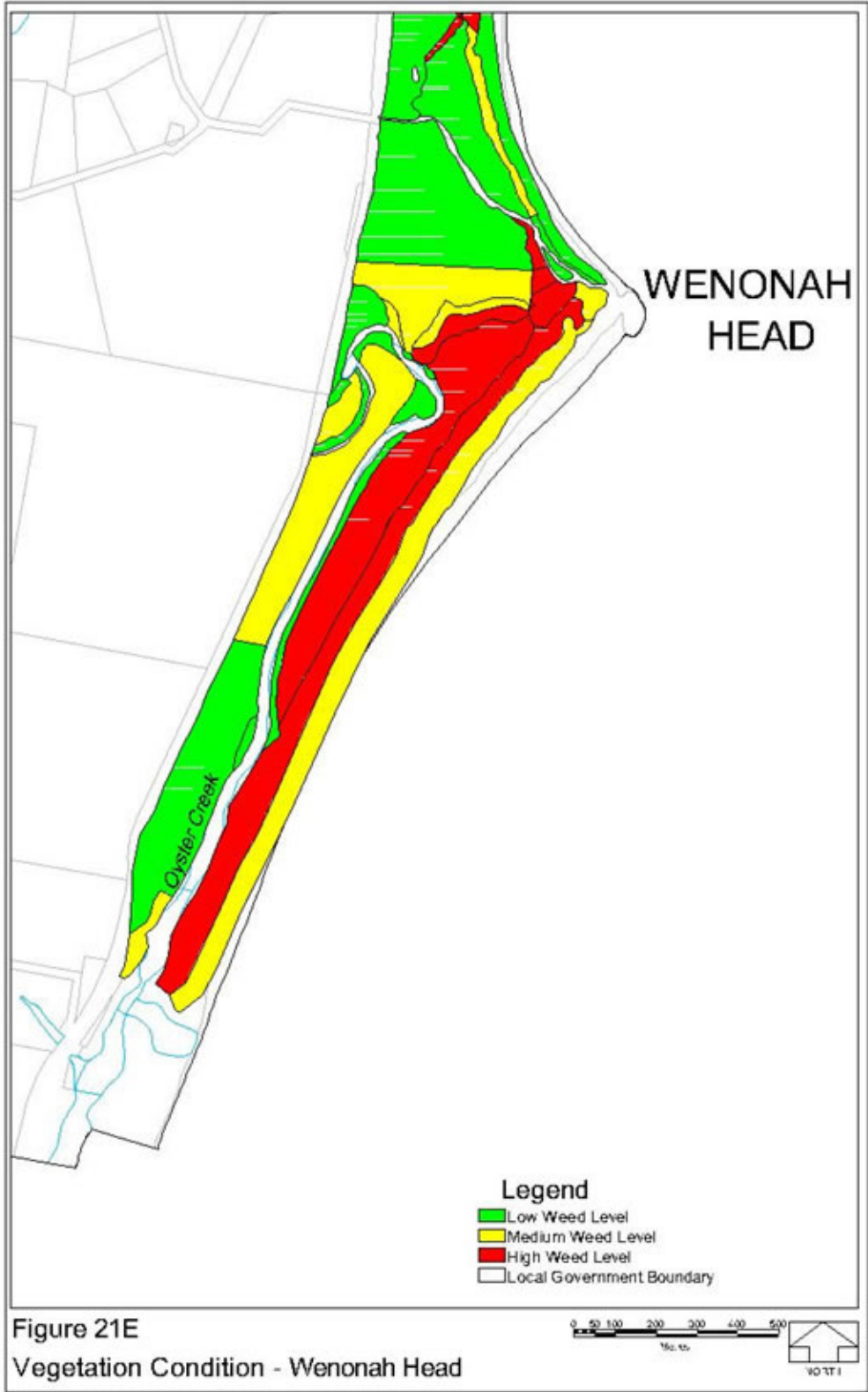




Figure 21D
Vegetation Condition - Hungry Head/Second Headland





3.7 Mapping of management priority levels

Management priority levels in the Study Area are shown in Figure 22a-e and on Council's GIS layer "Management_Priority". Management priority levels indicate the priority of undertaking management actions (specifically, bush regeneration) in the Study Area.

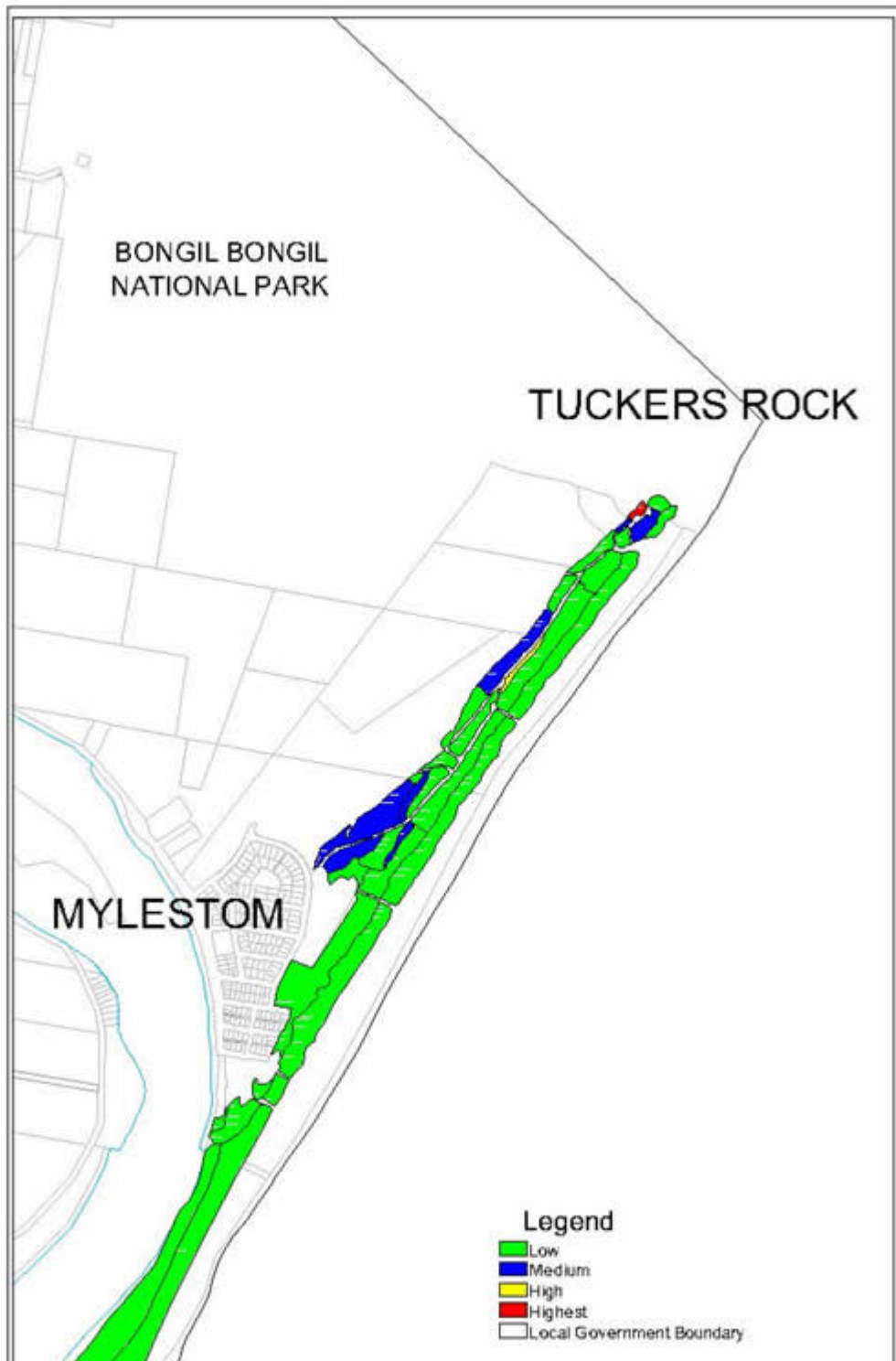
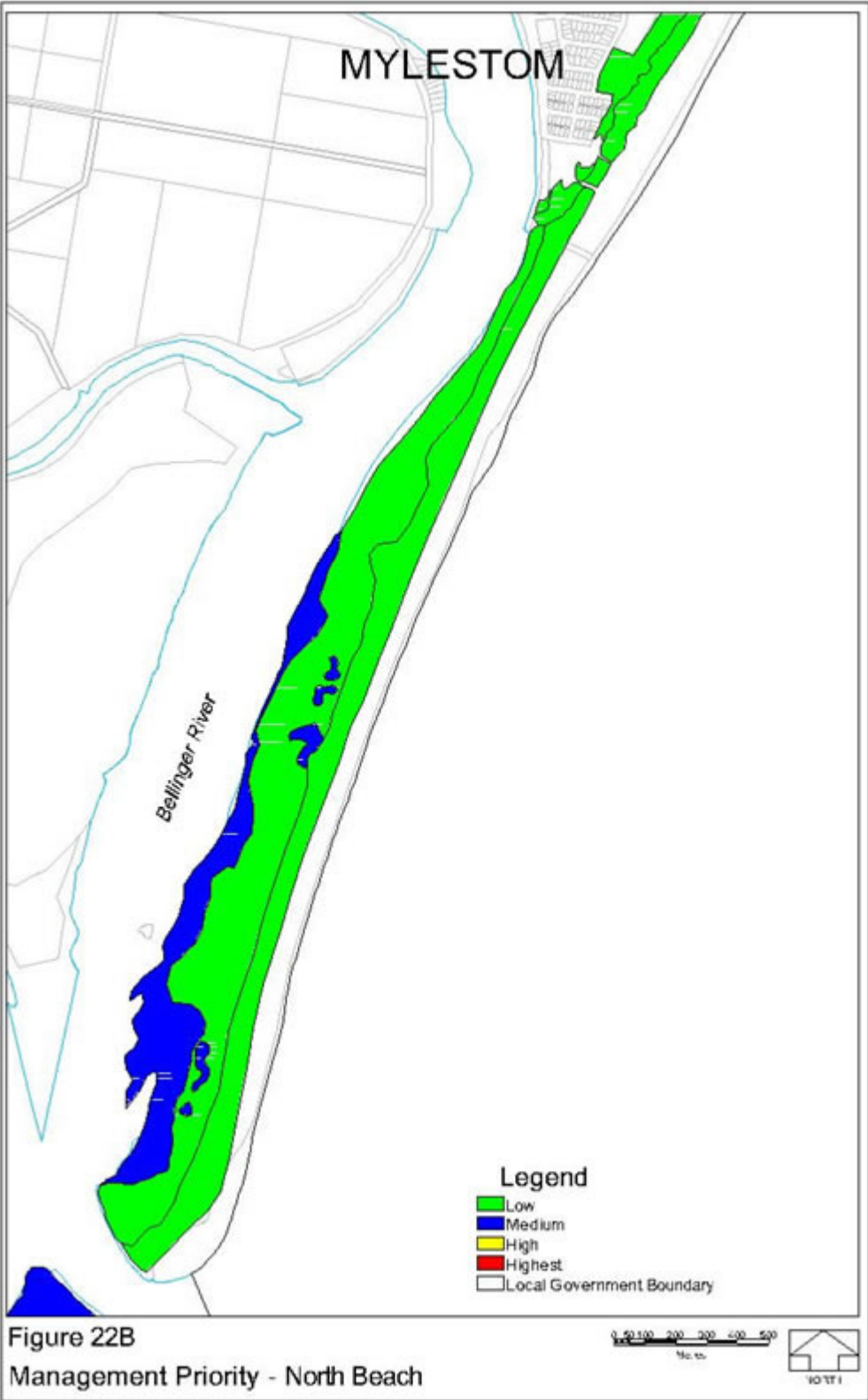


Figure 22A
 Management Priority - Tuckers Rock/Mylestom





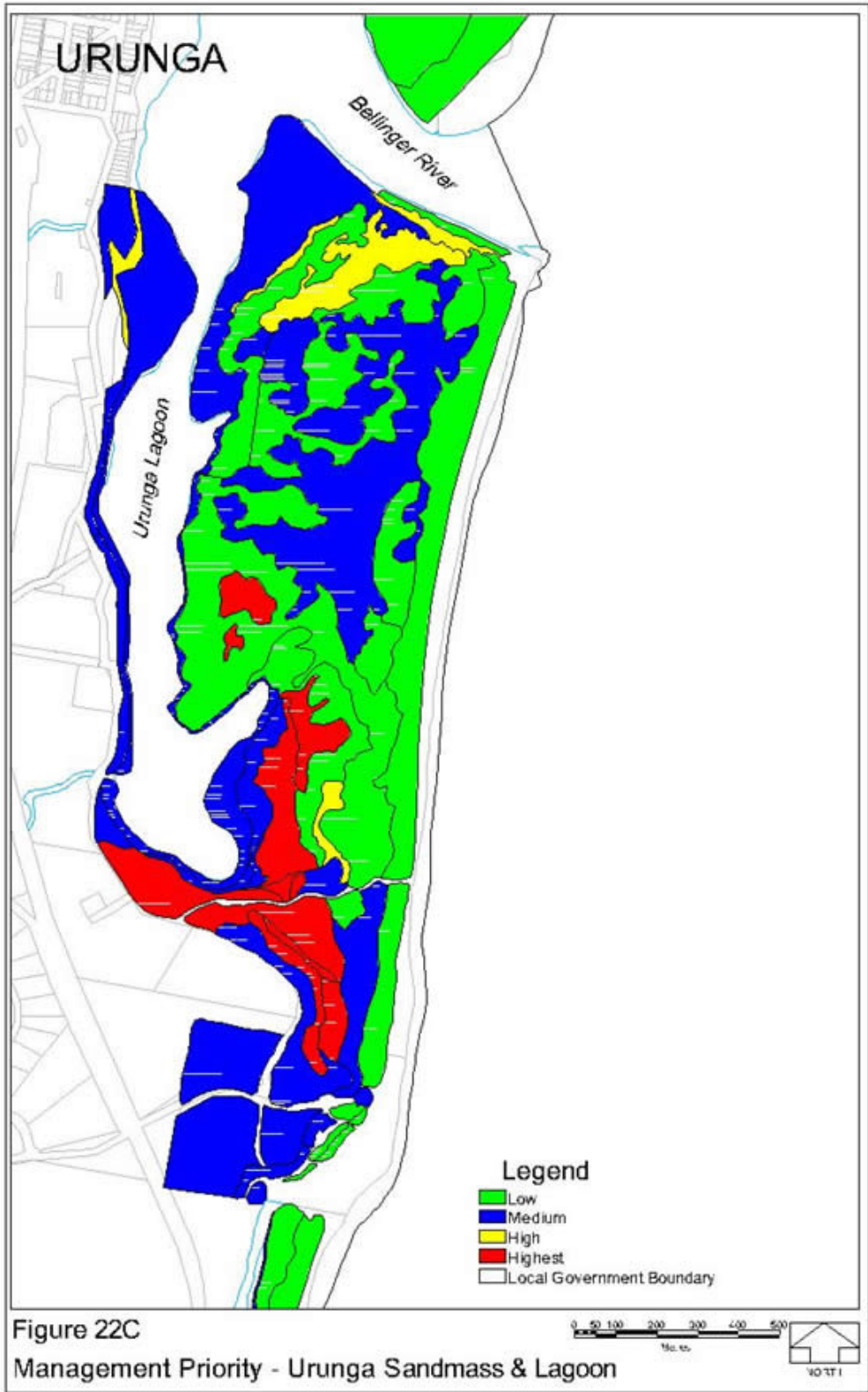
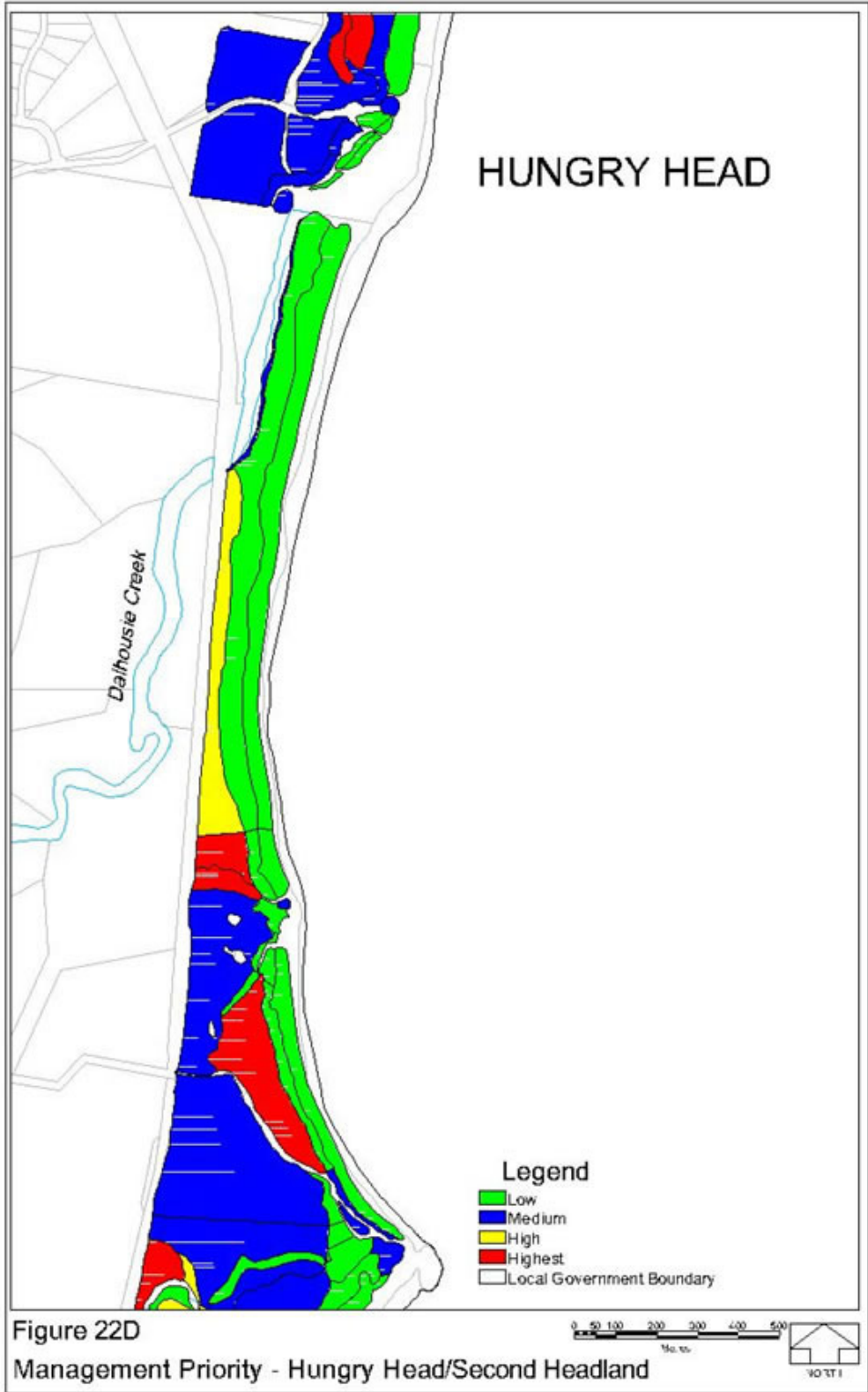
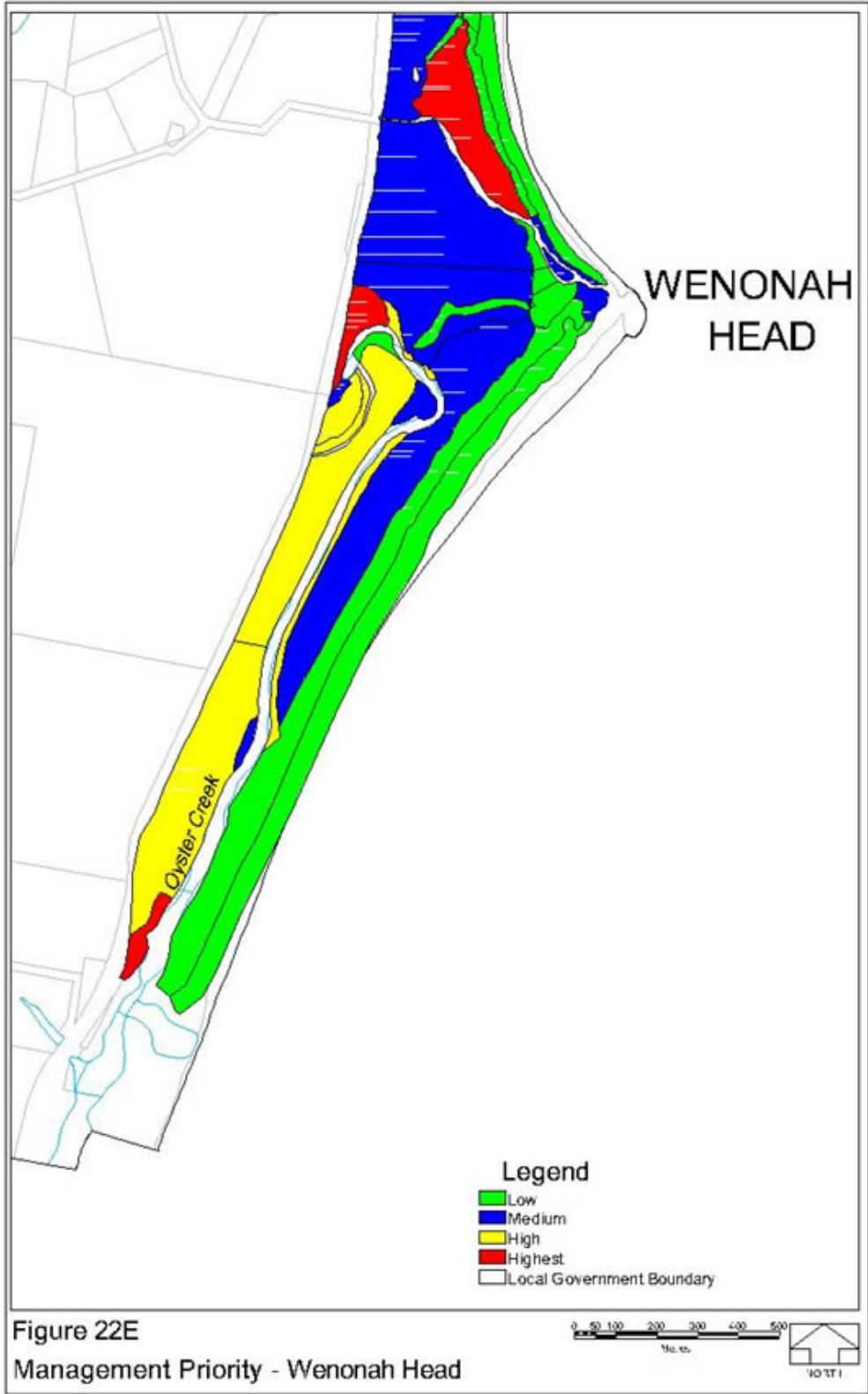


Figure 22C
 Management Priority - Urunga Sandmass & Lagoon





4. Discussion

4.1 Vegetation community mapping

4.1.1 General patterns

Travelling from the coast inland, the general pattern of community succession in the Study Area is that Foredune vegetation occurs to the crest of the first dune, followed by Hind Dune vegetation from the crest down the landward slope, grading next into Pink Bloodwood Forest Red Gum Forest in post-dune low-lying areas, and finally Mixed Sclerophyll Forest when higher, better-drained, rock-derived substrates are reached. This pattern is complicated by the existence of rocky headlands, which are vegetated by native grasses and provide shelter for Littoral Rainforest and Brush Box Forest; and by the presence of several tidal creeks, lagoons, and associated swampy areas, around which a variety of communities – Mangrove, Freshwater Wetland, Rushland, Paperbark Forest, Couch Saltmarsh and Swamp Oak Forest – occur.

An exception to this general pattern is the Urunga Sandmass, the area between the northern part of Urunga Lagoon and the coast. A study of the geomorphological history of this area might explain several enigmatic aspects of the vegetation – for instance, the absence of Hind Dune vegetation on the landward side of the coastal dune. Elsewhere in the Study Area the landward side of the coastal dune is occupied by a more or less dense community of Coast Banksias, Tuckeroos, and understorey species characteristic of Littoral Rainforest: why this community should be absent from the Urunga Sandmass is a mystery. Perhaps the geomorphology of this relatively recent landform, which must to some extent have resulted from the building of training walls along the mouth of the Bellinger River in 1900 (Lawson and Treloar 2003), and was subject to sand blowouts at least until the 1940s (Lawson and Treloar 2003), is evolving too rapidly for Tuckeroos and other rainforest species to establish.

4.1.2 Accuracy

Although the accuracy of the mapping is necessarily greatest where we actually walked, the combination of aerial photography interpretation and field surveys allowed us to achieve a high degree of accuracy overall. Something of an exception, again, is the Urunga Sandmass, where aerial photography interpretation did not allow ready discrimination between Urunga Sand Vegetation and Mixed Grassland/Sedgeland (itself a composite of two distinct communities). Part of the reason for the lack of discrimination in this area is that the communities are closely interpenetrated, with the vegetation changing in response to minor changes in elevation; and part is due to the prevalence of Blady Grass in both Urunga Sand Vegetation and Mixed Grassland/Sedgeland, giving both communities the same rusty hue when viewed from the air. GIS contour layers lacked the level of resolution required for us to discriminate between Urunga Sand Vegetation (on slightly higher ground), Mixed Sedgeland (on lower ground), and Mixed Grassland (in between the Urunga Sand Vegetation and Mixed Sedgeland), leading to a lower level of accuracy where these communities are concerned.

4.2 Vegetation condition mapping

The main environmental weeds in the Study Area are Bitou Bush, Glory Lily, Lantana, Senna and Groundsel Bush. These species are almost ubiquitous in the Study Area, with the exception of Groundsel Bush, which currently occurs mainly on North Beach and the Urunga Sandmass, with an isolated record from near Wenonah Head, and Glory Lily,

which does not seem to have spread south of Wenonah Head. Most vegetation communities in the Study Area are affected by weeds to some extent. However, communities that undergo periodic inundation – such as Rushland, Swamp Oak Forest, Paperbark Forest and Mangrove Forest – experience generally lower levels of weed infestation: Mangrove Forest is the only community that appears to be totally free of weeds. Vine Weeds are generally not a major problem in the Study Area, though *Ipomoea cairica* may be on the increase. The same is true of Groundsel Bush, which appears to be in the early stages of expansion, and is a growing threat to the vegetation of the Urunga Sandmass.

Weed “hotspots”, where the diversity and often the abundance of weeds increases dramatically, occur close to the towns of Mylestom and Urunga, due to garden escapes and the dumping of clippings. However, we consider the “weediest” part of the Study Area to be the depression inland of Wenonah Head, part of which was mapped by Allen *et al.* (1996) as rainforest. This patch of vegetation has been badly affected by a recent bushfire, with many canopy trees killed, and currently consists of a “sea”, up to 3m high, of Bitou Bush, Lantana, and other weeds (Figure 23).



Figure 23. Weed invasion of Brush Box Forest following bushfire near Wenonah Head

Apart from the periodically inundated communities discussed above, the only parts of the Study Area to remain relatively unaffected by weeds are where bush regeneration has been carried out (Tuckers Rocks, Hungry Head-Urunga, Wenonah Head); the effect of the work that has been done – particularly with regards to Woody Weeds and Vine Weeds – is very noticeable. Glory Lily, however, appears to be more resistant to control. Opinions of local bush regenerators are divided as to the seriousness of the threat posed by this weed.

In our mapping we have used weed levels as an index of vegetation condition. The only exception to this relationship in the Study Area occurs on the coastal sand-dunes of the Urunga Sandmass (Figure 24), where in places weed scores were relatively low, but vegetation condition was not as good as the scores might suggest. This was a result of Bitou Bush having been sprayed – and possibly also burnt⁴ – with minimal subsequent recovery of native vegetation. Unlike in other parts of the Study Area, where Bitou Bush control was followed by hand-seeding of Coast Wattle, these dunes have a generally poor covering of vegetation, and may be susceptible to blow-out.



Figure 24. Foredune Vegetation on Urunga Sandmass south of Urunga. There is virtually no shrub layer in this section, due probably to a combination of spraying and burning. Note Glory Lily seedlings, sprayed/burned-out clumps of Bitou Bush, and absence of Coast Wattle.

Finally, it is likely that not all weed species in the Study Area were recorded during fieldwork. When mapping weeds in the field, one develops a “search image” for the commoner species, meaning that some uncommon weeds may be missed.

4.3 Threatened flora species recorded

One Threatened flora species was recorded in the Study Area: the Scented Acronychia, with a population of around 15 plants growing at the edge of Littoral Rainforest north of Hungry Head. The fact that we recorded only a sole Threatened flora species during our fieldwork does not discount the presence of other Threatened flora species in the Study Area. The demands of mapping in the field – when one must pay close attention to where one is walking, as well as keeping a look out for weeds and vegetation changes

⁴ This area was not burnt by a large-scale bushfire, but probably as a result of a recreational fire on the beach becoming out of control.

which might indicate community boundaries – are such that, in practice, only a small amount of attention can be devoted to searching for Threatened species. The Threatened *Senna acclinis* has been reported from the Study Area (Colin Matthews, pers. comm.), although we did not record it during surveys.

One plant worthy of attention is the low-growing *Zieria smithii* on the headland near the cottage at Tuckers Rocks, on the edge of the Study Area. Although *Zieria smithii* is common and not Threatened, a genetically distinct, low-growing form of the species at Diggers Headland, near Coffs Harbour, is listed as an Endangered population under the NSW Threatened Species Conservation Act (1995). The low-growing *Zieria smithii* at Tuckers Rocks may therefore warrant further study.

4.4 Endangered Ecological Communities

The identification of Endangered Ecological Communities is not always straightforward. In particular, several Endangered Ecological Communities in the Study Area (Sub-tropical Coastal Floodplain Forest, Swamp Sclerophyll Forest on Coastal Floodplain, Swamp Oak Floodplain Forest and Freshwater Wetland on Coastal Floodplain) are defined, not by any inherent characteristics of the vegetation, but by whether or not they occur on Coastal Floodplains. Floodplains are “level landform patterns on which there may be active erosion and aggradation by channelled and overbank stream flow with an average recurrence interval of 100 years or less” (NSW Scientific Committee 2004a, b, c and d). Mapping the exact extent of floodplains in the Study Area is beyond our expertise, and is a challenge best suited to the geomorphologist. When mapping Endangered Ecological Communities, we adopted the approach of “if in doubt, call it a floodplain.” Thus – quite apart from the difficulty in distinguishing between Freshwater Wetland and non-Freshwater Wetland on the Urunga Sandmass, as discussed above – the mapping of Endangered Ecological Communities in the Study Area may be overgenerous.

4.5 Management priority

Management priority levels indicate the priority of undertaking management actions (specifically, bush regeneration) in the Study Area. The highest priorities have been assigned to Endangered Ecological Communities in good condition and with high value as Threatened fauna habitat. Conversely, the lowest priorities have been assigned to non-Endangered Ecological Communities in poor condition and with low value as Threatened fauna habitat.

One vegetation polygon is deserving of special consideration: this is the small patch of Littoral Rainforest behind the Hungry Head Surf Club, which is notable for being the southernmost limit of the Red Bean (Lonie 2000). Even though this polygon is mapped as only a medium-level management priority (due to its high weed levels), in light of its small size and significance we consider that it ought to be treated as a high-level priority.

4.6 Concordance with previous mapping studies

Where comparisons were possible, our mapping was generally in accordance with previous studies. An exception is the area in the depression inland from Wenonah Head, which was mapped by Allen *et al.* (1996) as containing Brush Box and Tuckeroo Rainforest. This vegetation has been severely affected by a bushfire, and today is dominated by weeds (Figure 23). A comparison of our results with the Bitou Bush

mapping undertaken in 2002 (Thomas 2002) suggests that Bitou Bush infestation in the Study Area has neither worsened nor improved significantly in the intervening time.

4.7 Management recommendations

We recommend the following management actions:

- 1) That Bellingen Council continues or extends its program of bush regeneration. The difference in vegetation condition between regenerated and unregenerated areas is very noticeable.
- 2) That patches of Littoral Rainforest be protected from fire.
- 3) That, in the event of a bushfire in the Study Area, preventing weed infestation of recently burnt vegetation should be given the highest priority.
- 4) That any spraying of Bitou Bush on sand-dunes should be followed by the scattering of Coast Wattle seed. This ought to prevent the creation of patches of sand denuded of stabilising vegetation, and also to hinder the reestablishment of Bitou Bush.
- 5) That Coast Wattle seed should be collected, in order to fulfil action 4.

4.8 Methodologies for monitoring ecological change

Changes in the extent of vegetation communities in the Study Area can be monitored only by vegetation mapping, using the same community classifications as in this report. Monitoring changes in vegetation condition is easier: the methodology described in Section 2.2 can be used in the future to derive weed scores and levels for the vegetation polygons mapped as part of this project, which will allow easy comparison between vegetation condition in the future and current vegetation condition.

5. Glossary

- Council. Bellingen Shire Council.
- EEC. Endangered Ecological Community, as listed in Part 3 of Schedule 1 of the NSW Threatened Species Conservation Act (1995).
- Eucalypt. Any member of the “eucalypt genera”, i.e. *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon*.
- Weed. Any plant species which would not have occurred in the Study Area in 1750

6. References

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Appendix: common and scientific names of plant species referred to in the text

In alphabetical order by common name:

Common Name	Scientific Name
Asparagus Fern	<i>Asparagus aethiopicus*</i>
Bacopa	<i>Bacopa monnieri</i>
Basket Grass	<i>Oplismenus sp.</i>
Beach Acronychia	<i>Acronychia imperforata</i>
Beach Alectryon	<i>Alectryon coriaceus</i>
Bitou Bush	<i>Chrysanthemoides monilifera subsp. monilifera*</i>
Black She-oak	<i>Allocasuarina littoralis</i>
Blackberry Nightshade	<i>Solanum nigrum*</i>
Blady Grass	<i>Imperata cylindrica var. major</i>
Blue Morning Glory	<i>Ipomoea indica*</i>
Bolwarra	<i>Eupomatia laurina</i>
Bracken	<i>Pteridium esculentum</i>
Broad-leaved Paperbark	<i>Melaleuca quinquenervia</i>
Broad-leaved Paspalum	<i>Paspalum wettsteinii*</i>
Broad-leaved Pepper Tree	<i>Schinus terebinthifolia*</i>
Brush Box	<i>Lophostemon confertus</i>
Brush Cherry	<i>Syzygium australe</i>
Burrgrass	<i>Cenchrus sp.*</i>
Camphor Laurel	<i>Cinnamomum camphora*</i>
Cape Honeysuckle	<i>Tecoma capensis*</i>

Common Name	Scientific Name
Cheese Tree	<i>Glochidion ferdinandi</i>
Climbing Asparagus Fern	<i>Asparagus plumosus*</i>
Climbing Nightshade	<i>Solanum seaforthianum*</i>
Coast Banksia	<i>Banksia integrifolia</i>
Coast She-oak	<i>Casuarina equisetifolia</i>
Coast Wattle	<i>Acacia longifolia subsp. sophorae</i>
Coastal Morning Glory	<i>Ipomoea cairica*</i>
Cobblers Pegs	<i>Bidens pilosa*</i>
Common Acronychia	<i>Acronychia oblongifolia</i>
Common Passionfruit	<i>Passiflora edulis*</i>
Common Reed	<i>Phragmites australis</i>
Coral Tree	<i>Erythrina sykesii*</i>
Cottonbush	<i>Gomphocarpus fruticosus*</i>
Crofton Weed	<i>Ageratina adenophora*</i>
Dragon Fruit	<i>Hylocereus undatus*</i>
Elastic Grass	<i>Eragrostis tenuifolia*</i>
Fine-leaved Asparagus Fern	<i>Asparagus plumosus*</i>
Fleabane	<i>Conyza spp.*</i>
Flintwood	<i>Scolopia braunii</i>
Forest Red Gum	<i>Eucalyptus tereticornis</i>
Freckle Face	<i>Hypoestes phyllostachya*</i>
Giant Parramatta Grass	<i>Sporobolus fertilis*</i>
Ginger Lily	<i>Hedychium gardnerianum*</i>
Glory Lily	<i>Gloriosa superba*</i>
Golden Wreath Wattle	<i>Acacia saligna*</i>
Grey Mangrove	<i>Avicennia marina</i>
Groundsel Bush	<i>Baccharis halimifolia*</i>
Guioa	<i>Guioa semiglauca</i>
Hard Quandong	<i>Elaeocarpus obovatus</i>
Hopbush	<i>Dodonaea viscosa subsp. viscosa</i>
Inkweed	<i>Phytolacca octandra*</i>
Ironbark	<i>Eucalyptus sp.</i>
Japanese Honeysuckle	<i>Lonicera japonica*</i>
Kangaroo Grass	<i>Themeda australis</i>
Knobby Club-rush	<i>Isolepis nodosa</i>
Lantana	<i>Lantana sp.*</i>
Lilly Pilly	<i>Acmena smithii</i>
Lomandra	<i>Lomandra sp.</i>
Madeira Vine	<i>Anredera cordifolia*</i>
Mexican Sunflower	<i>Tithonia diversifolia*</i>

Common Name	Scientific Name
Midgen Berry	<i>Austromyrtus dulcis</i>
Molasses Grass	<i>Melinis minutiflora*</i>
Mother of Millions	<i>Bryophyllum delagoense*</i>
Native Coastal Morning Glory	<i>Ipomoea brasiliensis</i>
Native Guava	<i>Rhodomyrtus psidioides</i>
Ochna	<i>Ochna serrulata*</i>
Pink Bloodwood	<i>Corymbia intermedia</i>
Plum-pine	<i>Podocarpus elatus</i>
Prickly Couch	<i>Zoysia macrantha</i>
Ragweed	<i>Ambrosia artemisiifolia*</i>
Red Bean	<i>Dysoxylum mollissimum</i>
Red Bloodwood	<i>Corymbia gummifera</i>
Red Mahogany	<i>Eucalyptus resinifera</i>
Rusty Plum	<i>Amorphospermum whitei</i>
Scented Acronychia	<i>Acronychia littoralis</i>
Scentless Rosewood	<i>Synoum glandulosum</i>
Scrambling Lily	<i>Geitonoplesium cymosum</i>
Senna	<i>Senna pendula*</i>
Setaria	<i>Setaria sp.*</i>
Small-leaved Privet	<i>Ligustrum sinense*</i>
Snow Wood	<i>Pararchidendron pruinatum</i>
Spinifex	<i>Spinifex sericeus</i>
Swamp Lily	<i>Crinum pedunculatum</i>
Swamp Mahogany	<i>Eucalyptus robusta</i>
Swamp Oak	<i>Casuarina glauca</i>
Swamp Turpentine	<i>Lophostemon suaveolens</i>
Sydney Blue Gum	<i>Eucalyptus saligna</i>
Tallowwood	<i>Eucalyptus microcorys</i>
Three-veined Laurel	<i>Cryptocarya triplinerva</i>
Tuckeroo	<i>Cupaniopsis anacardioides</i>
Turkey Rhubarb	<i>Acetosa sagittata*</i>
Wandering Jew	<i>Tradescantia fluminensis*</i>
Whisky Grass	<i>Andropogon virginicus*</i>
White Passionfruit	<i>Passiflora subpeltata</i>
Wild Tobacco	<i>Solanum mauritianum*</i>
Yellow Tulip	<i>Drypetes deplanchei</i>
	<i>Cyperus polystachyos</i>
	<i>Juncus kraussii</i>
	<i>Leucopogon parviflorus</i>

In alphabetical order by scientific name:

Scientific Name	Common Name
<i>Acacia longifolia subsp. sophorae</i>	Coast Wattle
<i>Acacia saligna*</i>	Golden Wreath Wattle
<i>Acetosa sagittata*</i>	Turkey Rhubarb
<i>Acmena smithii</i>	Lilly Pilly
<i>Acronychia imperforata</i>	Beach Acronychia
<i>Acronychia littoralis</i>	Scented Acronychia
<i>Acronychia oblongifolia</i>	Common Acronychia
<i>Ageratina adenophora*</i>	Crofton Weed
<i>Alectryon coriaceus</i>	Beach Alectryon
<i>Allocasuarina littoralis</i>	Black She-oak
<i>Ambrosia artemisiifolia*</i>	Ragweed
<i>Amorphospermum whitei</i>	Rusty Plum
<i>Andropogon virginicus*</i>	Whisky Grass
<i>Anredera cordifolia*</i>	Madeira Vine
<i>Asparagus aethiopicus*</i>	Asparagus Fern
<i>Asparagus plumosus*</i>	Climbing Asparagus Fern
<i>Asparagus plumosus*</i>	Fine-leaved Asparagus Fern
<i>Austromyrtus dulcis</i>	Midgen Berry
<i>Avicennia marina</i>	Grey Mangrove
<i>Baccharis halimifolia*</i>	Groundsel Bush
<i>Bacopa monnieri</i>	Bacopa
<i>Banksia integrifolia</i>	Coast Banksia
<i>Bidens pilosa*</i>	Cobblers Pegs
<i>Bryophyllum delagoense*</i>	Mother of Millions
<i>Casuarina equisetifolia</i>	Coast She-oak
<i>Casuarina glauca</i>	Swamp Oak
<i>Cenchrus sp.*</i>	Burrgrass
<i>Chrysanthemoides monilifera*</i>	Bitou Bush
<i>Cinnamomum camphora*</i>	Camphor Laurel
<i>Conyza spp.*</i>	Fleabane
<i>Corymbia gummifera</i>	Red Bloodwood
<i>Corymbia intermedia</i>	Pink Bloodwood
<i>Crinum pedunculatum</i>	Swamp Lily
<i>Cryptocarya triplinerva</i>	Three-veined Laurel
<i>Cupaniopsis anacardioides</i>	Tuckeroo
<i>Cyperus polystachyos</i>	
<i>Dodonaea viscosa subsp. viscosa</i>	Hopbush
<i>Drypetes deplanchei</i>	Yellow Tulip

Scientific Name	Common Name
<i>Dysoxylum mollissimum</i>	Red Bean
<i>Elaeocarpus obovatus</i>	Hard Quandong
<i>Eragrostis tenuifolia</i> *	Elastic Grass
<i>Erythrina sykesii</i> *	Coral Tree
<i>Eucalyptus microcorys</i>	Tallowwood
<i>Eucalyptus resinifera</i>	Red Mahogany
<i>Eucalyptus robusta</i>	Swamp Mahogany
<i>Eucalyptus saligna</i>	Sydney Blue Gum
<i>Eucalyptus sp.</i>	Ironbark
<i>Eucalyptus tereticornis</i>	Forest Red Gum
<i>Eupomatia laurina</i>	Bolwarra
<i>Geitonoplesium cymosum</i>	Scrambling Lily
<i>Glochidion ferdinandi</i>	Cheese Tree
<i>Gloriosa superba</i> *	Glory Lily
<i>Gomphocarpus fruticosus</i> *	Cottonbush
<i>Guioa semiglauc</i>	Guioa
<i>Hedychium gardnerianum</i> *	Ginger Lily
<i>Hylocereus undatus</i> *	Dragon Fruit
<i>Hypoestes phyllostachya</i> *	Freckle Face
<i>Imperata cylindrica var. major</i>	Blady Grass
<i>Ipomoea brasiliensis</i>	Native Coastal Morning Glory
<i>Ipomoea cairica</i> *	Coastal Morning Glory
<i>Ipomoea indica</i> *	Blue Morning Glory
<i>Isolepis nodosa</i>	Knobby Club-rush
<i>Juncus kraussii</i>	
<i>Lantana sp.</i> *	Lantana
<i>Leucopogon parviflorus</i>	
<i>Ligustrum sinense</i> *	Small-leaved Privet
<i>Lomandra sp.</i>	Lomandra
<i>Lonicera japonica</i> *	Japanese Honeysuckle
<i>Lophostemon confertus</i>	Brush Box
<i>Lophostemon suaveolens</i>	Swamp Turpentine
<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark
<i>Melinis minutiflora</i> *	Molasses Grass
<i>Ochna serrulata</i> *	Ochna
<i>Oplismenus sp.</i>	Basket Grass
<i>Pararchidendron pruinatum</i>	Snow Wood
<i>Paspalum wettsteinii</i> *	Broad-leaved Paspalum
<i>Passiflora edulis</i> *	Common Passionfruit
<i>Passiflora subpeltata</i>	White Passionfruit

Scientific Name	Common Name
<i>Phragmites australis</i>	Common Reed
<i>Phytolacca octandra</i> *	Inkweed
<i>Podocarpus elatus</i>	Plum-pine
<i>Pteridium esculentum</i>	Bracken
<i>Rhodomyrtus psidioides</i>	Native Guava
<i>Schinus terebinthifolia</i> *	Broad-leaved Pepper Tree
<i>Scolopia braunii</i>	Flintwood
<i>Senna pendula</i> *	Senna
<i>Setaria sp.</i> *	Setaria
<i>Solanum mauritianum</i> *	Wild Tobacco
<i>Solanum nigrum</i> *	Blackberry Nightshade
<i>Solanum seaforthianum</i> *	Climbing Nightshade
<i>Spinifex sericeus</i>	Spinifex
<i>Sporobolus fertilis</i> *	Giant Parramatta Grass
<i>Synoum glandulosum</i>	Scentless Rosewood
<i>Syzygium australe</i>	Brush Cherry
<i>Tecoma capensis</i> *	Cape Honeysuckle
<i>Themeda australis</i>	Kangaroo Grass
<i>Tithonia diversifolia</i> *	Mexican Sunflower
<i>Tradescantia fluminensis</i> *	Wandering Jew
<i>Zoysia macrantha</i>	Prickly Couch