**SHOALHAVEN CITY COUNCIL**

# Endangered Ecological Community Mapping

**Final Report**
**January 2010**

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# INTRODUCTION

### 1.1 Purpose

Alison Hunt & Associates Pty Ltd was commissioned by Shoalhaven City Council (Council) in association with the Southern Rivers Catchment Management Authority (SRCMA) and NSW Environmental Trust to revise and refine the mapping of Endangered Ecological Communities (EECs) listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) across priority lands managed by Council and selected private lands in the Local Government Area (LGA).

Preliminary ground-verification of Council's existing digital data revealed significant inaccuracies in the identification and extent of EECs due to the scale of the original mapping. As Council manages approximately 4,000ha of open space, some of which contains EECs, it is important for Council to know the extent of these communities across the LGA to ensure that current maintenance practices do not conflict with the conservation, protection and restoration requirements of those communities listed under the NSW TSC Act.

A pilot project undertaken in 2007 / 2008 (AHA Ecology 2008) tested the scale of variation between the broad-scale mapping and on-ground resource. The study found that of the 814 ha surveyed, 240ha were subsequently identified as containing an EEC. Fifty one hectares previously thought to contain EECs were found not to contain vegetation communities which could be considered EECs. Furthermore, this study demonstrated that many of the EECs under Council's care, control and management were in poor condition. Such information allows Council to focus management resources in order to improve condition and ultimately viability of the EEC. The results from the pilot project are incorporated into this report.

Specific project tasks included a review of vegetation within the study sites to determine the location and extent of EECs identified under the TSC Act (and amendments), delineation of indicative boundaries of identified EECs and to provide Council with shapefiles produced within the verified results of the exercise.

### 1.2 Study Area, Sites and Council Reserves

Sites identified as Natural Areas within the spectrum of Community Land and Crown Land under Council management and / or trust were the focus of the study. Each site was selected based on size and location in relation to other vegetated areas as well as the threats posed to the land. Operational Land suspected of having high conservation values was also included in the study.

# 2 METHODS

Mapping of the vegetation within the Council owned lands was undertaken by utilising aerial photograph interpretation, contour information and data obtained during field surveys.

### 2.1 Aerial photograph interpretation

Aerial photograph (Shoalhaven City Council 2006) interpretation (API) and contour information were used to broadly verify the previous vegetation mapping prior to field assessment. Any predicted changes to the boundaries based on the aerial photographs were marked and verified during the site surveys.

The central section of the Jaspers Brush Illawarra Escarpment Walking Track was not ground-verified and instead vegetation mapping was undertaken entirely through aerial photograph interpretation. These areas

were visually compared to rainforest areas that had been ground-verified for this project. Areas of vegetation of similar shape and colour combined with contour information were used to broadly identify different vegetation communities. Some areas have been tentatively identified as Illawarra Subtropical Rainforest. More certainty of this identification and mapping would require ground-verification.

## 2.2 Ground-verification of vegetation mapping

### 2.2.1 Non Endangered Ecological Communities

Given mapping of EECs is the primary focus of this project, no detailed surveys of areas not supporting vegetation communities other than EECs was undertaken. Instead, in those areas where vegetation was clearly not characteristic of an EEC, the vegetation community previously mapped was broadly verified by recording dominant canopy species and structural observations. A general check that the mapping approximated the extent of the community was also made.

### 2.2.2 Endangered Ecological Communities

**Vegetation Community Boundary Mapping**

The boundaries of vegetation communities were marked using a Global Positioning System (GPS) and / or recorded directly onto aerial photographs. Data was downloaded to a Geographic Information System (GIS) and the boundaries of the communities were mapped onto an aerial photograph for each of the sites. As discussed in Section 2.5, the boundaries mapped during this project do not delineate between the core and transition zones of each vegetation community and instead are approximate vegetation boundaries that incorporate transition zones.

**Vegetation Quadrats**

An inventory of flora species was undertaken in vegetation quadrats (20 m x 20 m or 10 m x 40 m in some riparian areas and coastal saltmarsh areas) within at least one representative area of each of the potential EECs at each of the sites.

Quadrats were arbitrarily placed within an area representative of the vegetation community, avoiding features not generally representative of the community in that area (e.g. edges). At each quadrat site, proforma from *Vegetation Mapping Guidelines for Reserve and Conservation Planning* (Wilson *et al.* 1997) were used to record site attributes, structural information of the vegetation community type and an inventory of species. An example of the data sheets is provided in Appendix A. Completed data sheets have been provided to Council and Department of Environment and Climate Change (DECC).

Any specimens unidentifiable in the field were retained and later identified. In addition, any specimens that were thought to be threatened species or for which identification was problematic were sent to the Janet Cosh Herbarium, University of Wollongong for further verification.

## 2.3 Verifying the Presence of Endangered Ecological Communities

Some vegetation appeared to be clearly characteristic of an EEC but on occasion further analysis was required. The data from quadrat surveys were used to obtain a list of species characteristic of each of the suspected EECs. The presence of the EEC was then verified using the field results obtained during the quadrat survey and notes made regarding the structural composition of the community, diagnostic species listed in the NSW Scientific Committee Final Determinations for each community and other key characteristics such as elevation, soil type and hydrological requirements listed in the determination for the EEC. The Final Determinations were used to create tables which listed the key diagnostic features of each

EEC. The key criteria / features were then addressed for each site in which the ecological community had the potential to be an EEC.

### 2.4 Broad Condition Assessment

The broad condition and value of each of the Council lands were assessed using criteria developed by Council for their *Condition of Bushland Mapping* across the LGA (Table 1). This was thought to be important preliminary information to guide Council in identifying sites in relatively good condition, those that have the potential to be rehabilitated and those which would require an extensive and costly works program.

**Table 1 Condition of Bushland Assessment Criteria**

| **Red – Very Poor Condition** |
|---|
| ▪ Dominated by weeds (i.e. > 80% weeds in proportion to natives);<br>▪ Degradation has been severe and / or continual;<br>▪ Natural regeneration of native species is unlikely; and<br>▪ Restoration of the site will generally require revegetation. |
| **Orange – Poor Condition** |
| ▪ Weeds dominate BUT;<br>▪ There is potential or natural regeneration of native species;<br>▪ Continued weed removal is necessary over time while native species re-establish; and<br>▪ Planting generally not necessary. |
| **Blue – Fair Condition** |
| ▪ Native species dominate, but weeds invading the site and may constitute 10 – 40% of the vegetation; and<br>▪ Weed removal on a regular basis will allow the native species to dominate the vegetation. |
| **Green – Good Condition** |
| ▪ These areas are basically weed free; and<br>▪ Occasional weeds may be found and must be removed. |
| **Source**: Shoalhaven City Council |

### 2.5 Limitations

Vegetation mapping of an area seeks to describe the distribution of the plant species in that area at that time by defining a number of vegetation units (assemblages or communities), which are relatively internally homogeneous. This generalised approach can over simplify the real situation as plants rarely occur in well-defined communities with distinct boundaries. Accordingly, vegetation units used for mapping should be

viewed as indicative of their extent. This is particularly relevant to the central sections of the Jaspers Brush - Illawarra Walking Track as these areas were not ground-verified.

This is also especially relevant for coastal floodplain EECs due to their 'mergability' sometimes as a result of very minor changes in elevation or drainage patterns, and therefore it can be difficult to determine where one community starts and the other finishes. It should be noted that for the purposes of this project, the delineation of the core and transition zones was not required by Council, and that the approximate vegetation boundary for each of the EECs is considered sufficient for the purposes of this mapping project.

# 3 MAPPING

## 3.1 Endangered Ecological Communities in the LGA

Fifteen endangered ecological communities listed under the TSC Act are known to occur within the Shoalhaven LGA but only some of these have the potential to be present in coastal areas. Those that have been previously mapped on Council owned coastal lands are listed in Table 2 along with an assessment of the potential for occurrence of other EECs in coastal parts of the LGA.

**Table 2 EECs known to occur within the Shoalhaven LGA and likely presence at sites**

| EECs Recorded within the Shoalhaven LGA | Potential to Occur |
|---|---|
| Robertson Basalt Tall Open Forest (RBTOPF) | No |
| Robertson Rainforest (RR) | No |
| Sydney Freshwater Wetlands in the Sydney Basin (SFW) | Potential |
| Illawarra Lowlands Grassy Woodlands (ILGW) | Yes previously mapped |
| Illawarra Subtropical Rainforest (ISR) | Yes previously mapped |
| Milton Ulladulla Subtropical Rainforest (MUSR) | Yes previously mapped |
| Coastal Saltmarsh of the NSW North Coast, Sydney Basin and South East Corner Bioregions (CS) | Yes previously mapped |
| Littoral Rainforest of the NSW North Coast, Sydney Basin and South East Corner Bioregions (LR) | Potential |
| Freshwater Wetlands on Coastal Floodplains NSW North Coast, Sydney Basin and South East Corner Bioregions (FW) | Potential |
| Montane Peatlands and swamps of the New England Tablelands, NSW North Coast, Sydney Basin and South East Corner Bioregions (MP&S) | No |
| River Flat Eucalypt Forest on NSW North Coast, Sydney Basin and South East Corner Bioregions (RFEF) | Potential |
| Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions (SOF) | Yes previously mapped |
| Swamp Sclerophyll Forest on Coastal Floodplains of the NSW | Yes previously mapped |

| EECs Recorded within the Shoalhaven LGA | Potential to Occur |
|---|---|
| North Coast, Sydney Basin and South East Corner Bioregions (SSF) | |
| Themeda grasslands on seacliffs and coastal headlands (TG) | Potential |
| Bangalay Sand Forest of the Sydney Basin and South East Corner Bioregions (BSF) | Yes previously mapped |

### 3.2 Council Lands

Notes on dominant species and a broad assessment of the condition of the vegetation within each of the sites are summarised in Appendix B. Vegetation communities meeting the EEC criteria listed in the Final Determinations have been mapped for each of the Council lands. These maps are included as Appendix C. The Final Determinations for each EEC identified in the study are provided in Appendix D. For some of the areas that have been noted as being modified or remnant, it is likely that the vegetation communities in these areas may have been EECs in the past. However, their present condition means that they could not be sensibly classified as such. Management of small and highly modified and degraded patches would not be economically viable and funds would be best directed to those patches that are currently partially intact and with the potential to be rehabilitated and managed in accordance with requirements for EECs.

# 4 DISCUSSION

An ecological community listed as endangered under the NSW *Threatened Species Conservation Act 1995* (TSC Act) is one which is likely to become extinct, or is in immediate danger of extinction if measures are not taken to protect, conserve and recover the community through a reduction in threats and appropriate management regimes. It is important for Council to know the extent of these communities across the LGA to ensure that current maintenance practices are in line with legislative requirements.

Initial mapping undertaken by Council and DECC of EECs across the LGA was broadly indicative of the current vegetation communities verified during these surveys. However, predictive modelling based on two dimensional analyses of landscapes using aerial photograph interpretation and topographic maps, does not necessarily provide the detail required to detect fine scale landscape changes associated with the occurrence and distribution of some EECs, nor does it easily allow the condition of vegetation to be assessed.

The distribution of EECs which are most easily predicted through consideration of basic characteristics of landscape and coarse scale investigations of topographic maps were the most accurately predicted groups. Bangalay Sand Forest was the most accurately predicted and also the most widespread of all the EECs within the coastal expanse of the LGA. Conversely, those vegetation communities which were least predictive were those that are particularly sensitive to minor changes in elevation and alteration of drainage patterns. For example, Swamp Sclerophyll Forest often merges into Swamp Oak Floodplain Forest due to changes in elevation and drainage patterns and these minor changes cannot necessarily be detected through aerial photograph interpretation or topographic maps.

In some instances it was difficult to classify remnant vegetation into EEC or non-EEC categories due to the current condition of the community. Past and present land use activities have altered some remnant vegetation to such an extent that ground and shrub layers may be completely absent or trees may only occur as scattered remnants. For example, many of the caravan parks across the LGA have been built in areas

that would originally have been vegetated with an EEC, although many of these areas are now only represented by scattered trees, and consequently could not be logically classified as an extant EEC. The use of Council resources to manage and restore such areas to viable EECs would be inappropriate and / or impossible due to current land use activities.

The condition of vegetation within Council lands varied in quality from highly degraded, or modified to exceptionally good quality and sometimes this range occurred within the one site. For example, at Shoalhaven Heads, Council lands varied in quality from highly degraded (e.g. reserve adjacent to caravan parks at the Bolong Road end of Shoalhaven Head Road was intensively weed infested) and highly modified (e.g. Vic Zealand Park) to being of exceptionally good quality (e.g. areas adjacent to Seven Mile Beach National Park on Gerroa Road). The most consistently degraded Council lands occurred at Orient Point. The majority of these reserves were modified and degraded through tracks, erosion, dumping, unauthorised fires and weed invasion.

In general, the condition of land and the quality of the vegetation communities in this study was largely dependent on the degree of isolation from urbanisation and agriculture, past and current land use activities. Areas of the Illawarra Escarpment Walking Track at Jaspers Brush, which are within Council ownership, are in general, areas of high conservation value. This is due to the lack of historical or current impacts as the inaccessible and often steep terrain could not easily be developed for agriculture or urbanisation and therefore has remained undisturbed. Similarly, Conjola Reserve and Narrawallee Reserve are both in fair to good condition with Conjola Reserve being consistently good throughout due to its relative isolation from intense urbanisation. Narrawallee Reserve is impacted by the intensive urbanisation along its eastern boundary, and although weeds have not spread extensively into the bushland there are tracks, rubbish dumping and informal camp sites especially in its northern area and all these degrade the quality of the reserve.

EECs are inherently important representatives of often rare and threatened vegetation communities. They can also provide habitat for threatened plant species, especially if they have little disturbance of the understorey. One endangered species, Tangled Bedstraw (*Galium australe*) was recorded within the Bangalay Sand Forest at Tabourie Lake. Although this species is widespread in Victoria and is also found in South Australia and Tasmania it was once regarded as presumed extinct in NSW. Populations are now known from several areas in coastal and near-coastal southern NSW, including within the Shoalhaven LGA. At Tabourie Lake this species was found on the flat behind the frontal sand dune in an area of relatively intact, high quality and diverse Bangalay Sand Forest. The extent of the population at Tabourie Lake is unknown. It is recommended that targeted surveys for this species be undertaken to more clearly define the population extent, plant densities, boundaries and threats. Management actions should then be developed and implemented to protect this important population.

# 5 Summary

Overall the condition of land and the quality of the vegetation communities was largely dependent on the degree of isolation from urbanisation and / or coast, ease of accessibility, current and past land use activities, size of the remnant and type of vegetation community and these points are summarised below.

- Vegetation within Council lands are likely to be of better quality if they are not directly in high use coastal areas, adjacent to urbanisation and in particular caravan parks;
- The size and shape of the land will also determine the degree of impact due to edge effects. Narrow and linear blocks are more highly impacted than larger patches, especially if these larger patches join larger tracts of bushland;

- The ease of accessibility is also a determinant of condition with those areas not easily accessed being in better condition. This can be related to landform (e.g. coastal cliff face), vegetation type (e.g. Swamp Sclerophyll Forest is difficult to walk through) or tracks (e.g. 4WD tracks provide ease of access);
- Land use activities which have resulted in clearing and changes to drainage patterns and ground levels will also determine the condition of remaining and adjacent vegetation communities;
- Parcels of land at the rear of houses are generally more impacted due to clearing and dumping; and
- Wetter communities, such as Swamp Oak Floodplain Forest, Swamp Sclerophyll Forest and Coastal Saltmarsh, tend to be the most impacted. These communities are susceptible to changes in drainage patterns and ground levels and they are also located in areas favoured for urbanisation and agriculture. Weeds are also most prolific in these communities.

# 6 REFERENCES


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NSW Scientific Committee 2004d **Final Determination to list River-flat eucalypt forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions**. NSW Department of Environment and Conservation, Hurstville.

NSW Scientific Committee 2004e **Final Determination to list Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions**. NSW Department of Environment and Conservation, Hurstville.

NSW Scientific Committee 2004f **Final Determination to list Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions**. NSW Department of Environment and Conservation, Hurstville.

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| DICTIONARY AND LIST OF ACRONYMS | |
|---|---|
| biodiversity | The variability among living organisms from all sources (including terrestrial, marine and other ecosystems and ecological complexes of which they are part) and includes: diversity within species and between species; and diversity of ecosystems |
| bioregion | A territory defined by a combination of biological, social and geographical criteria rather than by geopolitical considerations; generally, a system of related, interconnected ecosystems. |
| clearing | Removing vegetation, particularly trees and shrubs, from a landscape. |
| DECC | Department of Environment and Climate Change (NSW Government Department). |
| DEWHA | Department of Environment, Water, Heritage and the Arts (Commonwealth Government Department). |
| ECC | Endangered Ecological Community |
| E | East |
| ecological community | An assemblage of different species occupying a particular area. |
| ecology | The scientific study of living organisms and their relationships to one another and their environment. |
| edge effects | The changes in the environmental conditions of a patch of habitat that result from an edge or boundary in the environment. |
| endangered species | Used in reference to a species, population or ecological community, specified in the NSW *Threatened Species Conservation Act 1995*, NSW *Fisheries Management Act 1994* or Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* that is in danger of becoming extinct if threats continue, or its numbers are reduced to a critical level, or its habitat is reduced. |
| environment | The aggregate of all conditions that influence the life of a species, including natural, social, cultural, built and spatial elements. |
| EPBC Act | Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.* |
| exotic species | A species occurring in an area outside its historically known natural range as a result of intentional or accidental dispersal by human. |
| family | In the hierarchical classification of organisms, a group of species of common descent higher than the genus and lower than the order, hence a group of genera. |
| fauna | The entire animal life of a site or region. |
| feral animal | Wild exotic animal; usually refers to introduced animal species, like foxes, cats and pigs, in Australia. |

| DICTIONARY AND LIST OF ACRONYMS | |
|---|---|
| fire regime | The pattern of fires at a location; includes the frequency, intensity and seasonality of the fires |
| flora | The entire plant life of a site or region. |
| Geographic Information System (GIS) | A package of computer programs specifically designed to deal with data that are spatially related; a set of tools for collecting, storing, retrieving, manipulating, analysing and displaying mapped data from the real world. |
| habitat | A specific type of place within an ecosystem occupied by an organism, population or community that contains both living and non-living components with specific biological, chemical and physical characteristics including life requirements (e.g. food, shelter and water). |
| hectare (ha) | 10,000 square metres |
| LGA | Local Government Area |
| N | North |
| native (indigenous species) | Species that are native to (i.e. occur naturally) in a region. |
| native vegetation | Any local indigenous plant community containing throughout its growth the complement of native species and habitats normally associated with that vegetation type or having the potential to develop these characteristics. It includes vegetation with these characteristics that has been regenerated with human assistance following disturbance. It excludes plantations and vegetation that has been established for commercial purposes. |
| noxious | Undesirable, troublesome, difficult to control or eradicate. |
| population | A group of individuals of the same species, forming a breeding unit and sharing a habitat. |
| regrowth | Native vegetation containing a substantial proportion of individuals that are in the younger growth phase and are actively growing in height and diameter. |
| remnant vegetation | A small fragmented portion of the former dominant vegetation which once covered the area before being cleared. |
| riparian | Situated on or within a riverbank. |
| run-off | The portion of precipitation not immediately absorbed into or detained upon the soil and which thus becomes a surface flow. |
| S | South |
| saltmarsh | Saltwater wetland occupied mainly by herbs and dwarf shrubs, characteristically able to tolerate extremes of environmental conditions, notably waterlogging and salinity. |

| DICTIONARY AND LIST OF ACRONYMS | |
|---|---|
| species | A group of organisms that is biologically capable of breeding and producing fertile offspring with each other but not with members of other species. |
| species diversity | A measure of the number of individuals and their relative abundance in an area. |
| terrestrial | Belonging to or living on the land. |
| TSC Act | NSW *Threatened Species Conservation Act 1995*. |
| threatened | Refers to a species, population or ecological community specified in the *Threatened Species Conservation Act 1995, Fisheries Management Act 1994* or *Environment Protection and Biodiversity Conservation Act 1999* that is either endangered, vulnerable, or presumed extinct. |
| threatening process | Processes such as habitat disturbance, degradation, or predation that threaten the survival, abundance or evolutionary development of a species, population or ecological community. |
| vulnerable species | Refers to a species, population or ecological community specified in the Threatened *Species Conservation Act 1995, Fisheries Management Act 1994* or *Environment Protection and Biodiversity Conservation Act 1999* that is likely to become endangered unless the circumstances and factors threatening its survival or evolutionary development cease to operate. |
| W | West |
| weed | Any plant that is not cultivated deliberately by humans but that grows entirely or predominantly in situations disturbed by humans. |
| wetland | an area of low-lying land, submerged or inundated periodically by fresh or saline water |
| woodland | An area with scattered trees where the portion of the land surface covered by the crowns is more than 30% (open woodland) but less than 60% (forest). |

# APPENDIX A

# DATASHEET PROFORMAS

# SITE ATTRIBUTE 1: VEGETATION SURVEY PROFORMA

Site Code

Day Site no

Date

RECORDERS

**LOCALION DESCRIPTION:**

**MAP CODE:** **MAP NAME:**

**GEOREFERENCE** (at centre of plot)

| | ZONE | EASTING | NORTHING |
|---|---|---|---|
| *From* GPS | | | |
| *From* 1:25,000 topo. map | | | |

**Quadrat size** m X m

**Map datum** used AMD (AMG) GDA GPS EPE No. of satellites

**Vegetation cover scale** used 1 to

**PRE-SURVEY STRATIFICATION** (if any):

**LAND TENURE**

**PHYSICAL DETAILS**

**Altitude** (m) **Slope** ° **Aspect** °

**Topographic Position** Morphoterrain Element (within 20m) Pattern (within 300m)

Horizon elevation (azimuth) Horizon Visibility (G-Good A- Average P-Poor)

| ± | N | ± | NE | ± | E | ± | SE | ± | S | ± | SW | ± | W | ± | NW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |

**Ground cover**

% Outcropping

% Surface rock

% bare ground

% litter

**Geology:** Mapped Field evidence

**Erosion:** Geomorph. Action Geomorph. Agent Runoff

**DISTURBANCE HISTORY**

| | Time since last | Accuracy | Severity | Basis of assessment |
|---|---|---|---|---|
| **Fire** | | | | |
| **Logging** | | | | |
| **Clearing** | | | | |
| **Grazing** | | | | |
| **Weeds** | | | | |
| **Other** | | | | |

**SOIL**

Type: Depth:

Site Condition: (G-Good A- Average P-Poor) (Deep Shallow Skeletal)

Distance to nearest water course (m)

Name of watercourse

Notes (incl. brief descdription of veg type):

Camera/Film No

Photo No.

NPWS

FLORISTIC

Central Directorate
Po Box 1967
Hurstville 2220

| Cover abundance scale 1-7 | | |
|---|---|---|
| 1 | <5% - Rare or few individuals | 3 or less Individuals |
| 2 | <5% - uncommon | more than 3 - sparsely scattered or localised |
| 3 | <5% - common | consistent throughout plot |
| 4a | <5% very abundant | many individuals throughout plot |
| 4b | 5% - 25% | |
| 5 | 25% - 50% | |
| 6 | 50% - 75% | |
| 7 | 75% - 100% | |

Page ..... of .....

Site

Dat

Quadrat 2 m 2 m i m m

| Sample | No. | C/a | Species | Id'd |
|---|---|---|---|---|
| | 1 | | | |
| | 2 | | | |
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| | 19 | | | |
| | 20 | | | |

| Sample | No. | C/a | Species | Id'd |
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| | 40 | | | |

u:\share\cra\veg_map\flor_sys.ppt; *adapted from file of the same name developed by CRA Unit, Northern*

# APPENDIX B

# TABLES

Basin View
Bawley Point
Bendalong, Manyana and Cunjurong Point
Berry
Bomaderry and North Nowra
Burrill Lake
Callala
Cudmirrah and Berrara
Culburra
Currarong
Hyams Beach
Jaspers Brush
Kioloa
Lake Tabourie
Mollymook
Narrawallee and Milton
Orient Point
Sanctuary Point
Sanctuary Point SE, Bream Beach and Wrights Beach
Shoalhaven Heads
St Georges Basin
Sussex Inlet, Swan Haven
Ulladulla
Vincentia North
Vincentia South
Woollamia, Myola and Huskisson
Yatte Yattah and Conjola Park

| BASIN VIEW | | | | |
|---|---|---|---|---|
| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| 1 | Parkland | This large parkland / picnic area / boat ramp area has been cleared of understorey and grassed. Large old specimens of Spotted Gum and Blackbutt remain. | **Fair condition**. Although this area has been substantially impacted through clearing and modification there are few serious weed species or erosion. The trees provide habitat for arboreal fauna and provide a link to the west along a drainage line. | Senescence of the old and large trees. A replanting program to provide replacement trees over time should be undertaken. |
| 2a | **Swamp Oak Floodplain Forest** | This EEC is degraded due to its proximity to housing. It follows a drainage line upstream until it merges with Bangalay Sand Forest to the west. Swamp Oak dominates the canopy with Buffalo Grass in the understorey. Some native understorey species occur sporadically and these are Lomandra, Tall Saw-sedge and Common Reed. | **Poor condition**. Degraded through weed invasion and clearing. Provides a buffer to St Georges Basin. | Lack of management. Further human induced impacts. |
| 2b | **Bangalay Sand Forest - EEC** | This remnant EEC is badly degraded. Where it adjoins houses, areas have been cleared and grassed and only scattered trees remain. Much of the area is smothered in Common Silkpod. | **Poor condition**. Degraded through, nutrient enrichment, weed invasion and clearing. Provides a buffer to St Georges Basin from development. | Lack of management. Edge effects, high nutrient run-off. May benefit from a low intensity fire. |
| 3a | **Swamp Oak Floodplain Forest** | The remnant of this EEC fringes St Georges Basins. Almost completely comprised of Swamp Oak with either no understorey or Buffalo Grass. | **Poor condition**. Degraded through weed invasion and clearing. Provides a buffer to St Georges Basin. | Lack of management. Further human induced impacts. |
| 3b | Spotted Gum Open Woodland | This community occurs behind the Swamp Oak Floodplain Forest. Spotted Gum dominates but Blackbutt is also present and Turpentine occurs occasionally. | **Fair condition**. This open woodland retains some understorey and appears to be relatively intact. Provides an important coastal vegetated link. | Weed invasion and trampling. |
| 4 | Turpentine – Red Bloodwood Woodland | This small reserve between The Wool Road and Winn Avenue grades from Blackbutt into Turpentine – Red Bloodwood woodland. Some new understorey plantings have been undertaken. | **Poor condition**. This area has been modified during the construction of surrounding roads. It contains no understorey. Trees would provide some habitat for arboreal fauna. | Weed invasion. |
| 5 | BMX Park | This area has been cleared and is used as a BMX park. Some Blackbutt trees remain. | **Very poor condition**. Completely modified. Trees would provide some habitat for arboreal fauna. | Continued human induced impacts could impact on the health of the trees. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
|---|---|---|---|---|
| 6 | Grey Ironbark – Turpentine Open Woodland | Tallyan Point reserve is a dry open sclerophyll forest dominated by Grey Ironbark and grading into Turpentine. The condition of the understorey varies from open Lomandra dominated to a denser more intact community. A narrow strip of Swamp Oak, Angophora, Blackbutt strip of vegetation remains along the south-western section of this reserve. | **Fair condition**. Impacts include some clearing, dumping, track formation and weed invasion along the edges. Provides an important vegetated link along the coastline and is a substantially intact patch of woodland in a cleared landscape. | Impacts from neighbouring development and overuse. |
| 7 | Scribbly Gum – Black She-oak Woodland | This reserve is a dry sclerophyll open woodland dominated by Scribbly Gums, Black She-oak with scattered occurrences of Red Bloodwood and Turpentine. In sections, the understorey is moderately intact and includes Mountain Devil, Old-man Banksia, Needlebush. Radiata Pine also occurs in the south of the site. | **Poor condition - Fair condition**. Condition varies depending on distance from edges. It is fenced and some rehabilitation works have / are being undertaken. Tracks, trampling and under scrubbing are the major impacts. Vegetation community is relatively intact and provides a link to areas to the north. | Human induced impacts from neighbouring development. |
| 8a | **Swamp Sclerophyll Forest - EEC** | This EEC follows an unnamed creek that drains into Pats Bay. It is dominated by Tall Saw-sedge, Bangalay, Blackbutt and Turpentine on the drier margins. Callicoma, Common Bracken, Common Maidenhair and Old Man's Beard are also common. | **Poor condition**. There are tracks, dumping, changes to drainage and small fire areas. Provides an important vegetated link along the drainage line from the north-west to St Georges Basin. | Lack of management and ongoing human impacts. |
| 8b | Blackbutt-Turpentine-Bloodwood Tall Forest | This area has a dense understorey of Prickly Beard-heath, Hairpin Banksia, Coffee Bush, Slender Rice Flower. | **Poor condition**. There are tracks, dumping, changes to drainage, small fire areas and in particular edge effects. Provides an important vegetated link along the drainage line from the north-west to St Georges Basin. | Lack of management and ongoing human impacts. |
| 9a / 10a | **Swamp Sclerophyll Forest - EEC** | This EEC follows an unnamed creek that drains into Pats Bay and is a part of the EEC described in 8a. Dominated by Tall Saw-sedge, Bangalay, Blackbutt and Turpentine on the drier margins. Callicoma, Common Bracken, Common Maidenhair and Old Man's Beard area also common. | **Poor condition**. There are tracks, dumping, changes to drainage and edge effects particularly along the road verge. Provides an important vegetated link along the drainage line from the north-west to St Georges Basin. | Lack of management, urbanisation and ongoing human impacts. |
| 9b / 10b | Blackbutt –Turpentine - Bloodwood Tall Forest | This area has a dense understorey of Prickly Beard-heath, Hairpin Banksia, Coffee Bush, Slender Rice Flower. | **Fair condition**. There are tracks, dumping, changes to drainage and edge effects. Provides an important vegetated link along the drainage line from the north-west to St Georges Basin. | Lack of management and ongoing human impacts. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
|---|---|---|---|---|
| 11 / 12 / 13 / 14 | Modified wet sclerophyll forest | These highly disturbed areas located to the south of large lot urban development would have once been representative of Swamp Sclerophyll Forest. | **Poor condition**. Degraded through clearing and urbanisation. Tracks, trampling, weed invasion and dumping. Provides a buffer to more intact areas to the south and tree hollows would provide habitat for arboreal fauna. | Lack of management, urbanisation and ongoing human impacts. |
| 15 | **Swamp Sclerophyll Forest - EEC** | This EEC is protected from the majority of the effects of urbanisation. Dominated by Swamp Mahogany and a dense cover of Tall Saw-sedge. | **Fair condition**. Its relative isolation has protected this area from the majority of impacts associated with urbanisation. A large area of intact EEC. | In the long term further urbanisation could impact on this EEC. |
| 16a | **Swamp Sclerophyll Forest - EEC** | Dominated by Swamp Mahogany and Blackbutt. Callicoma, Common Bracken, Common Maidenhair and Old Man's Beard are also common. | **Fair condition**. There are tracks, dumping, changes to drainage, small fire areas and edge effects particularly along the urban edge. Provides an important vegetated link along the drainage line from the north-west to St Georges Basin. | Lack of management, urbanisation and ongoing human impacts. |
| 16b | Scribbly Gum - Grey Ironbark Woodland | This area occurs along the margins of urbanisation and has been degraded through the proximity of houses. Scribbly Gums have tree hollows. | **Poor condition**. Degraded through clearing and urbanisation. Tracks, trampling, weed invasion and dumping. Provides a buffer to more intact areas to the south and tree hollows would provide habitat for arboreal fauna. | Lack of management, urbanisation and ongoing impacts. |
| 17a | **Swamp Sclerophyll Forest - EEC** | Dominated by Tall Saw-sedge, Swamp Mahogany and Blackbutt. Callicoma, Common Bracken, Common Maidenhair and Old Man's Beard are also common. | **Fair condition**. There are tracks, dumping, changes to drainage, small fire areas and edge effects particularly along the urban edge. Provides an important vegetated link along the drainage line from the north-west to St Georges Basin. | Lack of management, urbanisation and ongoing impacts. |
| 17b | Scribbly Gum-Grey Ironbark Woodland | This area occurs along the margins of urbanisation and has been degraded through the proximity of houses. Scribbly Gums have tree hollows. Southern section grades into much modified Swamp Oak Forest / Coastal Saltmarsh / Swamp Sclerophyll Forest. | **Very poor condition**. Degraded through clearing and urbanisation. Tracks, trampling, weed invasion and dumping. Provides a buffer to more intact areas to the south and tree hollows would provide habitat for arboreal fauna. | Lack of management, urbanisation and ongoing impacts. |
| 18 | Scribbly Gum – Blackbutt – Bangalay Woodland | Eucalypts dominate throughout although the occasional Swamp Oak occurs. | **Fair condition**. The effects of urbanisation along the southern boundary include clearing and weed invasion. Provides a buffer to the EEC to the north. | Ongoing impacts from urbanisation. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
|---|---|---|---|---|
| 19a / 19b / 19c 19d | Modified - Coastal Saltmarsh, Swamp Oak Forest, Swamp Sclerophyll Forest - EECs | This highly disturbed area shows components of vegetation communities including, Swamp Oak Forest, Coastal Saltmarsh and Mangrove forest. A marina has been constructed on the northern margin. | **Very poor condition**. Completely modified through changes in drainage, clearing, urbanisation and marina construction. Provides a buffer to more intact areas to the south. | Ongoing impacts from the substantial changes associated with urbanisation and the marina. |
| 20a | Cleared | This area has been cleared of vegetation and it is likely that the ground levels have been altered. | **Very poor condition**. Completely modified. No particular ecological value. | None. |
| 20b | **Swamp Oak Floodplain Forest - EEC** | Swamp Oak forms a near monoculture. | **Poor condition**. The area has been modified and some clearing has occurred. Provides a buffer to Pats Bay. | Further clearing, tracks and dumping. |
| 20c | **Coastal Saltmarsh - EEC** | The large scald area supports a scattered and degraded saltmarsh community. | **Very poor condition**. This area of Saltmarsh may have been formed after clearing and modification of drainage patterns. Tracks and trampling are widespread. | Lack of management and further trampling. |
| 21a / b | **Coastal Saltmarsh - EEC** | Both of these patches occur where creeks flow into the bay. Creeping Brookweed and *Sarcocornia quinqueflora* occur throughout. | **Fair condition to Good condition**. The western occurrence of Saltmarsh is more impacted due to it accessibility by people visiting the nearby sports ground and parkland. | Trampling and track formation. |
| 21c | **Swamp Oak Floodplain Forest - EEC** | This EEC is a monoculture of Swamp Oak with very little understorey. It fringes the eastern edge of Pelican Point. | **Good condition**. This area shows some signs of impacts by visitors to the reserve. However, there are few signs of weeds or changes to the drainage patterns. Provides an intact buffer to Home Bay. | Impacts from visitors to the reserve. |
| 21d | **Swamp Sclerophyll Forest - EEC** | This EEC sits in a shallow gully behind the Swamp Oak Floodplain Forest. It is densely vegetated with Large-leaf Hop-bush, Common Silkpod, Lomandra. | **Poor condition**. The edges of this EEC are impacted by tracks, weeds and rubbish dumping. Provides a buffer to Home Bay. | Further impacts from visitors to the reserve. |
| 21e | **Swamp Sclerophyll Forest - EEC** | This occurrence of Swamp Sclerophyll Forest follows the unnamed creek. Away from the creek line it becomes vegetated by Turpentine and Blackbutt. | **Fair condition**. Has been impacted by road building and changes to drainage patterns. Provides a vegetated buffer to the creek. | Weed invasion and poor water quality. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
|---|---|---|---|---|
| 21f | Scribbly Gum-Grey Ironbark Woodland | The majority of this reserve is a dry sclerophyll woodland dominated by Scribbly Gum, Grey Ironbark with occurrences of Turpentine and Red Bloodwood. Many of the Scribbly Gum have tree hollows. The understorey is intact in sections with Cherry Ballart, Large-leaf Hop-bush and Prickly Beard-heath common throughout. | **Fair condition**. Tracks, weeds on the edges, trampling and rubbish dumping are all impacting this reserve. This is a large patch of relatively intact vegetation in a fragmented landscape. | Further impacts from visitors to the reserve. |
| 22a | **Swamp Sclerophyll Forest - EEC** | This occurrence of Swamp Sclerophyll Forest follows the unnamed creek and is a continuation of Swamp Sclerophyll Forest in 21e. | **Fair condition**. Has been impacted by road building and changes to drainage patterns. Provides a vegetated buffer to the creek. | Weed invasion and poor water quality. |
| 22b | Cleared | This area has been cleared. It houses a pump station. | **Poor condition**. It has been cleared and grassed with introduced species. Weeds occur along the boundary with the Swamp Sclerophyll Forest. | Weed invasion. |

| BAWLEY POINT | | | | |
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| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| 1a | **Swamp Oak Floodplain Forest - EEC** | A Swamp Oak community with a weedy understorey. Buffalo Grass dominates in sections and Sea Rocket is also common. | **Fair condition.** Weed invasion and tracks around the edges. Provides a buffer to Willinga Lake entrance. | Ongoing weed invasion. |
| 1b | **Bangalay Sand Forest - EEC** | Swamp Oak grades into a Bangalay dominated community. Also occurring are Common Silkpod, Sweet Pittosporum, Lomandra, Coast Banksia, Blady Grass and Common Bracken. Garden plants are also scattered throughout. | **Fair condition.** Some tracks, dumping and weed invasion. Provides an important vegetated link to Willinga Lake entrance. | Ongoing impacts of urbanisation. |
| 1c | Spotted Gum tall forest | This diverse community supported Bordered Panic, Bonnet Orchid, Burrawang, *Glycine tabacina* , Climbing Guinea Flower, Prickly Beard-heath, Silver Banksia. Garden plants become more common in the south and south-east. | **Fair condition.** Some tracks, dumping and weed invasion. Provides an important vegetated link to Willinga Lake entrance. | Ongoing impacts of urbanisation. |
| 2a | Modified/**Bangalay Sand Forest - EEC** | Willinga Point car parking area supports remnant and stunted Bangalay Sand Forest. | **Poor condition.** Impacted from clearing and high visitor usage. Provides an important vegetated link and stabilises the headland. | Ongoing impacts of urbanisation and high visitor usage. |
| 2b | Spotted Gum tall forest | This Spotted Gum community appears to have been partially cleared in the understorey. Remaining are Coastal Wattle, Sweet Pittosporum and Asparagus Fern. | **Fair condition.** Edge effects and the pressures of urbanisation and high visitor usage. Away from the edges the condition improves. Provides an important vegetated link around Willinga Point. | Ongoing impacts of urbanisation and high visitor usage. |
| 3a | **Bangalay Sand Forest - EEC** | Bangalay dominates in this area with Spotted Gum still present in low numbers throughout. | **Fair condition.** Predominately poor condition due to edge effects and the pressures of urbanisation and high visitor usage. Away from the edges the condition improves. Provides an important vegetated link around Willinga Point. | Ongoing impacts of urbanisation and high visitor usage. |
| 3b | Spotted Gum tall forest | Spotted Gum community grades back in this area of slightly higher elevation. | **Poor condition.** This is a high use area that is impacted by visitor usage. Tracks, trampling and rubbish are common. Provides an important vegetated link around Willinga Point. | High usage area. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| 4 | Cleared / Coastal scrub | This is a cleared picnic area. May once of been representative of Bangalay Sand Forest. Weeds dominate throughout. | **Very poor condition.** Predominately poor condition due to edge effects and the pressures of urbanisation and high visitor usage. Provides an important coastal link. | Ongoing impacts of urbanisation and high visitor usage. |
| 5 | Cleared / Coastal scrub | Badly degraded area on Bawley Point. | **Very poor condition.** Predominately poor condition due to edge effects and the pressures of urbanisation and high visitor usage. Provides an important coastal link. | Ongoing impacts of urbanisation and high visitor usage. |
| 6a / 6d | **Swamp Oak Floodplain Forest - EEC** | Swamp Oak dominates the western edge and southern corner. Both patches are badly degraded. Western patch supports Tall Saw-sedge, Kidney Weed, Common Silkpod. Swamp Oak has been cleared throughout. The southern patch occurs in a drainage channel which is degraded through modification and garden plants. | **Very poor condition.** Much of this area has been modified through clearing, weed invasion and changes to drainage patterns. Provides a buffer to Cormorant Beach and stepping stone habitat with areas to the west. | Ongoing impacts of urbanisation and lack of management. |
| 6b | **Swamp Sclerophyll Forest - EEC** | Bangalay are scattered throughout this dense and badly degraded community. Tall Saw-sedge is also common. It grades into Bangalay Sand Forest to the east. | **Very poor condition.** Much of this area has been modified through clearing, weed invasion and changes to drainage patterns. Provides a buffer to Cormorant Beach and stepping stone habitat with areas to the west. | Ongoing impacts of urbanisation and lack of management. |
| 6c | **Bangalay Sand Forest - EEC** | This Bangalay Sand Forest has an open understorey and shows signs of clearing and changes to drainage patters. | **Very poor condition.** Much of this area has been modified through clearing, weed invasion and changes to drainage patterns. Provides a buffer to Cormorant Beach and stepping stone habitat with areas to the west. | Ongoing impacts of urbanisation and lack of management. |
| 6e | Modified | This central section contains dried ponds and the majority of vegetation within these ponds appears dead. Saltwater Couch and Swamp Paperbark occur on the edges | **Very poor condition.** Much of this area has been modified through clearing, weed invasion and changes to drainage patterns. Provides stepping stone habitat with areas to the west. | Ongoing impacts of urbanisation and lack of management. |
| 7-Aug | Cleared / Coastal scrub | Areas throughout are maintained as lawn. Coastal Wattle is dominant in this area. | **Very poor condition.** Predominately poor condition due to edge effects and the pressures of urbanisation and high visitor usage. Rabbits are also present. Provides a buffer to Cormorant and Gannet Beach from urbanisation. | Ongoing impacts of urbanisation and high visitor usage. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| 9a | **Bangalay Sand Forest - EEC** | A narrow strip of Bangalay occurs behind the frontal dune and Malibu Drive. | **Poor condition.** This is a narrow strip affected by edge effects and tracks. Provides a buffer to Gannet Beach. | Ongoing impacts of urbanisation and high visitor usage. |
| 9b | Cleared / Coastal scrub | Patches of coastal vegetation remains although it is likely that substantial clearing has occurred. | **Poor condition.** This is a narrow strip affected by edge effects and tracks. Provides a buffer to Gannet Beach. | Ongoing impacts of urbanisation and high visitor usage. |
| 9c | **Swamp Oak Floodplain Forest - EEC** | This narrow and badly degraded EEC is dominated by Swamp Oak with a Kikuyu understorey | **Very poor condition**. This area is weed infested and drainage patterns have been changed. Provides habitat for birds and amphibians. | Lack of management of this site as an EEC. |
| 10a | **Coastal Saltmarsh - EEC** | Dominated by *Sarcocornia quinqueflora* , Creeping Brookweed and the introduced *Atriplex prostrate* . | **Fair condition.** This community is reasonably well protected although a number of tracks through the saltmarsh are evident where development is adjacent. Provides a buffer to Willinga Lake. | Weed invasion. With current levels of adjacent development threats are minimal. |
| 10b | **Swamp Oak Floodplain Forest - EEC** | This community is present along areas where drainage lines enter the lake. | **Fair condition.** This community is reasonably well protected although a number of tracks through the EEC are evident where development is adjacent. Areas around the south-west drainage line have recently been burnt. Provides a buffer to Willinga Lake. | Weed invasion. With current levels of adjacent development threats are minimal. |
| 10c / 10d | Turpentine - Spotted Gum Tall Forest | Black She-oak is co-dominant in this community. Blackbutt and Thin-leaved Stringybark also occur in patches. | **Fair condition.** This community is reasonably well protected from development. Areas around the south-west drainage line have recently been burnt. Provides a buffer to Willinga Lake. | Weed invasion. With current levels of adjacent development threats are minimal. |

| BENDALONG, MANYANA & CUNJURONG POINT | | | | |
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| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| MA-76,78 | **Bangalay Sand Forest - EEC** | Pockets of Bangalay & Swamp Oak in a thin strip along the edge of Washerwoman's & Boat Harbour beaches & towards the E end of the headland caravan park. Lantana infested with native mesic species present. | **Poor condition**. Thin remnant strip but does provide some fauna habitat and connectivity. | Erosion and weed invasion. |
| MA-77 | Coastal Scrub | Occurs in the more exposed areas of the headland in ront of Bangalay Sand Forest. Some areas intact but much of it is weed-infested with Arum Lily and Lantana. Native speciies include Coast Banksia, Boastal Rosemary, Lilly Pillyl and Poa sp. | **Very poor condition**. Weedy and formation of tracks and erosion. | Further formation of tracks and erosion. |
| MA-74 | **Bangalay Sand Forest - EEC** | Occurs between a lower lying area of Swamp Sclerophyll forest and Coastal Scrub to the E. Parts of it have recently been cleared for access. It is dominated by Bangalay and Coast Banksia with the edges of the commuity infested with Lantana. | **Poor condition**. Some areas are weed-infested and recent clearing. Area to the N of the Swamp Sclerophyll Forest is more intact. | Urbanisation. |
| MA-75 | **Swamp Sclerophyll Forest - EEC** | Bangalay dominates the canopy with Red Cedar, Common Bracken, Baumea Juncea, wiry Panic, Gahnia throughout the understorey. | **Fair condition**. Are reasonably intact with some weed invasion along the margins. | Weed invasion. |
| MA-73 | Coastal Scrub | Occurs on the seaward side fo the frontal dune dominated by Coastal Rosemary, Coastal Wattle and Lomandra. | **Fair condition.** Appears to be intact although there are some areas of erosion. | Weed invasion and erosion. |
| MA-71 | Modified/Coastal Scrub | Ranging from grassy area with Norfolk Island Pines and Lomandra to coastal scrub dominated by Coastal Rosemary, Coastal Wattle and Lomandra. | **Poor condition**. Provides connectivity along the coastline and fauna habitat. | Urbanisation. |
| MA-70 | **Bangalay Sand Forest - EEC** | BSF with patches of very dense understorey compared to other BSF in the area. Dominant species include Coast Banksia, Bracken and Lomandra. Area grades in Swamp Oak and Coastal Teatree along the creekline and coastal scrub along the frontal dune. | **Poor condition**. Weedy and partially cleared in sections. Provides connectivity along the coastline and fauna habitat. | Weed invasion and clearing. |
| MA-67 | **Bangalay Sand Forest - EEC** | Intact vegetation community extends along much of the coastal vegetated area of Lake Conjola Inlet. The canopy is dominated by Black She-oak, Coast Banksia and Blueberry Ash with Bangalay subdominant. | **Good condition**. Intact and diverse in sections due to little clearing or development directly adjacent to the area. A buffer is provided by large areas of vegetation to the N. | None. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
|---|---|---|---|---|
| MA-66a | **Swamp Sclerophyll Forest - EEC** | This vegetation community follows a W-E drainage line to the N of the Bangalay Sand Forest | **Good condition**. Intact and diverse in sections due to little clearing or development directly adjacent to the area. A buffer is provided by large areas of vegetation to the N. | None. |
| MA-66b | **Swamp Oak Forest - EEC** | Dominated by Swamp Oak along a small unnamed creek which grades into Coastal Saltmarsh and Bangalay Sand Forest on either side. Other species include, Baumea juncea, Coast Banksia, Gahnia and Snake Vine. | **Good condition**. Intact and diverse in sections due to little clearing or development directly adjacent to the area. A buffer is provided by large areas of vegetation to the N. | None. |
| MA-72 | **Littoral Rainforest - EEC** | A small pocket of Littoral Rainforest. Limited species diversity and degraded through adjacent urbanisation. Dominated Lilly Pilly with Bangalay scattered throughout. | **Poor condition**. May be late successional as there are few understorey species. Weed invasion is also prevalent and bush regeneration is currently being undertaken in areas adjacent. | Weed invasion. |
| MA-68 | **Littoral Rainforest - EEC** | Small patch of Littoral Rainforest. Relatively intact and diverse patch is dominated by Scentless Rosewood, Lawywer Vine, Snake Vine, Ivy-leaved Violet, Oplismenus aemulus. | **Good condition.** A buffer is provided by large areas of vegetation to the N so there are few impacts of urbanisation. | None. |
| MA-65 | **Coastal Saltmarsh - EEC** | This vegetation borders Bangalay Sand Forest to the N and grades into sand flats and river estuary associated with the Lake Conjola Inlet. It reaches 10 m to 15 m in width and is almost completely dominated by Sea Rush. | **Good condition.** Intact and diverse in sections due to little clearing or development directly adjacent to the area. A buffer is provided by large areas of vegetation to the N. | None. |
| Ma-63,64 | Turpentine - Mixed Eucalypt Forest | The area N of the coastal vegetation has Sydney Peppermint-Turpentine-Blackbutt-Stringybark-Red Bloodwood forest on red gravely soils. Grades into Blackbutt and Sydney Peppermint on sandier soils in the S with a patch of Scribbly Gum to the E. | **Good condition.** Intact with few apparent impacts as there is little clearing and development directly adjacent to the area. This vegetation provides a valuable buffer to the EECs to the S. | None currently. Potential for weed invasion from powerline clearing. |

| BERRY | | | | |
|---|---|---|---|---|
| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| 1 | Blackbutt – Turpentine forest | Dominated with regrowth Blackbutt with Turpentine as a subdominant. Black She-oak, Blue Gum and Cheese Tree are also scattered throughout. Understorey is dominated by Lantana across much of the site. Native understorey species include Red-fruit Saw-sedge, Blue Flax-lily, Common Silkpod, Bordered Panic. Grades into wetter areas to the east. | **Poor condition.** Harley Hill Road Cemetery is infested with Lantana although sections have been cleared especially around the old graves. Provides a stepping-stone link with areas to the north-east and south-west. | Weed infestation and re-infestation due to non-consistent follow-up of primary weed control. Unformed tracks and trampling degrades vegetation and potentially introduces weeds. |
| 2a | **Swamp Sclerophyll Forest - EEC** | A small section of Swamp Sclerophyll Forest occurs in the north-east corner of the Toolijooa Lawn Cemetery around where two drainage lines merge. It is dominated by Swamp Mahogany and *Melaleuca* spp. with Cheese Tree, Red-fruit Saw-sedge, Common Maidenhair, Gristle fern, Common Bracken also common. | **Poor condition.** In general this section of the site has relatively fewer weeds than in adjacent areas perhaps due to its relative isolation from edge effects of those sections closer to Beach Road. Provides a stepping stone link to Moeyan Hill and Borrowdale Close Reserve | Weed infestation and re-infestation due to non-consistent follow-up of primary weed control. Unformed tracks and trampling degrades vegetation and potentially introduces weeds. |
| 2b | Blackbutt – Turpentine forest | Blackbutts and Turpentine dominate throughout although in general the site shows wetter influences than the Harley Hill Road Cemetery to the east with Cabbage-tree Palm and Black She-oak and Blue Gum scattered throughout. | **Poor condition.** In general the site is infested with Lantana especially those sections closest to Beach Road. Provides a stepping-stone link with areas to the north-east and south-west. | Weed infestation and re-infestation due to non-consistent follow-up of primary weed control. Unformed tracks and trampling degrades vegetation and potentially introduces weeds. |
| 3 | Blue Gum – Turpentine forest | Tall forest of Blue Gum and Turpentine with Blackbutt and Grey Ironbark as subdominants. The understorey varies from drier grassier elements upslope such as Kangaroo Grass to Blady Grass, *Carex* sp. with Cheese Tree, Cabbage Tree Palm and Red-fruit Saw-sedge scattered throughout. | **Fair condition.** A powerline easement and roads traverse the block although the vegetated areas are largely free of weeds except along the boundaries. Moderate infestation of Lantana scattered throughout. Provides a stepping-stone link with areas to the north-east and south-west. | Weed invasion from adjacent agricultural lands and easements. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
|---|---|---|---|---|
| 4 | Early successional wet sclerophyll forest / rainforest | Past disturbances include logging, clearing, farming and severe Lantana invasion. Removal of massive infestations and ongoing control has resulted in the natural regeneration of vegetation indicating the substantial resilience of the soil seed bank. Some replanting in key locations has assisted with infilling and erosion control issues. | **Good condition.** Regeneration of the native community largely from the soil seed bank is successfully occurring. Weed control and erosion control are ongoing. Provides a stepping stone link between Moeyan Hill and Coomonderry Swamp. With ongoing restoration and regeneration it may become a weed free example of rainforest. | None with current land ownership. |
| 5a | Mixture of native forests | Borrowdale Close Reserve (185 ha) is a mixture of dry to wet sclerophyll open forest types which varies with slope, soil and elevation. A mixture of Eucalypts (e.g. Bangalay, Blackbutt, Forest Red Gum, Blue Gum) dominates the canopy whilst a wide range of subcanopy and understorey species occur throughout. | **Fair condition.** Weed invasion is an ongoing problem although weed removal continues throughout. A large area of remnant vegetation with examples of a number of vegetation communities in an otherwise cleared landscape. Provides refuge for flora and fauna species. | Weeds including current infestations and the risk of new invasions from urbanisation and agriculture. Re-infestation due to non-consistent follow-up of primary weed control. Unformed tracks and trampling degrades vegetation and potentially introduces weeds. |
| 5b | **Illawarra Subtropical Rainforest - EEC** | Two linear patches of Illawarra Subtropical Rainforest occur at the base of sheltered north-western and northern facing gullies. The canopy is dominated by Lilly Pilly, Red Cedar and Sandpaper Fig with Sassafras common in the midlayer. Prickly Rasp Fern, Rainbow Fern and Sickle Fern dominate the groundlayer. | **Fair condition.** The dense canopy layer reduces the opportunity for many weed species to establish although Lantana and Small Leaved Privet are present. Provides secure tenure for an EEC which has largely been cleared from the area. | Weeds - current and new infestation from upstream. Nutrient enrichment from upstream agriculture. |
| 6 | Cleared / Blackbutt – Blue Gum Forest | Whilst the majority of this property is cleared the northern areas are still vegetated with Blackbutt – Blue Gum Forest. Away from the edges weed invasion is limited. | **Fair condition.** Weed invasion is an ongoing problem although ongoing Lantana removal and control continues. Provides a link with vegetation to the north. | Weed invasion and current Lantana infestation re-establishing. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| 7 | Cleared / Blackbutt – Turpentine Forest | Well established Blackbutt – Turpentine Forest grades down to wetter influences along the creekline where Prickly-leaved Tea Tree, Hairy Clerodendrum, Common Silkpod, Flame Tree and Two-veined Hickory occur. The riparian area may have been representative of a rainforest community before past clearing. | **Poor condition.** Past land use has resulted in infestation of Lantana and degradation of the riparian area. Ongoing weed removal has resulted in substantial improvement in Lantana infestation and is showing signs of natural regeneration. Provides a stepping stone link to Moeyan Hill. | Reinfestation with non-consistent follow-up of primary weed control. Erosion of the riparian area. |
| 8a | Cleared / Blue Gum – Grey Ironbark Forest | Blue Gum dominates the canopy although Grey Ironbark also occurs as a co-dominant. Two-veined Hickory, Kidney Weed, Sweet Pittosporum and *Carex* sp. occur in the lower storeys. Lantana infestation particularly dense around creeklines leading to Broughton Creek. | **Poor condition.** Past land use has resulted in Lantana infestation and degradation of the riparian area. Vegetation condition improves away from the creekline and cleared edges. Provides important link to Broughton Creek. | Weed invasion. |
| 8b | **Illawarra Subtropical Rainforest - EEC** | A linear patch of Illawarra Subtropical Rainforest occurs near the eastern boundary of the site. This patch is a continuation of the northern area of Illawarra Subtropical Rainforest of the Borrowdale Road Reserve. Prickly Rasp Fern, Rainbow Fern and Sickle Fern dominate the groundlayer. | **Fair condition.** The dense canopy layer would reduce the opportunity for many weed species to establish although it is likely that the infestation of Lantana and Small Leaved Privet are a problem. This area is an example of an EEC which has largely been cleared form the area. | Weed current and new infestation from upstream. Nutrient enrichment from upstream agriculture. |

| BOMADERRY & NORTH NOWRA | | | | |
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| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| 1a | Modified and rehabilitated - West of Illaroo Rd | Quality decreases closer to Illaroo Rd. Blackbutt, Grey Gum, Bangalay, Swamp Mahogany dominate the canopy. Callicoma, Brush Cherry and Bleeding Heart occur in the midstorey. Understorey dominated by sedges and rushes. Lantana & garden escapes on edges. | **Fair condition to Good Condition**. Condition improves away from the edges and some substantial vegetation occurs especially in the areas of rehabilitation. Provides an important east-west link with Bomaderry Creek. | West of Illaroo Road - Inconsistent follow up of rehabilitation. Weeds encroaching. |
| 1b | Modified - East of Illaroo Rd | Some canopy species remain. The understorey is dominated by Lantana and garden species. Creek banks are badly eroded, nutrient enrichment of creek, dumping of household refuse. | **Poor condition**. This section has not been rehabilitated and is being impacted by numerous factors. Provides an important east-west link with Bomaderry Creek. | East of Illaroo Road - Continued degradation through expansion of weeds, ongoing erosion, further dumping. Requires major restoration works. |
| 2 | Spotted Gum – River-oak Forest | Large, old River-oak dominate the banks, with tall Spotted Gum with Blue Gum back from the top of bank. The shrub layer contains Lantana, Black Wattle, Coffee Bush, Water Gum and Grey Myrtle. Groundcover has scattered Lomandra and Carex . | **Poor condition**. Cleared to the top of bank. Banks are eroded, weedy in sections. Livestock has access in sections. High nutrient run-off from adjacent agricultural practices. | Further weed invasion, erosion and pollution of Bomaderry Creek. |
| 3a | Constructed - **Freshwater Wetland - EEC** | Illowra Wetlands and Rainforest Reserve. Freshwater wetlands. This area has been artificially created after closure of a dump. It is dominated by *Persicaria strigosa* , Tall Spike-rush and Couch. | **Fair condition**. This artificial wetland is densely vegetated with little weed incursion. Provides wetland habitat. | Weed invasion. |
| 3b / c | Constructed rainforest | Illowra Wetlands and Rainforest Reserve. Rainforest species have been created around the boundaries of the wetland. | **Fair condition**. This artificial rainforest is densely vegetated especially with canopy species and weeds species are limited to the edges especially along car park and road. | Requires consistent follow up of these rehabilitation works. |
| 3d | Cleared | Illowra Wetlands and Rainforest Reserve. The higher elevation areas in the north of the site are largely unrehabilitated areas. | **Poor condition**. This section is partially cleared with numerous weed species. | Further weed invasion. |

| BURRILL LAKE | | | | |
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| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| 1 | Coastal scrub | Racecourse Beach. Typical coastal vegetation that occurs on the frontal dune. Dominated by Coast Banksia, Coastal Wattle but degraded with weeds, including Bitou Bush, Norfolk Island Pine and a substantial number of common garden plants. | **Poor condition.** Weed invasion and erosion have degraded this area. High human use area. Provides a narrow coastal vegetated link. | Lack of weed control and management. |
| 2a | **Bangalay Sand Forest - EEC** | This EEC sits behind the fore dune. It is dominated by Bangalay with a sparse understorey in sections. | **Poor condition.** Predominately poor condition due to edge effects and the pressures of urbanisation and high visitor usage. Away from the edges the condition improves. Provides an important vegetated link with areas to the west including Burrill Lake. | Ongoing impacts of urbanisation and the caravan park. |
| 2b | Coastal scrub | Typical frontal dune vegetation. Dominated by Coastal Wattle and Spiny-head Mat-rush. | **Poor condition.** Predominately poor condition due to edge effects and the pressures of urbanisation and high visitor usage. Away from the edges the condition improves. Provides an important vegetated link with areas to the west including Burrill Lake. | Ongoing impacts of urbanisation and the caravan park. |
| 3a | **Bangalay Sand Forest - EEC** | This EEC sits behind the fore dune. It is dominated by Bangalay with a sparse understorey in sections. Tracks and erosion are prevalent. | **Poor condition.** Predominately poor condition due to edge effects and the pressures of urbanisation and high visitor usage. Away from the edges the condition improves. Provides an important vegetated link with areas to the west including Burrill Lake. | Ongoing impacts of urbanisation and high visitor usage. |
| 3b | Coastal scrub | Typical frontal dune vegetation. Dominated by Coastal Wattle and Spiny-head Mat Rush. | **Poor condition.** Predominately poor condition due to edge effects and the pressures of urbanisation and high visitor usage. Away from the edges the condition improves. Provides an important vegetated link with areas to the west including Burrill Lake. | Ongoing impacts of urbanisation and high visitor usage. |
| 4a | **Bangalay Sand Forest - EEC** | This EEC sits behind the fore dune. It is dominated by Bangalay with Coast Banksia and Lomandra common in the understorey. Tracks and erosion are prevalent. Appears to have recently been burnt. | **Poor condition.** Predominately poor condition due to edge effects and the pressures of urbanisation and high visitor usage. Away from the edges the condition improves. Provides an important vegetated link with areas to the west including Burrill Lake. | Ongoing impacts of urbanisation and high visitor usage. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| 4b | **Coastal Saltmarsh - EEC** | This saltmarsh is a narrow strip that is dominated by sedges. Mown grassed areas border the northern sections of this community while Swamp Oak and Coastal Scrub abut the southern portions. | **Poor condition.** This is a high use area that is impacted by visitor usage. Tracks, trampling and rubbish are common. Provides a buffer to the entrance of Burrill Lake. | High usage. |
| 4c | Coastal scrub | Typical frontal dune vegetation. Dominated by Coastal Wattle and Spiny-head Mat Rush. | **Poor condition.** Predominately poor condition due to edge effects and the pressures of urbanisation and high visitor usage. Away from the edges the condition improves. Provides an important vegetated link with areas to the west including Burrill Lake. | Ongoing impacts of urbanisation and high visitor usage. |
| 5 | Parkland | This area is maintained as a park. Remnant trees are indicative of the historical presence of Bangalay Sand Forest and Swamp Oak Floodplain Forest. | **Poor condition.** The pressures of nearby urbanisation have impacted this area. Provides a buffer to entrance to Burrill Lake. | Trampling and dumping. |
| 6 | Modified and parkland | This narrow strip of vegetation varies from Spotted Gum – Grey Ironbark at higher elevations to areas that would have originally supported Bangalay Sand Forest but which are now mown grassed areas with scattered trees. The occasional Swamp Oak also occurs along the edges of Burrill Lake. | **Poor condition.** Much of this area has been modified through clearing and weed invasion. Provides a vegetated link along Burrill Lake. | Erosion, further tree clearing and weed invasion. |
| 7 | Scribbly Gum – Old-man Banksia open woodland | This area is largely dominated by Scribbly Gum with an open grassy / shrubby understorey which is largely intact. Spotted Gum occurs in areas of higher elevation. | **Fair condition.** 4WD tracks, erosion and dumping although away from edge effects impacts are reduced and the community is largely intact. An important east-west corridor connecting Burrill Lake with Burrill Beach. | Ongoing track formation, erosion and weed invasion. |
| 8 & 9 | Parkland | These reserves are all highly modified and maintained as parkland. Swamp Oak are scattered throughout with Buffalo Grass understorey. May once have been Swamp Oak Floodplain Forest. | **Poor condition.** Mown parkland. Trees would provide habitat for birds. | Weed invasion and senescence of trees. |
| 10 | Parkland | A mown grassed area adjacent to a boat ramp. A number of Swamp Oak occur with Buffalo Grass understorey. May once have been Swamp Oak Floodplain Forest. | **Poor condition.** Cleared and modified. Provides a buffer to Burrill Lake from development. | Weed invasion. |
| 11 | Parkland | This grassed and mown area houses a pumping station. Swamp Oak occurs along the back boundary. The areas adjoining the street have been newly landscaped. This area may have representative of an EEC before clearing. | **Fair condition.** Landscaping of this site has been undertaken although weeds are still common. Trees would provide habitat for birds. | Weed expansion. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| 12a | **Swamp Oak Floodplain Forest - EEC** | This badly degraded EEC follows an unnamed drainage line which flows into Burrill Lake. The edges of the EEC are regularly mown. Kikuyu dominates the understorey. | **Very poor condition.** The unnamed drainage line passes through a pipe culvert into this area and water flow is impeded. Area is regularly mowed. Provides habitat for birds. | Lack of management of this site as an EEC. |
| 12b | Parkland | Mown grassed area with scattered trees, including Coast Banksia, Swamp Oak, Coastal Wattle and Lomandra. | **Poor condition.** Area maintained as a parkland. Provides habitat for birds. | Dumping and weed invasion. |
| 13 | **Swamp Oak Floodplain Forest - EEC** | This badly degraded EEC is a continuation of 12a. Swamp Oak and Common Silkpod are very dominant. Bangalay also occurs around the boundaries. A ponded area with Common Reed is located in the south-western section of this reserve. Ground layer is almost entirely comprised of weed species. | **Very poor condition.** This area is weed infested and drainage patterns have been changed. Provides habitat for birds and amphibians. | Lack of management of this site as an EEC. |
| 14a | **Bangalay Sand Forest – EEC** | This area has been impacted by clearing. The occurrence of the Bangalay Sand Forest is patchily distributed along this reserve with the most substantial areas in the south of the site. Also occurring are Swamp Oak and Lilly Pilly in wetter areas. Prior to clearing Littoral Rainforest may have occurred in the gully area at Dolphin Point. | **Poor condition.** Clearing of vegetation, erosion and weed invasion have all impacted this reserve. A vegetated headland which is linked to more vegetated areas to the south. | Ongoing clearing and weed invasion, erosion. |
| 14b | Coastal scrub | Vegetation fringing the frontal due combined with parkland. | **Poor condition.** Clearing, weed invasion and erosion. Provides scattered vegetation along the mouth of Burrill Lake. | Clearing, erosion and weed spread. |
| 15a | Spotted Gum open woodland | Much of this reserve has recently been burnt. Spotted Gum was dominant but some Blackbutt was also present. There was evidence of past selective logging. | **Very poor condition – poor condition.** Pressures of urbanisation have severely degraded sections of this narrow reserve. Weed invasion, poor water quality and dumping are common. Provides some stepping stone habitat for mobile species. | Culvert at Warden Street should be replaced with a box culvert to improve water flow. Weeds need to be removed and the creek line rehabilitated. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| 15b | **Coastal Saltmarsh – EEC** | This badly degraded saltmarsh is dominated by *Sarcocornia quinqueflora* , Creeping Brookweed and *Juncus usitatus* . | **Very poor condition.** Extremely degraded through clearing, construction of minor channels for drainage, stagnant water, trampling, boat storage and tracks. Currently has few ecological values. | Lack of management and continued impacts from adjacent urbanisation. |
| 15c | **Swamp Oak Floodplain Forest - EEC** | Saltmarsh grades into Swamp Oak. | **Poor condition.** Clearing, weed invasion and trampling have all impacted this badly degraded area. Provides a buffer to Burrill Lake. | Lack of management and continued impacts from adjacent urbanisation. |
| 15d | **Littoral Rainforest** | This community is likely to be representative of a badly degraded Littoral Rainforest which extends back to the Burrill Lake Rock Shelter. Rough fruit Pittosporum, Common Silkpod, Callicoma and Rainbow Fern are all common. | **Very poor condition.** This whole reserve is in extremely poor condition. Adjacent urban development has resulted in clearing, weed invasion, tracks and dumping. Provides habitat for a range of species. | Lack of management of this area is the most substantial threat. |

| CALLALA | | | | |
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| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| CA-32 | **Coastal Saltmarsh – EEC** | Saltmarsh species include *Sarcocornia quinqueflora, Suaeda australis* and Saltwater Couch. Bordered by large areas of Grey Mangrove and Sea Rush into forested areas. | **Poor condition.** Area used for dumping and driving with large areas of bare ground. Runnelling throughout. | Further inappropriate use. |
| CA-33 | **Swamp Oak Forest - EEC** | Swamp Oak dominated with Prickly-leaved Teatree subdominate. Understorey of Hop Goodenia, Whieroot, Snake Vine, Swamp Paperbark, Stinkweed, *Cassytha glabella* and Gahnia. | **Good condition.** Intact community dominated by native species. Forms part of a large, intact forested area. | None apparent. |
| CA-34 | **Swamp Sclerophyll Forest - EEC** | Dominated in sections by Woollybutt, Swamp Mahogany and Swamp Paperbark with a sedge understorey and scattered Swamp Oak. Areas with less sedge have Bangalay, Snake vine, Dianella, Coast Banksia, Bracken and Gahnia. | **Good condition**. Intact community dominated by native species. Forms part of a large, intact forested area. | None apparent. |
| CA-35a | Grey Gum Woodland | Wetter areas grade into the drier Grey Gum-Stringybark-Red Bloodwood-Scribbly Gum-Rough barked apple woodland to the north, Understorey contains Dianella, Threeawn Speargreass, Whiteroot, Blady Grass and Lomandra. | **Good condition.** Intact community dominated by native species. Forms part of a large, intact forested area. | Urbanisation. |
| CA-35b | Rough-barked Apple-Scribbly Gum-Bangalay Forest | Area dominated by Rough-barked Apple and Scribbly Gum with Bangalay, Old-Man Banksia, Common Bracken, Dianella, Blady Grass, Wombat Berry and Lomandra. | **Poor condition**. Signs of being impacted by urbanisation (e.g. changes in flow regimes, weed invasion and alteration of ground levels) along the eastern boundary with Lackersteen St. | Further urbanisation and degradation |
| CA-38 | **Bangalay Sand Forest - EEC** | Bangalay with Coast Banksia subdominant. Understorey of NZ Spinach, Lomandra, Coastal Teatree, Common Bracken, Blady Grass, Coffee bush, Tree Broom-heath and Club-rush. Bangalay drops out on the seaward side of the frontal dune,replaced by coastal scrub. | **Fair condition.** Relatively intact stand which protects the dune system. | Weed invasion. |
| CA-39 | **Swamp Oak Forest - EEC** | Vegetation within the drainage line feeding down from Callala Creek into an open-depression surrounded by Bangalay Sand Forest. Dominated by Swamp Oak and Gahnia. NZ Spinach, Blady Grass, Swamp Weed and Swamp Paperbark are also scattered throughout. | **Poor condition**. Bisected by a bicycle track and extensive lantana invasion to the east of the track. Bush regeneration is currently being undertaken. | Weed invasion. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| CA-36 | Coastal Scrub | This community dominates on the seaward side of the frontal dune. | **Fair condition**. Relatively good with few weeds. | Trampling and weeds. |
| CA-40 | Mangrove Forest - protected vegetation | SOF grades into a narrow strip of *Suaeda australis* and then into Grey Mangrove Forest which is a monoculture. | **Good condition**. Although this community is not an EEC it is protected as marine vegetation under the *Fisheries Management Act, 1994.* | Potential poor water quality from urbanisation. |
| CA-47, 48 | Modified/Remnant Parks | W block has remnant features of grassy woodland which is in relatively good condition. E block is similar but younger. Canopy of Grey Gum, Red Bloodwood and White Stringybark with grassy understorey of Themeda, Wallaby Grass and Tick Bush. | **Very poor condition** although they contain quite good diversity and provide stepping-stone for mobile fauna such as birds and bats. | Weeds and senescence of trees. |
| CA-37 | Modified grading into coastal scrub | Bicentennial Park is a grassed area with scattered Swamp Oak, Bangalay, Broad-leaved Paperbark and common landscaping plants. The NE vegetation retains some features of Coastal Scrub although only a thin strip. | **Poor condition.** Provides fauna habitat trees and a link between the intact forested areas to the west and coastal vegetation. | Senescence of trees. |
| CA-44 | Modified/Remnant | Bangalay dominates toward the frontal dune with some Coastal Teatree, Blady Grass and Lomandra. Further upstream within the riparian zone, a thin strip of Swamp Oak with occasional Grey Gum. It has a weedy understorey. | **Very poor condition**. Degraded, weedy and eroded riparian area. | Poor water quality and weed invasion. |
| CA-46 | **Bangalay Sand Forest - EEC** | This vegetation community unusually extends along the frontal dune. It is dominated by Bangalay, Coastal Teatree, Sydney Golden Wattle, Sweet Pittosporum, Tree Broom-heath with Lomandra, Common Bracken and Themeda dominating the understorey. | **Good condition**. Native species dominate and proves a god link from adjacent riparian vegetation through Wowly Gully. | Trampling. |

| CUDMIRRAH & BERRARA | | | | |
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| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| BR-13 | **Coastal Saltmarsh – EEC** | East of Cudmirrah bridge. Dominated by *Baumea juncea* grading into Swamp Oak, Swamp Paperbark, Snake Vine and Common Bracken to the N and NE before transitioning into BSF. | **Good condition**. Appears to be intact and functioning saltmarsh area. (Area to the W and NW of the bridge is not considered Coastal Saltmarsh due to its modified and degraded state. | Impacts from adjacent road and bridge. |
| BR-14 | **Bangalay Sand Forest - EEC** | Extends across much of the reserve area to the NE of the Cudmirrah Bridge on both sides of the road. Canopy dominated by Old-Man Banksia, Tree Broom-Heath with Lomandra dominating the understory. Bangalay are also scattered throughout. | **Good condition**. Relatively large intact area. Mostly weed-free and diverse. Provides good connectivity with areas to the South and potentially important fauna habitat. | Weed invasion from road edge. |
| BR-7 | Coastal Scrub | Bangalay commuity grades into Swamp Paperbark in the depression behind the frontal dune and then becomes Coastal Scrub dominated by Coastal Teatree, Lomandra, Coast Banksia and Tree-heath on the seaward side of the frontal dune. | **Good condition**. Relatively weed-free and intact. Provides important protection for une system | None apparent. |
| BR-11 | Scribbly Gum - Red Bloodwood Forest | Scribbly Gum and Red Bloodwood dominated forest bordering the southern shores of Swan Lake. Also dominant are *Dodonaea, Dianella* , Tree-broom-heath, Black She-oak and Maiden's Wattle. Area to the E is more disturbed and modified to parkland. | **Fair condition.** Relatively weed-free and intact. Provides important protection for lake shore | Senescence of trees. |
| BR-10 | **Bangalay Sand Forest - ECC** | A small section of Bangalay Sand Forest borders the Rural Fire Services property behind First Avenue. Dominated by Bangalay with Sweet Pittosporum, Coast Banksia, Common Bracken and Blady Grass in the understorey. | **Fair condition**. Some weed invasion and disturbance along the urban boundary thruogh clearing and road building. | Urbanisation. |
| BR-12a | **Swamp Sclerophyll Forest - EEC** | Two patches of forest with Swamp Oak, Sweet Pittosporum, Swam Weed, Dianella, Blady Grass, Baumea Juncea, Swamp Paperbark and Common Bracken. | **Fair condition.** Some weed invasion along the margins in particular and tracks cleared. | Changes to flow regimes and weed invasion. |
| BR-12b | **Swamp Paperbark - Baumea Juncea** | Transition area between the Swamp Sclerophyll Forest and Coastal Saltmarsh is dominated by Swamp Paperbark and Baumea Juncea. | **Fair condition**. Although tracks throughout. | Trampling and poor water quality. |
| BR-15 | **Coastal Saltmarsh – EEC** | This community on the western and eastern sides of the Swan Lake Inlet is dominated in sections by a monoculture of Baumea Juncea, with Club-sedge and Sea Rush occurring intermittently. Swamp Oak occurs in clumps in slightly elevated areas. | **Fair condition**. Although areas closer to the road are more degraded. | Edge effects associated with the road. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| BR-6,9 | **Bangalay Sand Forest - EEC** | 2 patches of Bangalay dominated forest along the thin coastal reserve S of Swan Lake Inlet. Lilly Pilly, Bracken, Maidenhair Fern, Coast Banksia, Buffalo Grass & Lomandra. More mesic species occurring in depressions behind dunes. | **Poor condition**. Varies but generally weedy throughout. | Weed invasion. |
| BR-8 | Modified/Coastal Scrub | Areas between Bangalay Sand Forest patches are generally modified with large grassed areas or with the absence of tree species. Areas on the seaward side of the frontal dunes are vegetated with Coast Banksia, Coastal Rosemeary and Lomandra. | **Poor condition.** Modified habitat provides fauna habitat potential. Other, some erosion and weed invasion in places but generally intact or restored. | Senescence fo trees, weed invation and erosion. |
| BR-5 | Modified/Remnant Coastal Scrub | In some sections a thin strip of vegetation remains although much of this area is grassed. Species present include Swamp Oak, Climbing Guinea Flower, Dianella, Coast Banksia, Blady Grass and Lomandra with infestations of Asparagus Fern and Senecio. | **Very poor condition**. Highly modified. | Continued modification. |
| BR-1,3 | Modified | Modified vegetation at the northern end of Waterhaven Avenue. Swamp Oak, Blackbutt, Coast Banksia and Sweet Pittosporum scattered throughout with an intermittent understorey of Common Bracken, Bird of Paradise and Blackberry. | **Very poor condition.** Modified. | Continued modification and senescence of trees. |
| BR-2 | **Swamp Oak Forest - EEC** | Occurs in a depression at the southern end of Waterhaven Avenue. Dominated by Swamp Oak, Sweet Pittosporum in the canopy with vines, Kidney Weed, Common Bracken, Gahnia, Tall Sedge and Bleeding Heart throughout. Bangalay also occurs intermittently. | **Poor condition**. Area bounded by road and development either side. Reduced water quality and week invasion at the edges makes this area marginal. Weeds include Senna sp. especially along the margins. | Water quality and weed invasion. |
| BR-4 | Modified | Mown grassed park with scattered Bangalay and Swamp Oak | **Very poor condition**. Understorey absent. | Senescence of trees. |

| CULBURRA | | | | |
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| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| 1a | **Coastal Saltmarsh - EEC** | Adjoins Curleys Bay behind a Sewage Treatment Plant (STP). Heavily disturbed area. Dominated by *Sarcocornia quinqueflora* , Saltwater Couch with *Juncus usitatus* and Grey Mangrove being common along the southern boundary of this vegetation community. Crab burrows were very numerous and the common *Parasesarma erythodactyla* was regularly observed. | **Very poor condition**. The easy accessibility of this area means that it is extremely degraded. Bike tracks and dumping have severely impacted this area. Coastal Saltmarshes are important resources as fisheries nurseries and feeding grounds. | Poor management and ease of access of this site has resulted in severe degradation. Ongoing. |
| 1b | **Swamp Oak Floodplain Forest - EEC** | Located to the south of the Coastal Saltmarsh this very narrow strip is dominated by Swamp Oak. Other species include Prickly-leaved Tea Tree, Norfolk Island Hibiscus, *Juncus usitatus, Baumea juncea* , Saltwater Couch, Swamp Weed, and Common Silkpod. She-oak Mistletoe was also recorded in moderate numbers. | **Fair Condition**. This narrow strip is weed free in places but becomes more degraded to the north-west with dumping and Bridal Creeper smothering vegetation. This area provides a buffer to the Coastal Saltmarsh and Curleys Bay. | Encroachment of activities from the adjacent Coastal Saltmarsh community. Lack of management. |
| 1c | **Swamp Sclerophyll Forest - EEC** | Located to the west of the STP. This community would have extended further east before construction of the STP. Botanically diverse with Swamp Mahogany dominating the canopy. Also commonly occurring are Swamp Oak, Two-veined Hickory, Tick Bush, Prickly Beard-heath, Lomandra, Many-flowered Mat-rush and Common Bracken. | **Good Condition**. Few few weeds back from the track. Largely intact. Is a part of a larger and contiguous tract of bushland. | Encroachment of weed infestation could occur from adjacent areas. Lack of management. |
| 1d | Scribbly Gum – Woollybutt Woodland | The remaining area around the STP is dominated by dry sclerophyll communities. | **Fair Condition**. The condition of this area varies with the degree of clearing, weed invasion and dumping. These impacts are more evident to the south-west of the STP. This is a part of a larger tract of land. | Lack of management. Dumping and weed invasion. |
| 2 | Grey Ironbark – Scribbly Gum Woodland | This disused tip has largely been cleared. Fringing vegetation is weed infested with Bitou Bush, Scotch Thistle and *Senna* sp. being common. | **Very poor condition**. Past land use and weed invasion has severely degraded this area. In its current form it has few values. | Ongoing weed infestations. |
| 3a | **Swamp Oak Floodplain Forest - EEC** | This small patch of EEC is severely degraded. Swamp Oak dominates with other natives including Tall Saw-sedge, Sweet Pittosporum and Common Silkpod. Severe infestations of Lantana, Blackberry, Honeysuckle and Asparagus Fern occur throughout. | **Very poor condition**. This severely degraded EEC shows signs of past fire, tracks, dumping, clearing and modification of drainage patterns through the construction of a drain. This area provides a buffer to adjacent Coastal Saltmarsh and Mangrove Forest. | Lack of management. Ongoing dumping, weed infestation and human encroachment. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| 3b | Cleared | Largely a grassed area. | **Very poor condition**. This area has little ecological value although it may provide some habitat for bird species that favour grassy habitats. Provides a buffer to vegetation fringing Curleys Bay. | Weeds could spread into adjoining habitat. |
| 4a | Cleared / Disturbed | This area may have been Bangalay Sand Forest in the past but is currently a cleared grassed area with the occasional tree species scattered throughout. | **Very poor condition**. This area has been cleared. Provides a buffer to the adjacent Bangalay Sand Forest. | Lack of active management. |
| 4b | **Bangalay Sand Forest – EEC** | Bangalay Sand Forest occurs behind the fore dune of Wollumboola Lake. It is dominated by Bangalay and Blackbutt. Sweet Pittosporum, *Senna* sp. and Sandfly Zieria are common in the midstorey with Asparagus Fern, Blackberry, and Lantana dominating the ground cover. | **Poor condition**. Although largely intact this area is weed infested and has impacts associated with human encroachment. This section is partially cleared with numerous weed species present. Provides a buffer to Lake Wollumboola. | Lack of management. Proximity to urbanisation and informal use has resulting in track formation, and rubbish dumping. |
| 4c | **Swamp Oak Floodplain Forest - EEC** | A very narrow strip of EEC occurs between Wollumboola Lake and an informal track. This area is dominated by Swamp Oak and *Juncus usitatus* with the introduced *Hydrocotyle bonariensis* occurring in sandier soils. | **Good Condition**. Few impacts are evident in the area. Provides an important vegetated zone adjacent to Lake Wollumboola. | Expansion of the track and encroachment of weeds. |
| 5 | **Bangalay Sand Forest – EEC** | Bangalay Sand Forest occurs adjacent to the Lake Wollumboola with *Juncus usitatus* fringing the lake. It is dominated by Bangalay with Coast Banksia and Sweet Pittosporum as co-dominants. Weed species are common in the understorey. | **Poor condition**. Although largely intact this area is weed infested and has impacts associated with human encroachment. Provides a buffer to Lake Wollumboola. | Lack of management. Proximity to urbanisation and informal use has resulting in track formation, weed infestation and rubbish dumping. |
| 6a | **Bangalay Sand Forest – EEC** | This EEC follows an unnamed drainage line. It is dominated by Bangalay and Blackbutt with Coast Banksia and Sweet Pittosporum also occurring. The ground layer is weed infested although native species also occur. | **Poor condition**. Although largely intact this area is weed infested and has impacts associated with human encroachment. The drainage line is eroded and weed infested in sections. This community provides a buffer to Lake Wollumboola. | Lack of management. Proximity to urbanisation and informal use has resulting in track formation, weed infestation and rubbish dumping. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| 6b | **Coastal Saltmarsh - EEC** | Adjoins Lake Wollumboola with *Juncus usitatus* dominating this narrow strip. Also occurring are New Zealand Spinach and *Ranunculus* sp. with Saltwater Couch becoming dominant with a slight rise in elevation. | **Fair condition**. The sedge community makes human access difficult so there are few obvious impacts. Coastal Saltmarshes are important resources as fisheries nurseries and feeding grounds. | Human encroachment. |
| 6c | Coastal Scrub | Coastal scrub dominates the frontal dune area where it adjoins Crookhaven Bight. Area dominated by Coast Banksia, Coast Wattle, *Monotoca elliptica* and Coast Teatree. | **Fair condition**. Coastal dune systems have largely been impacted through human encroachment and clearing. This area has been fenced and rehabilitated in the past. Protects the foredune. | Inconsistent follow up of rehabilitation. |

| CURRARONG | | | | |
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| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| 1 | Open Coastal Scrub / Woodland | This area borders an unnamed creek and the Crookhaven Bight. It is dominated by Coast Banksia and Lomandra although Common Bracken, Swamp Oak, Oplismenus aemulus are also present. | **Fair condition**. This community is fairly well protected from everyday impacts of urbanisation. Vegetation appears to have reached senescence due to lack of fire. A cool fire would assist in rejuvenation of this area. Stabilises the frontal dune and creek, and is part of a contiguous area of vegetation. | Lack of fire, tracks weeds and erosion. |
| 2 | Coastal Scrub | Coastal scrub dominates the frontal dune area where it adjoins Crookhaven Bight. Area dominated by Coast Banksia, Coast Wattle, *Monotoca elliptica* and Coast Teatree. | **Fair condition**. This area has been fenced and rehabilitated in the past although tracks and weed are present. Stabilises the frontal dune. | Inconsistent follow up of rehabilitation. Weed invasion and erosion. |
| 3 | Coastal Scrub | Coastal scrub dominates the frontal dune area at the river entrance. Area dominated by Coast Banksia, Coast Wattle, *Monotoca elliptica* and Coast Teatree. | **Fair condition**. Coastal dune systems have largely been impacted through human encroachment and clearing. This area has been fenced in sections and rehabilitated in the past. Weeds are encroaching from nearby urbanisation. Stabilises the frontal dune. | Inconsistent follow up of rehabilitation, erosion and weed invasion. |
| 4 | Cleared | This reserve area has been cleared and a car park and amenities block constructed.. Some trees remain. May once have been part of the Bangalay Sand Forest to the south. | **Poor condition**. The area is cleared and grassed and is impacted by high levels of human activities. Provides some canopy for common arboreal fauna and birds. | Weed invasion. Senescence of trees with no replacement trees being planted. |
| 5 | **Bangalay Sand Forest – EEC** | This section of the caravan park has been cleared with only scattered trees representative of Bangalay Sand Forest remaining. Sweet Pittosporum and Asparagus Fern are also present in the understorey. | **Poor condition**. The area is cleared and grassed and is impacted by high levels of human activity. A sewer line runs along the back fences of the properties which border the area to the north. Provides canopy for common arboreal fauna and birds. | Weed invasion. Senescence of trees without planting of replacement trees. |
| 6 | **Swamp Oak Floodplain Forest - EEC** | Swamp Oak Floodplain Forest dominates across this triangular section of vegetation adjacent to the caravan park and to the south of the Bangalay Sand Forest. It is densely vegetated. Swamp Oak is dominant but other canopy species which occasionally occur include Cheese Tree, Woollybutt and Blueberry Ash. | **Poor condition**. Impacts are mostly associated with edge effects as a consequence of the proximity of the caravan park and roads. Provides stepping stone habitat between Crookhaven Bight and large areas of intact vegetation to the south. | Edge effects and human encroachment. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| 7 | Caravan Park | The remaining area is comprised of a caravan park with only the occasional scattered shrub remaining. | **Very poor condition**. This area has been cleared. It provides little ecological value to the surrounding area. | Edge effects. |

| HYAMS BEACH | | | | |
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| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| 1 | Modified | This much modified coastal strip which borders Chinamans Beach is comprised of vegetation clinging to the face of the cliff line which grades into a park along Cyrus Street. Bangalay and Coast Banksia occur in the canopy and Purple Coral Pea, Coastal Wattle, Climbing Guinea Flower, Dusky Coral Pea, Sweet Pittosporum and Lomandra all occur in the understorey along the cliff line. | **Poor condition**. Erosion of the cliff line along this section is destabilising the vegetation, and weed invasion from neighbouring properties is common. Narrow strip provides connectivity along the shoreline. | Erosion and uncontrolled weeds outcompeting native species. Human induced impacts. |
| 2 | Degraded coastal vegetation | A very weedy coastal strip. Stunted Coast Banksia, Crofton Weed and Common Bracken occur. | **Very poor condition**. Very degraded, weed infested areas prone to erosion. Narrow strip provides connectivity along the shoreline. | Lack of management. Requires substantial rehabilitation to stabilise area and to re-establish native vegetation. |
| 3a | Coastal Scrub | Coastal scrub dominates the frontal dune area where it joins Hyams Beach. Area dominated by Coast Banksia, Coast Wattle, *Monotoca elliptica* and Coast Teatree. | **Fair condition**. Some tracks and trampling of vegetation. Stabilises the frontal dune and provides a vegetated link. | Tracks weeds and erosion. |
| 3b | **Bangalay Sand Forest - EEC** | A degraded drainage line flows through this area and discharges onto Hyams Beach. The stream is piped under the road. Water quality appears to be affected by nutrient enrichment. Canopy species include Bangalay, Coast Banksia, Sweet Pittosporum, Tall Saw-sedge, Common Bracken and *Monotoca elliptica* . An Echidna (*Echidna hystrix* ) was recorded foraging along the banks. | **Poor condition**. The edge of the woodland has been cleared for a car park and amenities block and human induced impacts spill over into the adjacent woodland. Provides an important coastal vegetated link to areas north and south. | Continued human induced impacts on site and upstream. |
| 3c | Old-man Banksia – Blackbutt Open Woodland | This is a dry open woodland which has been fenced. Tracks throughout provide access to the beach from the road and also from each of the residences bordering woodland. | **Poor condition**. The high levels of human activity adjacent to and within the woodland have impacted its integrity. Provides an important coastal vegetated link to areas north and south. | Inconsistent follow up of rehabilitation. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| 4a | **Bangalay Sand Forest - EEC** | This EEC is a continuation of that noted in 3b, although wetter elements occur such as Tree Ferns. Bangalay, Blackbutt, Grey Ironbark occur in the canopy. The drainage line piped under the road from 3b is also degraded by similar impacts. | **Poor condition**. This area suffers impacts from the adjacent urbanisation. Provides an important vegetated link along the drainage line to the west. | Continued human induced impacts on site and upstream. |
| 4b | Scribbly Gum Woodland | The Bangalay Sand Forest grades into a drier Scribbly Gum woodland which stretches along the banks of the wide sandstone creek. | **Poor condition**. This area suffers impacts from the adjacent urbanisation. Provides an important vegetated link along the drainage line to the west. | Human induced impacts from neighbouring development. |
| 5 | Scribbly Gum Woodland | The wide sandstone creek supports dry sclerophyllous vegetation which becomes wetter towards the east. Scribbly Gums dominate the banks. Other tree species include Blackbutt, Tall Saw-sedge, Hairpin Banksia. | **Fair condition**. Vegetation along this section is narrow and is impacted by the adjacent neighbouring development. Weeds have encroached as has dumping and clearing. Provides an important vegetated link along the drainage line to the west. | Human induced impacts from neighbouring development. |
| 6 | Scribbly Gum Woodland | The wide sandstone creek supports dry sclerophyllous vegetation which becomes wetter towards the east. Scribbly Gums dominate the banks. Other tree species include Blackbutt, Tall Saw-sedge, Hairpin Banksia. | **Good condition**. This upstream section is currently in good condition. Provides an important vegetated link along the drainage line to the west. | The new development adjacent to this area may overtime impact on the integrity of this community. |

| JASPERS BRUSH | | | | |
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| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| 1a | Warm Temperate Layered Forest | Eastern section of this block grades into Warm Temperate Layered Forest where Eucalypts (e.g. *Eucalyptus tereticornis* ) become dominant. | **Poor condition.** Lantana dominates throughout the understorey. Provides minor refuge for fauna and flora. | Weed invasion and run-off from Strongs Road. |
| 1b | **Illawarra Subtropical Rainforest (ISF) - EEC** | ISF in west area of a gully adjoining Cedar Vale Lane, with Giant Stinging Tree, Lilli Pilly and Giant Maidenhair throughout. Understorey dominated by Lantana with a 20m wide corridor at the base of the gully relatively weed free. | **Poor condition.** Lantana dominates throughout the understorey. Provides minor refuge for fauna and flora. | Weed invasion and run-off from Strongs Road. |
| 2 | **Illawarra Subtropical Rainforest (ISF) - EEC** | Narrow strip of ISF linking northern and southern areas of ISF. Eastern edge weedy but weed free away from edge. | **Fair condition.** Although good condition away from edges. Provides narrow linear connection between areas. | Weed invasion and edge effects. |
| 3a | Warm Temperate Layered Forest | A large block at the end of Strongs Road which is mostly comprised of Warm Temperate Layered Forest dominated by Eucalypts. | **Good Condition.** Denseness of the canopy has reduced the incursion of weed invasion away from edges. Provides valuable links to larger areas of wilderness and a buffer to ISF. | Minor weed invasion along edges. |
| 3b | **Illawarra Subtropical Rainforest (ISF) - EEC** | Intact ISF which stretches to a boulder field and escarpment approximately 100 m to the west. The ISF is weed free. Dominant flora includes Red Cedar, Sandpaper Fern, Sassafras, Giant Maidenhair, Rainbow Fern, Jungle Brake, Fragrant Fern. | **Good Condition.** No sign of weed invasion or other impacts such as tracks. Provides valuable links to larger areas of wilderness. | None known. |
| 4 | Modified / regenerating wet sclerophyll forest / rainforest | Area disturbed by clearing, farming & severe Lantana invasion. Removal of Lantana and ongoing control is showing good results indicating the substantial resilience of the soil seed bank. Some replanting with local species. | **Fair condition.** Regeneration of the native community largely from the soil seed bank is successfully occurring. Weed control and erosion control are ongoing. Will provide link with ridgeline and Wileys Creek to the south. | Erosion of slopes where removal of Lantana has been successfully undertaken and the reoccurrence of Lantana invasion. |
| 39969 | Modified Warm Temperate Layered Forest | Eucalypt dominated in north gully (Blue Gum and Forest Red Gum) with Lantana & other weeds such as Crofton Weed throughout. Wetter influences occur to the west where Illawarra Subtropical Rainforest borders the block. | **Poor condition.** Past land clearance has resulted in infestations of Lantana and other weed species. | Weed invasion and edge effects. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| 7a | Warm Temperate Layered Forest | Area mapped from aerial photograph interpretation (API) and ground-verified via roadside viewing. Emergent Eucalypts dominate. | **Good Condition.** It is likely that this area is in good condition due to its inaccessibility. | Unlikely although too frequent fire would alter the landscape. |
| 7b | **Illawarra Subtropical Rainforest (ISF) - EEC** | Area mapped from aerial photograph interpretation (API) and ground-verified via roadside viewing. Mapped as ISF due to the lack of emergent Eucalypts and denseness and colour of canopy. | **Good Condition.** It is likely that this area is in good condition due to its inaccessibility. | Unlikely although too frequent fire would alter the landscape. |
| 8a | Blue Gum – Turpentine Forest | Some clearing of the area has been undertaken in the past for farming and in these areas weed encroachment into the bushland has occurred. In general the drier areas have intact vegetation communities dominated by tall Blue Gum with Turpentine. | **Fair condition.** Regeneration of the native community largely from the soil seed bank is successfully occurring. Weed control and erosion control are ongoing. | Weed invasion. |
| 8b | **Illawarra Subtropical Rainforest (ISF) - EEC** | ISF occurs along Tandingulla Creek. Past disturbance has resulted in severe Lantana invasion. Removal and ongoing removal and control are resulting in the natural regeneration of vegetation indicating the substantial resilience of the soil seed bank. | **Poor condition.** Regeneration of the native vegetation community largely from the soil seed bank is successfully occurring and weed control and erosion control are ongoing. | Although massive amounts of work have gone into the control of Lantana it is a large problem that will require ongoing control and maintenance. |
| 9 - 17 | **Wet sclerophyll forests and Illawarra Subtropical Rainforest (ISF) - EEC** | Polygons 9 to 17 have been mapped from aerial photograph interpretation (API) and require ground-verification for added certainty. Likely to contain wet sclerophyll forests with areas of ISF occurring as tentatively mapped. | **Good Condition.** It is likely that these areas are in good condition due to their inaccessibility. | Unlikely although too frequent fire would alter the landscape. |

| KIOLOA | | | | |
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| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| 1a | Spotted Gum / informal car park | Large old Spotted Gum trees remain in a largely cleared informal car park. Some shrubs remain around the base of the trees. Grades into a narrow band of Swamp Oak. | **Poor condition.** Weed invasion, compaction of ground and erosion. Large old trees provide habitat for arboreal fauna. | Senescence of trees without replacement. Informal use as a car park. |
| 1b | Coastal Scrub | The frontal dune is vegetated with Coastal Wattle, Lomandra, Monotoco elliptica and Swamp Oak. | **Poor condition.** Tracks and trampling. Provides stability to the frontal dune. | This is a high use area and will continue to experience impacts. |
| 2a | **Bangalay Sand Forest - EEC** | Coastal scrub on the frontal dune grades back into the remains of Bangalay Sand Forest. The majority of understorey is cleared and the grass is mown. | **Poor condition.** Clearing, tracks and trampling. Provides stability to the frontal dune. | This is a high use area and will continue to experience impacts. |
| 2b | **Swamp Oak Floodplain Forest – EEC** | A dense Swamp Oak Floodplain community follows a drainage line around behind the frontal dune. Understorey comprises Kikuyu, Lomandra, Common Bracken, Asparagus Fern, Common Reed and Sweet Pittosporum. | **Poor condition.** Impacted from clearing and high visitor usage. Provides an important buffer to the drainage line. | This is a high use area and will continue to experience impacts. |
| 2c | **Swamp Sclerophyll Forest - EEC** | This densely vegetated area is dominated by Bangalay, Tall Saw-sedge, Hillock Bush and the occasional Swamp Oak. | **Poor condition.** Clearing has occurred in the past and dumping is ongoing. Provides an important vegetated link from western vegetated areas and Kioloa Beach. | Ongoing impacts of urbanisation and high visitor usage. |
| 2d | **Bangalay Sand Forest - EEC** | This highly impacted EEC is dominated by Bangalay with scattered Forest Red Gum, Coast Banksia and Coffee Bush. | **Poor condition.** Tracks, clearing and garden plants occur throughout this EEC. Provides an important vegetated link from western vegetated areas and Kioloa Beach. | Ongoing impacts of urbanisation and high visitor usage. |
| 2e | Coastal Scrub | The frontal dune is vegetated with Coastal Wattle, Lomandra, Monotoco elliptica and Swamp Oak. | **Poor condition.** Tracks and trampling. Provides stability to the frontal dune. | This is a high use area and will continue to experience impacts. |
| 3a | Coastal vegetation | The slope of the headland is vegetated with Swamp Oak, Lomandra, Coast Banksia and introduced grasses. | **Poor condition.** Tracks and trampling. Provides stability to the frontal dune. | This is a high use area and will continue to experience impacts. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| 3b | Cleared / Coastal scrub | Partially cleared coastal scrub. | **Poor condition.** Clearing and tracks. Provides stability to the frontal dune. | This is a high use area and will continue to experience impacts. |
| 3c | **Bangalay Sand Forest – EEC** | On the spine of the two headlands patches of Bangalay Sand Forest occurs. These areas are overgrown, with a lot of old wood throughout and weed infested. | **Poor condition.** Clearing and tracks. Provides stability to the frontal dune. | This is a high use area and will continue to experience impacts. Would benefit from a low intensity burn. |
| 4 | Coastal Scrub | Occurs on the front face of the seacliff. Vegetated with Coast Banksia, Coastal Rosemary. Stunted growth due to high winds. | **Fair condition.** This remnant vegetation is fairly well protected due to its inaccessibility. Provides stability to the rock face and a vegetated coastal corridor. | Requires ongoing management. |
| 5a | **Swamp Sclerophyll Forest – EEC** | This densely vegetated forest follows a drainage line. Bangalay dominates the canopy with Sweet Pittosporum, Tall Saw-sedge Climbing Guinea Flower and Common Silkpod all common throughout. | **Poor condition.** The community has been cleared and is impacted by changes in drainage patterns and weed invasion. Provides a buffer to the drainage line and Merry Beach and stepping stone habitat with areas to the west. | This is a high use area and will continue to experience impacts. |
| 5b | **Bangalay Sand Forest - EEC** | A moderately impacted forest which has been cleared and modified along the edges. | **Poor condition.** Edge effects, tracks, trampling and weed invasion. Provides a buffer to the drainage line and Merry Beach and stepping stone habitat with areas to the west. | This is a high use area and will continue to experience impacts. |
| 5c | Cleared / Coastal scrub | This area is partially cleared and partially vegetated with low lying coastal vegetation typical of frontal dune communities. | **Poor condition.** Clearing and tracks. Provides stability to the frontal dune. | This is a high use area and will continue to experience impacts. |
| 6a | **Swamp Sclerophyll Forest – EEC** | This community is continuation of Swamp Sclerophyll Forest in 5a. It has been cleared to the top of bank and water quality is low. On the day of assessment, stockpiles of soil and rubbish were dumped along the edges of this creek. | **Very poor condition.** Clearing and substantial modification of this community has taken place. Vegetation above top of bank has been removed. Low ecological value in its current form although remaining vegetation stabilises creek banks. | Ongoing current management regimes. |
| 6b | Cleared / Modified | This area has largely been cleared and it currently contains infrastructure associated with the caravan park. Large old trees remain but the understorey is missing or comprises introduced grasses. | **Very poor condition.** Clearing and substantial modification of vegetation has taken place. Bare earth present in places. Low ecological value in its current form although large trees provide habitat for arboreal fauna. | Ongoing current management regimes. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| 7 | Park | This small remnant is grassed and mown. Silvertop Ash, Sweet Pittosporum, Black Wattle remain. | **Fair condition.** A mown area with remnant trees. Provides habitat for arboreal fauna. | Weed invasion and senescence of trees over time. |
| 8 | Cleared / Modified | Forest Road Reserve. Presence of two ponded areas and earthen mounds suggests that drainage patterns in this area have been altered to reduce flooding in the adjacent urban development. It is likely that this area would have once been Swamp Sclerophyll Forest as this EEC is present adjacent to this site. | **Fair condition.** This area has been artificially created. Weeds are present on the edges. Provides habitat for a range of fauna, including water dependent birds and amphibians. | Weed invasion. Erosion after rain events. |

| LAKE TABOURIE | | | | |
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| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| TL-27 | **Bangalay Sand Forest - EEC** | This vegetation community extends throughout much of the NE between Tabourie Creek and the ocean. Dominant canopy species are Bangalay, Old-man Banksia and Sweet Pittosporum with Lomandra, Tree Broom-heath, Snake Vine in the understorey. | **Good condition**. Large relatively intact forest although with numerous access tracks throughout. | Tracks and Trampling. |
| TL-28a,25 | **Swamp Sclerophyll Forest - EEC** | Area bordering Tabourie Creek adjacent to the Bangalay Forest and at the southern end of the caravan park are dominated by Bangalay and Swamp oak wth a dense cover of Snake Vine and Tall Saw -sedge in the understorey. | **Fair condition**. Edge effects appareent especially in the areas adjacent to the caravan park. | Weed invasion along edges. |
| TL-28b,24,30 | **Coastal Saltmarsh - EEC** | This community occurs in a small section in the NW and also along the southern boundary of the northern Council reserve. Dominated by Sea Rush and Baumea juncea grading into Swamp Oak. | **Fair condition**. High traffic areas aroundthe caravan park are more degraded. | Trampling. |
| TL-26 | Coastal Scrub | Occurs on the seaward side of the frontal dune. Comprises Coast Banksia, Coastal Rosemary and Lomandra. | **Fair condition**. Relatively intact and provides protection to the frontal dune. | Weed invasion along edges. |
| TL-16 | **Bangalay Sand Forest - EEC** | Extensive stand S of the inlet. Dominated by Bangalay, Blackbutt and Coast Banksia with Coastal Wattle and Lomandra dominating the understorey. Quite open in sections. **Endgangered species, Tangled Bedstraw (Galium australe) recorded on this land.** | **Good condition**. Relatively intact and provides good dune protection and fauna habitat. | Edge effects of urbanisation. |
| TL-19 | **Swamp Sclerophyll Forest - EEC** | Dense stand dominated by Bangalay, Black She-oak, Gahnia, Common Bracken, Dusky Coral Pea and Dianella with Blackbutt and Tick Bush on the edges. | **Fair condition**. Impacts evident from adjacent urbanisation. | Urbanisation. |
| TL-29 | Coastal Scrub | Occurs on the seaward side of the frontal dune. Comprises Coast Banksia, Coastal Rosemary and Lomandra. | **Fair condition**. Relatively intact and provides protection to the frontal dune. | Tracks |
| TL-18,21,22 | Modified | Narrow strips and grassed area spreading northwards along the western side of Tabourie Creek. | **Very poor condition**. Narrow strip with absent understorey. | Further degradation through urbanisation. |
| TL-30 | **Coastal Saltmarsh - EEC** | Located on the south side of the inlet. Dominated by Sea Rush, Isolepis unundates, Swamp Oak, Hydrocotyle bonariensis. | **Fair condition**. Relatively intact. | Trampling as it is a popular recreation area. |

| MOLLYMOOK | | | | |
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| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| 1a | **Bangalay Sand Forest - EEC** | This strip of remaining coastal vegetation is representative of Bangalay Sand Forest even though cleared and modified in sections. | **Poor condition.** The strip is mostly in poor condition due to it being a narrow band of vegetation experiencing edge effects. Erosion of the cliff line in steeper areas is also a problem. Provides an important vegetated link along the coastline. | Lack of management. Clearing and overuse are the major impacts. Poisoning and removal of trees may also be an issue. Planting of garden plants was also evident in sections. |
| 1b | Eucalypt woodland | This drier section of woodland is set back from the cliff line. | **Fair condition.** Impacts from adjacent dwellings. Clearing, dumping and weeds. Provides a buffer to the coastline. | Weed invasion, clearing and dumping. |
| 2a | Coastal vegetation | Very steep landform with only scattered vegetation clinging to the cliff face. | **Fair condition.** Impacts from adjacent dwellings and clearing of trees to maximise views. Trees provide habitat for arboreal fauna and the sparse vegetation provides a buffer to the coastline. | Tree removal and erosion. |
| 2b | **Bangalay Sand Forest - EEC** | This quite steep section of coastline continues along to Bannisters Point. Blady Grass dominates the understorey in flatter sections. Also present are Coast Banksia, Red Bloodwood and Lomandra. There is a gap in the canopy where clearing has occurred for a pump station and in front of the Bannister's Resort. These areas are primarily grassed. | **Fair condition.** Impacts from adjacent dwellings and clearing of trees to maximise views. Remaining trees provide habitat for arboreal fauna and the sparse vegetation provides a buffer to the coastline. | Vegetation modification and erosion. |
| 2c / 2d | **Bangalay Sand Forest - EEC** | These areas are located along the exposed coastal edge of Bannisters Point and vegetation is reduced in stature. | **Fair condition.** Impacts from adjacent dwellings and clearing of trees to maximise views. The vegetation provides a buffer to the coastline. | Clearing and erosion of the cliff face. |
| 3a | Coastal vegetation | Cliff face is very steep and vegetation is scarce along this section. | **Fair condition.** Impacts from adjacent dwellings and clearing of trees to maximise views. The vegetation provides a buffer to the coastline and would stabilise the cliff face. | Clearing and erosion of the cliff face. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| 3b | **Littoral Rainforest** | This area of Littoral Rainforest is managed by Council. The understorey is sparse and the occasional sedge, New Zealand Spinach and Common Silkpod occur sporadically throughout. Sweet Pittosporum, Swamp Oak and Grey Myrtle are the most common canopy species. | **Poor condition – very poor condition.** This patch of rainforest is degraded through weed invasion and lack of ongoing rehabilitation. In the Shoalhaven the majority of Littoral Rainforest has been cleared so this patch is an important remnant. | Inconsistent follow up rehabilitation. |
| 3c | Coastal vegetation | Swamp Oak and Coast Banksia dominate this section. | **Poor condition.** This vegetation is degraded and trees appear stressed. Provides a vegetated link along the coastline. | Weed invasion and impacts which are causing this vegetation to appear stressed. |
| 4a | **Swamp Sclerophyll Forest - EEC** | Narrow Swamp Sclerophyll Forest follows the unnamed creek. The creek banks are bare and eroded. | **Poor condition.** Modified and impacted due to the pressures of urbanisation. Provides a vegetated link along the coastline. | Water quality, changes to drainage patterns and weed invasion. |
| 4b | **Bangalay Sand Forest - EEC** | 4a merges into a degraded narrow strip of Bangalay Sand Forest which has been cleared and is currently mown along the edges. The eastern edge merges into low coastal scrub. | **Poor condition**. Modified and impacted due to the pressures of urbanisation. Provides a vegetated link along the coastline. | Water quality, changes to drainage patterns and weed invasion. |
| 4c | Turpentine – Blackbutt Forest | Behind 4a and 4b, Turpentine and Blackbutt Forest occurs. | **Poor condition.** Modified and impacted due to the pressures of urbanisation. Provides a vegetated link along the coastline. | Water quality, changes to drainage patterns and weed invasion. |
| 5a | **Swamp Sclerophyll Forest - EEC** | This community occurs around a ponded area and has wetter influences such as Grey Myrtle. The area is weed infested and the ponded area is full of rubbish and is covered in brown algae. | **Very poor condition.** Modification, poor water quality and severe weed invasion have badly degraded this area. Is a part of a vegetated link to the west. | Water quality, changes to drainage patterns and weed invasion. |
| 5b | **Bangalay Sand Forest - EEC** | This forest is badly degraded and weed infested especially with Japanese Honeysuckle, *Senna* sp. and Asparagus Fern. | **Very poor condition.** Modification, poor water quality and severe weed invasion have badly degraded this area. Is a part of a vegetated link to the west. | Water quality, changes to drainage patterns and weed invasion. |
| 5c | Cleared | A large cleared and ponded area occurs in the north of the reserve where it borders Carroll Avenue. | **Very poor condition.** Modification, poor water quality and severe weed invasion have badly degraded this area. Would potentially provide habitat for a range of water dependent species. | Water quality, changes to drainage patterns and weed invasion. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| 6 | Blackbutt –Turpentine Forest | This community follows an unnamed creek. Black She-oak, Large-leaf Hop-bush and Red Bloodwood also occur with the Blackbutt and Turpentine. | **Fair condition.** Even though this area has tracks throughout and minor dumping it is still in fair condition with good biodiversity values. Provides a relatively intact vegetated link along the unnamed creek. | Water quality, dumping and weed invasion from surrounding development. |
| 7 | Blackbutt –Turpentine Forest / Cleared | Blackbutt – Turpentine Forest continues from 6 in to this reserve. The southern 75% has been cleared and only trees along the road edges remain. | **Poor condition.** Clearing and modification have degraded this area. Trees along the boundaries provides a vegetated link to areas west. | Weed invasion and lack of rehabilitation. |
| 8 | Modified | This sporting oval is fringed by vegetation. Swamp Oak and *Acacia* sp. occur along the southern edge and Bangalay in the north-west corner. This area is mown. | **Poor condition.** Cleared and mown. Also dumping and weed infestations in sections. Few ecological values. | Further weed invasion. |
| 9 | Blackbutt –Turpentine Forest | Occurs as small patches of trees interspersed with mown areas. | **Poor condition.** Dumping and garden plants common throughout. Provides stepping stone habitat for mobile species. | Further impacts from adjacent dwellings. |
| 10 | Blackbutt –Turpentine Forest / Cleared | Large section cleared for the pump station. Mollymook Creek flows along the northern boundary of this site and vegetation shows wetter influences, with Tall Saw-sedge and Callicoma becoming common. | **Poor condition.** Clearing of vegetation. Provides narrow vegetated buffer upslope of Mollymook Creek. | Poor water quality, spread of weeds. |
| 11 | Coastal Scrub | This area is typical of coastal scrub on the frontal dunes. Dominated by Coast Banksia and Coastal Wattle. | **Poor condition.** Tracks and clearing. Provides a vegetated coastal link . | Track formation, erosion, tree clearing and weed spread. |

| NARRAWALLEE & MILTON | | | | |
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| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| 1a | Blackbutt – Turpentine Woodland | This area is dominated by Blackbutt with Turpentine as a subdominant. The understorey is intact with Gahnia, Common Bracken, Lomandra, Narrow-leaved Geebung and Sydney Golden Wattle occurring throughout. | **Fair condition.** Although this area is largely intact there is evidence of edge effects where it adjoins urban development. It provides an important buffer to the Bangalay Sand Forest to the north-west and Swamp Sclerophyll Forest to the south-east. | Edge effects from adjacent urbanisation. |
| 1b | **Swamp Sclerophyll Forest - EEC** | SSF along a drainage line from Leo Drv to Land Number 2b and 2c. Dominated by Swamp Mahogany in the canopy and Blady Grass, Raspwort, Lepidosperma laterale, Gahnia and Curly Wig in the dense understorey. | **Good condition**. Apart from minor weed spread at the urban boundary this EEC is in good condition. It is an EEC that provides an important corridor. | Impacts from urbanisation, including weed invasion, runoff and formation of tracks. |
| 2a | **Bangalay Sand Forest – EEC** | BSF adjacent to Narrawallee Inlet. Burnt in Dec 2008. Dominated by Bangalay with Blackbutt occurring less commonly. Understorey dominated by Common Bracken reflecting its recent fire history. Also common were Curly Wig, Raspwort and Old-man Banksia. | **Fair condition.** Area is used as an informal camping and fishing site. It is a substantial remnant that links the estuary environment with contiguous vegetation communities to the south. | Proximity to urbanisation and informal use has resulted in track formation, burning and rubbish dumping. |
| 2b | Blackbutt – Turpentine Woodland | Dominated by Blackbutt with Turpentine subdominant. Swamp Oak closer to the waterways. Understorey intact with Gahnia, Common Bracken, Lomandra, Narrow-leaved Geebung and Sydney Golden Wattle throughout. | **Good condition**. Relatively weed-free and intact away from tracks and fishing sites. This site is part of a large remnant forest in a largely cleared landscape. | Weed invasion, too frequent fire, rubbish dumping, track formation. |
| 2c | Blackbutt – Turpentine Woodland | This area is dominated by Blackbutt with Turpentine as a subdominant with occasional Swamp Mahogany. Common Silkpod is a common climber. | **Good condition.** Relatively weed-free and intact away from tracks and fishing sites. This site is part of a large remnant forest in a largely cleared landscape. | Weed invasion, too frequent fire, rubbish dumping, track formation. |
| 3a | Blackbutt – Turpentine Woodland | Large remnant Blackbutt and Turpentine. Understorey of Sweet Pittosporum, Dichondra, Climbing Guinea Flower, Native Raspberry and *Glycine.* Wetter in the central and east with greater incidence of Sweet Pittosporum, Snake Vine and Parsonsia. | **Fair condition**. Weeds occur along the frequent tracks and minor dumping is evident throughout. It is a substantial remnant that links the estuary environment of Narrawallee to the west. | Weed invasion, too frequent fire, rubbish dumping, track formation. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| 3b | **Bangalay Sand Forest – EEC** | This Bangalay dominated community occurs in the north-east of this large remnant. Canopy also contains scattered Blackbutt. The understorey is dominated by Coffee Bush, Common Bracken, Narrow-leaved Geebung and Common Silkpod. | **Fair condition**. Weeds along the NE edge where it abuts an informal oyster camp. The community is an EEC and is a part of a substantial remnant that links the estuary environment of Narrawallee to the west. | Weed invasion, too frequent fire, rubbish dumping, track formation. |
| 3c | **Coastal Saltmarsh – EEC** | This community occurs in two sections separated by Grey Mangroves. It is dominated by Sea Rush, *Sarcocornia quinqueflora* and *Suaeda australis* with Swamp Weed and Sand Couch occurring around the edges. | **Good condition**. Relatively weed-free and intact. This site is part of a large remnant forest in a largely cleared landscape and Coastal Saltmarsh communities are important from a fisheries perspective. | Saltmarsh communities are susceptible to run off and sedimentation. |
| 3d | **Bangalay Sand Forest – EEC** | Dominated by Bangalay with Rough-barked Apple scattered throughout. The midstorey has Old-man Banksia and Coastal Banksia. Understorey underscrubbed or grazed - sparse with Lomandra, Climbing Guinea Flower and Common Bracken. | **Fair condition.** Weeds occur along the edges and much of the understorey has been removed probably through grazing over time. | Weed invasion, too frequent fire, rubbish dumping, track formation. |
| 3e | Cleared / Blackbutt –Turpentine Forest | A remnant Blackbutt – Turpentine forest grades into Bangalay Sand Forest (3d) to the east. | **Fair condition**. Forested area has impacts along the edges but is intact. It provides remnant vegetation in an otherwise cleared landscape. | Weed invasion, gazing and nutrient enrichment from adjacent agriculture. |
| 3f | **Swamp Oak Floodplain Forest - EEC** | Narrow band of SOF dominates the top of bank of a drainage line. Blackbutt occurs very sporadically. Clearing has occurred right up to the SOF but some native understorey occurs including Wombat Berry, Bordered Panic, Purple Coral Pea and Whiteroot. | **Poor condition**. Clearing and grazing have resulted in degradation of this EEC. | Weed invasion, gazing and nutrient enrichment from adjacent agriculture. |
| 4a | **Swamp Oak Floodplain Forest - EEC** | This area is dominated by Swamp Oak with an open understorey. This areas appears to be grazed as the Lomandra shows signs of foraging. This area merges into the Coastal Saltmarsh and mangrove community to the east. | **Poor condition.** Clearing and grazing have resulted in degradation of this EEC. | Weed invasion, gazing and nutrient enrichment from adjacent agriculture. |
| 4b | Cleared / Blackbutt –Turpentine Forest | The remainder of this block has been cleared for agricultural purposes except for a remnant Blackbutt – Turpentine forest on the eastern border. | **Fair condition**. Forested area has impacts along the edges but is intact. It provides remnant vegetation in an otherwise cleared landscape. | Weed invasion, gazing and nutrient enrichment from adjacent agriculture. |
| 5a | Cleared | This section of this block has been completely cleared for agricultural purposes. | **Very poor condition**. Currently used for agriculture and unlikely to be restored. | Ongoing agriculture. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| 5b | **Bangalay Sand Forest – EEC** | This community is a continuation of the Bangalay Sand Forest on the adjacent block. This narrow section is more degraded due to weed invasion and proximity to cleared paddocks. | **Fair condition**. Weeds occur along the edges and much of the understorey has been removed probably through grazing over time. | Weed invasion, rubbish dumping, track formation. |
| 6 | Cleared / Modified | Block has been cleared for agriculture. | **Very poor condition**. Currently used for agriculture and unlikely to be restored. | Ongoing agriculture. |
| 7a | Cleared / Modified | Block has largely been cleared for agriculture. There are pockets of vegetation remaining or as a result of regeneration. | **Very poor condition**. Currently used for agriculture and unlikely to be restored. | Ongoing agriculture. |
| 7b | **Milton Ulladulla Subtropical Rainforest - EEC** | Rock bench leading down to a much degraded creekline which appears to have retained much degraded elements of this EEC including Lilly Pilly, Cheese Tree, Wonga Wonga Vine, Sweet Pittosporum and Black Wattle. | **Very poor condition.** Currently used for agriculture and unlikely to be restored. | Ongoing agriculture. |
| 7c | **Milton Ulladulla Subtropical Rainforest - EEC** | Small section of remnant EEC at the sthn end of a degraded gully. Species include Giant Stinging Tree, Wallaby Apple, Cheese Tree, White Cedar, Wonga Wonga Vine, Sweet Pittosporum, Black Wattle and *Carex* sp. along the boundary with paddocks. | **Very poor condition.** Currently used for agriculture and unlikely to be restored. | Ongoing agriculture. |
| 8 | **Milton Ulladulla Subtropical Rainforest - EEC** | Milton Rainforest Reserve is undergoing massive restoration and regeneration works to restore this EEC. Massive infestations of Lantana occur throughout. 20 species of rainforest flora are listed as occurring. | **Poor condition**. Although this gully area is currently in poor condition there are ongoing large scale works being undertaken to restore and rehabilitate this EEC. This EEC is spatially restricted and has been cleared. | Ongoing weed invasion although large scale restoration of this area is being undertaken. Re-infestation of weeds is a threat with non-consistent follow up of primary weed control. |

| ORIENT POINT | | | | |
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| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| OP-50 | **Swamp Sclerophyll Forest - EEC** | Small patch dominated by SL Privet and Lantana but with elements of SSF including Bangalay, Snake Vine, Tall Sedge, Spiny-head Mat-rush, Wombat Berry, Bordered Panic and Whitetroot. Borders degraded and eroded drainage line/creek. | **Very poor condition.** | Weed infestation high levels of erosion |
| OP-49 | Scribbly Grum - Red Bloodwood forest | Forest of Scribbly Gum, Red Bloodwood, Bangalay and Swamp Oak. Other trees include Cherry Ballart, Sweet Pittosporum. Understorey has Prickly Beard-heath, Lomandra, Themeda, Dianella and Common Bracken. Grey Mangroves border this area to the south. | **Fair condition.** Intact forest providing good connectivity along shoreline. | Weed invasion. |
| OP-51 | Modified | Mown grassed area with scattered Blackbutt on a weed infested slope down to the river. Weeds include Fishbone and Asparagus Fern and SL Privet. Nthn end dominated by Swamp Oak along shoreline, joining Grey Mangrove. | **Very poor condition.** Modified, weed infested. Does provide some fauna habitat. | Weed invasion and senescence of trees. |
| OP-52 | Modified | Blackbutt and Swamp Oak with a very weedy understorey including Kikuyu, introduced succulents, Norfold Island pines, Fishbern Fern and African Lily. | **Very poor condition**. Modified, weed infested. Does provide some fauna habitat. | Weed invasion and senescence of trees. |
| OP-53 | **Coastal Saltmarsh – EEC** | CS dominated by Sea Rush, Saltwater Couch, Chorizandra cymbaria and Isolepsis inundates. Grades into Grey Mangrove to the W and SW. To the east is a weed infested slope leading to urban development. Swamp Oak borders the margins. | **Poor condition**. Vehicle tracks throughout with weed infestations upslope and along the edges of the area | Urbanisation. |
| OP- 54, 55, 56 | Degraded and/or Modified | Dominated by SOF with understorey either absent or if present, weedy. Some native species present along margins including Blady Grass, Themeda, and NZ Spinach. Other plants include Kangaroo Grape, Coast Banksia and Swamp Oak along margins. | **Very poor condition**. Severely degraded through inappropriate use including dumping, burning and tracks. A healthier and more intact forested area is present behind the thin coastal strip and outside the reserve. | Urbanisation. |
| OP-58a | Modified | Sports field. | **Poor Condition**. | Spread of weeds from here to other areas. |
| OP-58b | Bloodwood-Stringybark Woodland | Woodland area dominated by Swamp Oak, *Melaleuca hypericifolia,* Sweet Pittosporum, Blady Grass, Themeda, Dianella and Lomandra. | **Fair condition.** | Edge effects. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| OP-59 | Modified | Car park and grassed area with landscaped plants including natives such as Coast Banksia, Swamp Oalk and various Watt,e Tick Bush, Lomandra, Coastal Rosemary and Prickly Beard-heath. | **Poor condition.** Although does provide some connectivity with vegetated areas to the west and east. | None apparent. |
| OP-60 | Swamp Oak | Swamp Oak dominated with a grassy understorey although not considered the EEC Swamp Oak Forest as there are no forbs present and the understorey is dominated by Phalaris. Coastal Teatree and Hillock Bush are scattered along the margins. | **Very poor condition**. Weed infestation and monoculture of trees. Would provide some fauna resources and protect more intact vegetation communities to the south. | Weed invasion. |
| OP-61 | Coastal Scrub | Area dominated with Coastal Scrub and grassed areas dominated by Coast Banksia and Coastal teatree although denser areas of treeless heath dominate towards the SW. | **Fair condition**. Some areas intact. Provides good fauna habitat for small birds and good protection of the frontal dune. | Weeds and trampling. |
| OP-63 | Coastal Scrub | More disturbed area compared to OP-61. Lots of Bitou Bush and other weeds. Disturbed understorey throughout. Swamp Oak and Coast Banksia evident throughout. Bush regeneration being undertaken in sections. | **Poor condition.** Protects dune system and provides some fauna habitat. Would benefit from further bush regeneration. | Weeds and erosion. |

| SANCTUARY POINT | | | | |
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| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| 1 | **Bangalay Sand Forest - EEC** | This narrow strip of EEC follows the foreshore. Dominated by Bangalay although Spotted Gum also occurs in areas of higher elevation. | **Poor condition.** A narrow remnant clinging to the cliff line. Erosion and weed invasion are common. Provides a vegetated link around Erowal Bay. Tree hollows within some of the Spotted Gum also provide arboreal habitat. | Erosion and clearing to maintain views. |
| 2 | Cleared and modified | This area may have supported Bangalay Sand Forest. Since then it has been cleared and only a number of trees remain, the majority of which are Spotted Gum. Largely a grassed understorey. | **Poor condition.** Cleared grassed area with few of the original ecological features remaining. Hollows in trees provide habitat for arboreal fauna. | Senescence of trees. Replacement planting is required to ensure ongoing presence of trees into the future. |
| 3 | **Swamp Oak Floodplain Forest - EEC** | This is a badly degraded remnant Swamp Oak forest. | **Very poor condition.** This area has been severely impacted through trampling and overuse. Provides a buffer to St Georges Basin. | Lack of management. Ongoing ease of access. |
| 4 | **Bangalay Sand Forest - EEC** | Modified strip of EEC along the cliff line and foreshore. Some understorey species remain but in general is either cleared or weedy. | **Poor condition.** A narrow remnant clinging to the foreshore. Erosion and weed invasion are common. Provides a vegetated link around Erowal Bay. Tree hollows within some of the Spotted Gum also provide arboreal habitat. | Erosion, weed invasion and clearing to maintain views. |
| 5 | Cleared and modified | Mostly cleared area which is maintained as parkland, boat ramp and car parking. Some large old trees remain. | **Poor condition.** Cleared and modified. Trees would provide habitat for arboreal fauna. | Senescence of trees without replacement planting. |
| 6 & 7 | **Bangalay Sand Forest - EEC** | These areas are narrow modified strips of what would have once been extensive Bangalay Sand Forest. | **Poor condition.** These narrow strips of modified EEC are impacted by edge effects and some erosion. Provides a buffer to Paradise Beach and St Georges Basin. | Erosion, weed invasion and clearing to maintain views. |
| 8 | **Swamp Oak Floodplain Forest - EEC** | This is a degraded narrow remnant Swamp Oak forest. | **Poor condition.** This area has been impacted through trampling and overuse. Provides a buffer to St Georges Basin. | Lack of management. Ongoing ease of access. |
| 9 | **Bangalay Sand Forest - EEC** | These areas are narrow modified strips of what would have once been extensive Bangalay Sand Forest. The area around Palm Cove is the most modified with extensive clearing and modification. Steeper areas along the cliff line are in better condition. | **Poor condition.** These narrow strips of modified EEC are impacted by edge effects and erosion. Provides a buffer to Paradise Beach and Palm Cove. | Erosion, weed invasion and clearing to maintain views. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| 10 | Cleared and modified | Areas around Mackans Point are degraded. The majority of trees have been removed. Some shrubs remain. | **Poor condition.** Cleared and modified. Provides a semi-vegetated link along St Georges Basin. | Erosion, weed invasion and clearing to maintain views. |
| 11 & 12 | Modified patches/**Swamp Oak Floodplain Forest - EEC** | The low lying areas support patches of this EEC. This community would have been extensive before urbanisation. Some of the Swamp Oak are substantial trees. Buffalo Grass comprises the understorey. | **Poor condition.** This area has been impacted through trampling and clearing. Provides a buffer to St Georges Basin | Lack of management. Ongoing impacts from residents and visitors. |
| 13 | Cleared and modified | These areas have been cleared and maintained as grassed and mown areas. Scattered large Swamp Oaks remain throughout. | **Poor condition.** Cleared and modified. Provides a semi-vegetated link along St Georges Basin. | Weed invasion and clearing to maintain views. |
| 14 | Cleared and modified | Boobook Reserve is maintained as a mown parkland. Trees remaining include Bangalay and Blackbutt with clumps of Blady Grass and Sweet Pittosporum around the trees. Some landscaping has been undertaken with Coast Banksia and Climbing Guinea Flower. | **Poor condition.** This area is maintained as a park. Trees provide habitat for arboreal fauna and a link along St Georges Basin. | Senescence of trees, without tree replacement, as much of the understorey is mowed or cleared. |
| 15 / 17 | **Swamp Oak Floodplain Forest - EEC** | These modified patches are dominated by Swamp Oak with *Juncus usitatus* understorey. Also present are Common Silkpod and Swamp Weed. | **Poor condition.** This area has been impacted through trampling and clearing. Provides a buffer to St Georges Basin. | Lack of management and ongoing human impacts. |
| 16 | **Coastal Saltmarsh - EEC** | This low lying area which borders the Swamp Oak Forest supports a small Saltmarsh community. This area is dominated by *Sarcocornia quinqueflora* with Mangroves bordering the Basin. | **Poor condition.** This area is heavily used by visitors and residents. Tracks, trampling and rubbish occur throughout this small patch of Saltmarsh. Saltmarsh community provides an important buffer to St Georges basin. It stabilises the shoreline and reduces erosion. | Lack of management and ongoing human impacts. |
| 18 | Cleared and modified | The majority of this area has been cleared and is maintained as mown lawn. There are patches of Swamp Oak which indicate that Swamp Oak Floodplain Forest was widely spread along this section of the Basin. The understorey is dominated by Buffalo Grass. | **Poor condition.** This area has been impacted by tracks, clearing and weeds. In its present form it has few ecological value. | Lack of management, urbanisation and ongoing impacts. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| 19 | **Coastal Saltmarsh - EEC** | This relatively large area of Saltmarsh is dominated by *Sarcocornia quinqueflora* with sedges scattered around the margins. | **Very poor condition.** This area is heavily impacted by tracks, vehicles and trampling. Dumping and small fires also are evident. Saltmarsh community provides an important buffer to St Georges basin. It stabilises the shoreline and reduces erosion. | Lack of management and ongoing impacts. |

| SANCTUARY POINT SE - WRIGHTS / BREAM BEACH | | | | |
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| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| 1 | Scribbly Gum – Grey Ironbark Open Woodland | An open woodland dominated by Scribbly Gum and Grey Ironbark which grades into an Old-man Banksia - Blackbutt - Scribbly Gum open woodland with Lesser Flannel Flower and Heath-leaved Banksia in the understorey. Parts have recently been burnt. | **Poor condition.** The open woodland has been impacted by the adjoining caravan park. Fire has also impacted this area. Provides a vegetated link along St Georges Basin. | Clearing and overuse are the major impacts. |

| SHOALHAVEN HEADS | | | | |
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| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| SH-98 | Modified | Narrow roadside plantings of Camphor Laurel. | **Very poor condition** although would provide some fauna habitat | None |
| SH-97 | Modified | Mown grassed strip with scattered Swamp Oak and bordered by Grey Mangroves. | **Very poor condition** although would provide some fauna habitat. | Senescence of trees & weed invasion. |
| SH-84 | Modified | Mown grassed strip with scattered Swamp Oak and bordered by Grey Mangroves with seagrass beds offshore. | **Very poor** although provides narrow linear connection along Shoalhaven River. | Senescence of trees & weed invasion. |
| SH-83 | Modified Bangalay / Coastal Banksia | Narrow strip of Bangalay / Coast Banksia with a disturbed understorey comprised predominately of mown grass but with scattered Burrawang and Lomandra. | **Fair condition**. Provides narrow linear connection along Shoalhaven River and protects foreshore. | Senescence of trees & weed invasion. |
| SH-80 | **Swamp Oak Forest - EEC** | Small patch of Swamp Oak Forest in low-lying slight depression adjoining caravan park. Dominated by Swamp Oak and Common Reed. | **Very poor condition**. Badly degraded through weed invasion and adjacent development. Surrounding ground levels may have been altered. | Poor water quality & weed invasion. |
| SH-81 | **Bangalay Sand Forest - EEC** | Bangalay dominated woodland with Coast Banksia, Lomandra, Bracken and Red Cedar scattered throughout. Degraded patch with modified areas and few understorey plants. Weeds include Blackberry and Lantana. | **Poor condition**. Appears to be late successional. Poor to moderate with improvement towards the frontal dune. | Weed invasion and trampling. |
| SH-81 | Coastal Scrub | Frontal dune vegetation includes Coast Banksia, Lomandra, Coastal Wattle, Coastal Tea Tree, Hydrocotyle bonariensis, Hairy Spinifex and Tree Broom-heath. | **Fair condition**. Good majority intact and provides narrow linear corridor and protection of the frontal dune. | Weed invasion and trampling |
| SH-82 | Bangalay Sand Forest - EEC | Bangalay dominated woodland with Lantana, Hairy Clerodendrum, Panic Veldtgrass, Lomandra and Snake Vine located between golf course and frontal dune. | **Very poor condition**. Weed infested and degraded. | Weed invasion and trampling. |
| SH-82 | Coastal Scrub | Frontal dune vegetation includes Coast Banksia, Lomandra, Coastal Wattle, Coastal Tea Tree, Hydrocotyle bonariensis, Hairy Spinifex and Tree Broom-heath. | **Poor condition.** Weed infested on leeward side of frontal dune but relatively intact and provides narrow linear corridor and protection of the frontal dune. | Nutrient enrichment from golf course and further weed invasion |
| SH-85 | Modified | Vic Zealand Park with fringing trees of Bangalay, Coast Banksia, Lantana, Bracken, Lomandra, Climbing Guinea Flower, Kangaroo Grass. | **Poor condition.** Little value but does provide habitat trees. | Further weed invasion. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| SH-88 | **Bangalay Sand Forest - EEC** | Bangalay dominated but extensively weed infested with impenetrable thickets of Lantana. Also present are Coast Banksia, Snake Vine, Bracken, Wild Tobacco Bush. | **Very poor condition.** Extensive weed infestation. | Further weed invasion and senescence of trees. |
| SH-87 | **Swamp Oak Forest - EEC** | Swamp Oak Woodland completely infested with Lantana. Also present are Sweet Pittosporum, Bracken, Panic Veldtgrass. Broadleaf Cumbungi instream. | **Very poor condition.** Extensive weed infestation. | Further weed invasion, poor water quality and senescence of trees. |
| SH-89 | **Swamp Sclerophyll Forest - EEC** | Bangalay dominated woodland with trees covered in Common Silkpod with Gahnia dominant in the understorey. Bordered Panic, Bracken, Hydrocotyle bonariensis and Cassytha glabella were also present. | **Poor condition**. Limited weed infestation compared to other communities within this reserve. | Weed invasion and poor water quality. |
| SH-86 | Modified | Pepper Reserve - park with mown lawn with scattered Bangalay, Rough-barked Apple. Lomandra and Blady Grass at base of trees. | **Very poor condition** although does provide habitat trees. | Weed invasion. |
| SH-90 | **Bangalay Sand Forest - EEC** | Bangalay dominated woodland to the immediate north, east and west of the sewage treatment plant. Limited understorey of Bracken, Tree Broom-heath, Coast Banksia, Rough-barked Apple and Blady Grass but predominately Lantana infested throughout. | **Poor condition** although still retains pockets of intact vegetation. | Senescence of trees. |
| SH-91 | Modified | Very narrow strip of scattered Bangalay with severe infestation of Lantana and Blady Grass along creekline. | **Very poor condition**. Creek highly modified. | Poor water quality and weed infestation. |
| SH-92 | **Swamp Sclerophyll Forest - EEC** | Swamp Mahogany dominated forest. Intact native understorey of Gahnia, Kangaroo Grass, Swamp Paperbark, Sydney Golden Wattle and Maiden's Wattle. Bordered by Bangaly Sand Forest to the east and Sydney Freshwater Wetlands to the west. | **Good condition**. An excellent example of an intact Swamp Sclerophyll Forest. | None apparent but impacts could arise from neighbouring land use. |
| SH-93a | **Sydney Freshwater Wetland - EEC** | Part of Coomoderry Swamp with sedge beds of Jointed Twig-rush, Eleocharis sphacelata, Lepidosperma laterale with Swamp Mahogany and Swamp Oak scattered along the margins and Paperbark clumps. Bordered by paddocks to the W and SSF to the east. | **Good condition.** Excellent - Few obvious impacts of neighbouring development. | None apparent but urbanisation may alter over time. |
| SH-93b | Modified | Agricultural usage | **Very poor condition.** Cleared and changes to drainage. | Further degredation which could affect adjacent areas. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| SH-94a | **Bangalay Sand Forest - EEC** | Old-man Banksia and Blueberry Ash dominated forest with scattered Bangalay. Understorey dominated by Common Bracken, Lomandra, Dusky Coral Pea, Tree Broom-heath. | **Good condition** although weeds increase towards Gerroa Road | Weed invasion. |
| SH-94b | **Swamp Oak Forest - EEC** | Swamp Oak woodland along creekline. Dominated by Swamp Oak. Weedy and degraded towards road crossing on southern end. | **Fair condition**. | Changes to hydrology causing reduced water quality. |
| SH-96 | Forest Red Gum Woodland | Forest Red Gum woodland with Lantana infested and grassy understorey on the steep slopes of Coolangatta Mountain. Also present were Wonga Wonga Vine, Devious Bent-grass, Common Maidenhair, Weeping Grass and Kidney Weed. | **Poor condition**. Weed infested with erosion occuring where bare earth is exposed. | Further weed invasion. |

| ST GEORGES BASIN | | | | |
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| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| 1a | **Swamp Sclerophyll Forest - EEC** | This EEC follows Tomerong Creek which flows from the north to the mouth of Erowal Bay. Vegetation becomes denser away from The Wool Road. | **Poor condition.** This section of the EEC is in poor condition due to clearing for construction of The Wool Road, piping of the creek under the road and encroachment of weeds. Provides an important vegetated link along Tomerong Creek from the north to St Georges Basin. | Lack of management and ongoing human impacts. |
| 1b | Cleared | This area has been cleared between the EEC and housing to the west. | **Poor condition.** Cleared weedy area. It has few ecological values. | Weed invasion. |
| 2a | **Swamp Sclerophyll Forest - EEC** | This remnant EEC adjoins Sanctuary Point Road and is degraded along this edge. It is dominated by Bangalay, Red Bloodwood, Tall Saw-sedge, Large-leaf Hop-bush and Black Wattle. | **Poor condition.** Degraded along Sanctuary Point Road where levels have been altered during road construction. Provides a buffer to St Georges Basin from development. | Edge effects where it adjoins Sanctuary Point Road. |
| 2b | Spotted Gum – Grey Ironbark Open Woodland | This dry open woodland is dominated by Spotted Gum and Grey Ironbark but Turpentine and Blackbutt also occur. The understorey is heavily impacted. | **Poor condition.** There are tracks which provide vehicle access part way into the reserve. Dumping of building refuse and household refuse is widespread. Provides a buffer to St Georges Basin. | Lack of management. Further dumping and weed invasion. Closure of the tracks should be considered. |
| 2c | **Swamp Sclerophyll Forest - EEC** | This EEC follows Tomerong Creek which flows from the north to the mouth of Erowal Bay. Vegetation becomes denser away from The Wool Road. | **Poor condition.** This remnant EEC is degraded due to weed invasion and track formation. Is a part of a larger vegetated area. | Weed invasion and poor water quality |
| 3 | Spotted Gum – Ironbark | This narrow strip of Spotted Gum and Grey Ironbark occurs along the southern side of Tomerong Creek. Some Spotted Gum contain hollows. | **Poor condition.** This area has been cleared and now occurs as a narrow strip. Trees would provide some habitat for arboreal fauna and a link along Tomerong Creek. | Senescence of trees, without tree replacement, as much of the understorey is mowed or cleared. |
| 4a | **Swamp Sclerophyll Forest - EEC** | EEC adjoins Sanctuary Point Oval. It is likely that the oval was also once Swamp Sclerophyll Forest. Blackbutt and Bangalay dominate the canopy with Tall Saw-sedge and Black Wattle also common throughout. | **Poor condition.** This remnant EEC faces pressure from the adjoining golf course, oval, urbanisation, road and clearing. Provides patch of vegetation in a fragmented landscape. | Pressures associated with urbanisation and clearing. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| 4b | Spotted Gum – Bangalay modified woodland | The majority of the western and north-western areas of this reserve have been cleared and only clumps of trees remain. Weeds occur throughout. | **Poor condition.** Only trees remain with little understorey. Weed species are common. Provides a patch of vegetation in a fragmented landscape. | Human induced impacts from neighbouring development. |
| 4c | **Swamp Sclerophyll Forest - EEC** | Remnant EEC occurs as a narrow strip along a drainage line. Bare areas and weeds are common. | **Poor condition.** Narrow strip of remnant EEC impacted by clearing and the adjacent road. Provides a vegetated stepping stone link to the north. | Weed invasion and run off from the road and sports oval. |
| 5a | **Swamp Sclerophyll Forest - EEC** | Remnant EEC is a continuation of Swamp Sclerophyll Forest mapped in 4a and 4c. | **Poor condition.** Narrow strip of remnant EEC impacted by clearing and the adjacent road. Provides a vegetated stepping stone link to the north. | Weed invasion and run off from the road and sports oval. |
| 5b | Spotted Gum – Bangalay modified woodland | The majority of the western and north-western areas of this reserve have been cleared and only clumps of trees remain. Weeds occur throughout. | **Poor condition.** Trees remain with little understorey as the area is mowed. Weed species are common. Provides a patch of vegetation in a fragmented landscape. | Impacts from neighbouring development. |
| 6 | Spotted Gum – Ironbark | This narrow strip of Spotted Gum and Grey Ironbark occurs along the southern side of Tomerong Creek. Some Spotted Gum contain hollows. | **Poor condition.** This area has been cleared and now occurs as a narrow strip. Trees would provide some habitat for arboreal fauna and a link along Tomerong Creek. | Senescence of trees, without tree replacement, as much of the understorey is mowed or cleared. |
| 7a | **Coastal Saltmarsh - EEC** | A small patch of saltmarsh occurs on a small point on Erowal Bay. It is *Sarcocornia quinqueflora* dominated with Saltwater Couch occurring on the drier margins. Mangroves and Common Reed are also present. | **Poor condition.** This is a popular fishing spot and consequently sections are trampled and rubbish is strewn around. Has also been impacted by the low intensity fire in adjacent communities which occurred in 2006. Saltmarsh community provides an important buffer to Erowal Bay. | Lack of management and ongoing impacts from fishers. |
| 7b | **Swamp Oak Floodplain Forest - EEC** | The southern sections of this community were burnt in 2006 and are now recovering. Swamp Oak dominates with Common Reed and Tall Saw-sedge occurring also. This community is divided in two by a very degraded vehicle access track. On the day of assessment it was wet and very boggy. | **Poor condition.** Degraded through burning, weeds on edges and vehicle access track. This community provides a buffer to Erowal Bay. | Lack of management, urbanisation, 4WD track and other ongoing impacts. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
|---|---|---|---|---|
| 7c | **Swamp Sclerophyll Forest - EEC** | Swamp Sclerophyll Forest grades into the Swamp Oak Forest in a number of places but is most dominant as a patch along the northern boundary. The understorey is dense with Tall Saw-sedge, Coffee Bush and Common Silkpod common throughout. | **Poor condition.** This area has been impacted by tracks, clearing and weeds. This is part of a larger patch of vegetation. | Lack of management, urbanisation and ongoing impacts. |
| 8a | **Swamp Oak Floodplain Forest - EEC** | A narrow strip of Swamp Oak which borders Erowal Bay. A track traverses the eastern edge of this community. Further south the reserve has been cleared for parkland and a pumping station. | **Poor condition.** This narrow strip is degraded through clearing, uncontrolled human access and urbanisation. Provides a buffer to Erowal Bay. | Lack of management, urbanisation and ongoing impacts. |
| 8b | **Swamp Sclerophyll Forest - EEC** | This Swamp Sclerophyll Forest has been cleared on the western and southern sides which now contain parkland and a pumping station. The remnant has a fairly open understorey with Lomandra and scattered throughout. | **Poor condition.** Degraded through clearing and urbanisation. Tracks, trampling, weed invasion and dumping. Provides a buffer to Erowal Bay and an unnamed drainage line. | Lack of management, urbanisation and ongoing impacts. |
| 9 | **Swamp Sclerophyll Forest - EEC** | This is a continuation of the Swamp Sclerophyll mapped in 8b. It follows the unnamed drainage line to the east. This community is more densely vegetated. | **Fair condition.** There are tracks, dumping, changes to drainage and clearing along the edges associated with adjacent dwellings. Provides an important vegetated link through to Gurumbi Nature Reserve. | Lack of management, urbanisation and ongoing impacts. |
| 10a | **Swamp Oak Floodplain Forest - EEC** | This narrow strip borders the Worrowing Waterway. It is a Swamp Oak dominated system with sedges in the understorey. | **Poor condition.** Degraded through clearing and track formation. Provides a buffer to Worrowing Waterway. | Lack of management, urbanisation and ongoing impacts. |
| 10b | **Swamp Sclerophyll Forest - EEC** | EEC occurs behind the Swamp Oak Forest bordering Worrowing Waterway. It consists of Bangalay with very dense understorey of Tall Saw-sedge. Spotted Gum also occurs on the drier margins. | **Poor condition.** Degraded through clearing and track formation. Provides a buffer to Worrowing Waterway. | Ongoing impacts from urbanisation. |
| 10c | Scribbly Gum – Ironbark open woodland grading down to Spotted Gum open woodland | Scribbly Gum dominates in the northern section of this area but grades into Spotted Gum down slope. Many of these trees contain hollows. In sections the understorey is intact, and is characterised by Black She-oak, Hairpin Banksia, Needlebush, Kangaroo Grass. There are also some large cleared grassy areas. | **Fair condition.** There is clearing, tracks, dumping and weeds along the edges. However, it is substantially intact with all vegetative layers present. Is part of a larger vegetated area. Black She-oak provides extensive habitat for the Glossy Black-cockatoo and numerous trees hollows provide roosting and nesting habitat for a range of fauna. Potential threatened orchid habitat as well. | Ongoing impacts from 4WD track, dumping and weed invasion. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
|---|---|---|---|---|
| 11a | **Swamp Sclerophyll Forest - EEC** | Follows Worrowing Waterway. Bangalay dominated with a dense understorey of Large-leaf Hop-bush, Hairpin Banksia and Black Wattle. | Poor condition. Clearing to the edges has resulted in trampling, dumping and weed invasion. Water quality of Worrowing Waterway appeared to be negatively impacted. Provides a vegetated link along Worrowing Waterway. | Ongoing impacts from urbanisation. |
| 11b | Cleared | Asset protection zone. Some trees remain. | **Poor condition.** The area has been modified. Dumping of household refuse and spread of garden species is widespread. | Ongoing weed invasion and dumping. |
| 12 | Spotted Gum Dry Sclerophyll Woodland | This vegetation community occurs upslope from Worrowing Waterway. Turpentine and Ironbarks also occur throughout. | **Poor condition - Fair condition.** Near Vincentia Road tracks and dumping are common but this lessens further north away from areas which are easily accessed. Part of a larger vegetated area. Provides a buffer to Worrowing Waterway. | 4WD access and dumping. |
| 13a | **Swamp Sclerophyll Forest - EEC** | EEC occurs on the down slope side of Worrowing Waterway. Dominated by Bangalay with very dense understorey of Tall Saw-sedge. Spotted Gum also occurs on the drier margins. | **Poor condition.** Degraded through clearing, dumping, tracks and trampling. Garden plants are common. Provides a buffer to Worrowing Waterway. | Ongoing impacts from urbanisation. |
| 13b | Spotted Gum Dry Sclerophyll Woodland | This vegetation community occurs upslope from Worrowing Waterway. Turpentine and Ironbarks also occur throughout. | **Poor condition.** The proximity of this site to urbanisation has resulted in clearing, weed invasion and dumping. Part of a larger vegetated area. Provides a buffer to Worrowing Waterway. | Clearing, weeds, dumping. |
| 14 | Modified | This area has been substantially cleared but would have once supported a Spotted Gum community. Weeds now dominate the understorey. | **Poor condition.** It has been cleared. Weeds are common and dumping occurs throughout. Remaining trees would provide habitat for arboreal fauna. | Ongoing urban impacts. |
| 15 | Modified | This block has been substantially cleared in the past. Current vegetation includes regrowth Eucalypts, Black Wattle, Dusky Coral Pea and Common Bracken. Common garden plants have spread as weeds across the site and Giant Reed also occurs. | **Very poor condition.** Due to past clearing but also impacts from neighbouring blocks which has resulted in further clearing and the use of the site for storage. No particular ecological value. | Weed invasion and encroachment. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
|---|---|---|---|---|
| 16 / 17 / 18 / 19 / 20 | **Swamp Sclerophyll Forest - EEC** | Swamp Sclerophyll Forest dominates these blocks which follow an unnamed drainage line that discharges into Erowal Bay. Swamp Mahogany is the dominant canopy species with dense understorey cover of Tall Saw-sedge and Scrambling Coral Fern. . | **Fair condition.** Away from the edges which tend to be weedy these blocks are in fair condition due to the inaccessible nature of the vegetation. Weeds, dumping and track formation are the major impacts. Provides a vegetated buffer along the drainage line. Swamp Mahogany also provide winter foraging resources for a number of birds and the Grey-headed Flying-fox. Red Bloodwoods also have glider feed scars. | Edge effects, dumping, weed invasion and changes to drainage patterns. |
| 21 | Cleared | Cleared area maintained as mown lawn. | **Poor condition.** Cleared and mown. No particular ecological value. | Weed invasion. |
| 22 | Scribbly Gum – Bangalay Woodland | The slight elevation of this block has resulted in a drier vegetation association with Scribbly Gum becoming dominant. | **Fair condition.** Tracks, some clearing and dumping. Borders a larger area of vegetation leading to Gurumbi Nature Reserve. | Urban impacts. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| 1a | **Swamp Oak Floodplain Forest - EEC** | Degraded area dominated by Swamp Oak with Common Reed and Common Silkpod also common. Grades into Coastal Saltmarsh and Mangrove Forest. | **Poor condition.** This area is in close proximity to a caravan park and walking trail and suffers from impacts of overuse and clearing. Provides an important buffer to the wetland bordering Sussex Inlet. | Lack of management. Clearing and overuse are the major impacts. |
| 1b | Degraded vegetation | This area may once have supported Bangalay Sand Forest but is now substantially modified and weed infested. Bangalay and Blackbutt are scattered throughout but the dominant vegetation is Blackberry, Asparagus Fern, Wandering Jew, *Senna* sp., Cotoneaster and Lantana. | **Very poor condition.** Weed invasion, clearing and track formation. Rabbits were also recorded. Ecological value is very low. | Lack of management. Continuation of weed invasion. |
| 2 | Cleared and modified | Area is maintained as parkland, car parking, boat ramp, small marina with commercial outlets. William Mulligan Reserve is a part of this area. It is almost completely grassed and devoid of any vegetation. | **Poor condition.** Area maintained as parkland. Ecological value is currently low. | William Mulligan Reserve is in desperate need of landscaping. |
| 3 | Cleared and modified | This picnic area is adjacent to a boat ramp and The Springs accommodation. Scattered Bangalay and Ironbark trees occur but the understorey is maintained as lawn. The reserve continues around the side of the slope and this area is degraded and weed infested. | **Very poor condition.** This high use area is severely degraded by weeds, clearing and track formation. Provides some vegetation along Swan Lake. | Lack of management and in particular lack of weed control and rehabilitation. |

| ULLADULLA | | | | |
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| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| 1 | **Swamp Oak Floodplain Forest - EEC** | This community is a near monoculture of Swamp Oak. Sweet Pittosporum, Wonga Wonga Vine, *Monotoca elliptica* , Asparagus Fern and Common Silkpod occur in very low densities. Lantana also occurs around the northern boundary. | **Poor condition.** Ground levels have been altered, probably during construction of the adjacent apartment building. Provides a buffer from the adjacent apartment block to Blackwater Creek. | Lack of management. Weed invasion and dumping. |
| 2a | **Swamp Oak Floodplain Forest - EEC** | This community borders Blackwater Creek. Swamp Oak and sedges dominate. | **Fair condition.** This area is protected from direct impacts of nearby development although water quality may be comprised from the upstream golf course. Provides an important function in providing a buffer to Blackwater Creek. | Changes in water quality, weed invasion, clearing and dumping. |
| 2b | **Bangalay Sand Forest - EEC** | Blackwater Creek Reserve. Bangalay Sand Forest is dominated by Bangalay with a relatively intact understorey that improves with distance from Mitchell Parade. | **Good condition.** This community has been fenced and some rehabilitation taken place. Is a part of larger patch of vegetation along Blackwater Creek. | Changes in water quality, weed invasion, clearing and dumping. |
| 3 | Cleared pump station site | A patch within intact Swamp Sclerophyll Forest was cleared for construction of the pump station. | **Poor condition.** A cleared site amidst an EEC. No particular ecological value. | Weeds spreading from this site into the adjacent EEC. |
| 4 | **Swamp Sclerophyll Forest - EEC** | This small block is located at the south-western corner of larger areas of Swamp Sclerophyll Forest. This is a densely vegetated area dominated by Bangalay and Woollybutt. | **Fair condition.** This block is impacted by edge effects associated with clearing along the western and southern edges. Impacts from adjacent dwellings. This block is a small section of a much larger area of intact EEC. | Changes to drainage patterns, clearing and weed invasion. |
| 5 | **Swamp Sclerophyll Forest - EEC** | This EEC is a part of the larger Swamp Sclerophyll Forest patch to the north. | **Poor condition.** Largely impacted from adjacent clearing and development. The drainage channel also appears to have been altered. This block is a small section of a much larger area of intact EEC. | Changes to drainage patterns, dumping, clearing and weed invasion. |
| 6 | Modified | This area would have originally been a part of the Swamp Sclerophyll Forest which follows a small creek / drainage channel down from Maisie Williams Drive. It is now a poorly maintained reserve with clumps of trees. | **Very poor condition.** This area has been severely altered and degraded. Understorey is completely missing and the area is mown. The drainage line is shallow, mostly grassed and completely changed in character from its original condition. Provides a vegetated link along the coastline. | Continued management regime. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
|---|---|---|---|---|
| 7 & 8 | Cleared | This reserve has been almost completely cleared and is maintained as park along Mollymook Beach. | **Poor condition.** Modified and impacted due to the pressures of urbanisation. Few ecological values. | Erosion and weed invasion. |
| 9 | Coastal scrub / Cleared | The cliff has little vegetation along its face but merges back into coastal scrub which has been cleared in sections. | **Poor condition.** The pressures of nearby urbanisation have impacted this area. Provides a minor vegetated link along the coastline and stabilises the landscape. | Erosion and tree removal. |
| 10a | **Bangalay Sand Forest - EEC** | The Mollymook Bogey Hole area has been cleared in recent history. Vegetation is substantial regrowth. Coastal scrub and Blackbutt and Silvertop Ash occurs on the eastern edge but then grades back into modified regrowth Bangalay Sand Forest. | **Poor condition.** Regrowth area which continues to be impacted. Provides a vegetated link along the coastline and stabilises the coastline. | Erosion, clearing and weed invasion. |
| 10b / 11 / 12 | Cleared and modified | Likely to have once supported Bangalay Sand Forest but has been mostly cleared and invaded by weeds. Some rehabilitation has been attempted. | **Very poor condition.** Cleared, modified and weed infested. Is a part of a vegetated link to the west and assists with stabilisation of the area. | Inconsistent follow up of rehabilitation. Erosion, clearing and weed invasion. |
| 13 | Parkland | Conjola Street Reserve. Mown area with some trees remaining, mostly Blackbutt and Old-man Banksia. | **Poor condition.** Mown parkland. Trees would provide habitat for arboreal fauna. | Weed invasion and senescence of trees. |
| 14 | Coastal scrub | Likely to have once supported Bangalay Sand Forest. Vegetation remaining is sparse and degraded. | **Poor condition.** Cleared, modified and weedy in places. Provides a semi-vegetated coastal link. | Erosion, further clearing to maintain views and weed invasion. |
| 15 | Hairpin Banksia - *Kunzea ambigua* - *Allocasuarina distyla* heath | Ulladulla Head Reserve. North Head Walking Track. Allocasuarina distyla dominates the canopy across much of the headland. Blady Grass, Kangaroo Grass and Lomandra in the understorey. Formed tracks and interpretive signage throughout. | **Fair condition.** Rehabilitation of this site has been undertaken. Requires further rehabilitation and maintenance above the current weed management regime. A large area of vegetation in a relatively cleared landscape. Headland vegetation is now uncommon in the area. | Requires maintenance works and further rehabilitation. |
| 16 / 17 | Riparian zone and parkland | Millards Creek contains seagrass in channel and mangroves along the banks. Adjacent parkland is maintained as mown areas with scattered trees. | **Poor condition.** Creek is very degraded. The banks are weedy and much of the channel is covered in brown algae suggesting poor water quality. Is a part of a vegetated link to the west. | Millards Creeks flows into Ulladulla Harbour. Consequently, the degradation of this creek should be addressed to protect marine environments within the harbour. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
|---|---|---|---|---|
| 18 - 26 | Blackbutt – Turpentine Tall Forest | Millards Creek Park and cycleway. Some sections of this park have been really nicely rehabilitated and ongoing management has maintained them in good condition. In these areas all layers are present and intact. In more degraded areas the understorey is absent and weeds dominate especially along the edges. | **Good condition – poor condition.** Areas that have been rehabilitated and regularly maintained are nice examples of this vegetation community. Unrehabilitated and managed areas are weedy and areas have been cleared. Where houses back onto this linear park dumping, clearing and weed invasion are common. Provides a linear link to the west and habitat for a range of flora and fauna. | Dumping and weed invasion. |
| 27 / 28 | Blackbutt –Turpentine Forest | These areas are degraded and are experiencing pressure from neighbouring new developments. The drainage line is weedy and water quality appears to have been compromised. | **Poor condition.** Degraded through impacts of adjacent urbanisation and agriculture. Provides stepping stone habitat for mobile species. | Further impacts from adjacent dwellings. |
| 29 | Blackbutt –Turpentine Forest / Cleared | Very narrow area cleared right up the drainage line. Weeds include Willows. There is substantial new clearing around it. | **Very poor condition.** Clearing of vegetation and weed invasion. Few ecological values in its current state. | Ongoing clearing and weed invasion, erosion. |
| 30 | Blackbutt –Turpentine Forest / Cleared | The majority of this area has been cleared. Remaining vegetation around the western edges is remnant Blackbutt – Turpentine forest. | **Poor condition.** Tracks, weeds and clearing. Provides stepping stone habitat for mobile species. | Track formation, erosion and weed spread. |
| 31 | Blackbutt –Turpentine Forest / Cleared | Ulladulla Flower Nature Reserve. The eastern most section is in extremely poor condition. The creek is stagnant and choked with weeds. Western sections are in better condition. | **Very poor condition – poor condition.** Pressures of urbanisation have severely degraded sections of this narrow reserve. Weed invasion, poor water quality and dumping are common. Provides some stepping stone habitat for mobile species. | Culvert at Warden Street should be replaced with a box culvert to improve water flow. Weeds need to be removed and the creek line rehabilitated. |
| 32 / 33 | Turpentine – Grey Ironbark – Blackbutt Tall Dry Forest | This large relatively intact reserve is dominated by Turpentine and Grey Ironbark with Blackbutt occurring as a co-dominant. Western sections have recently been burnt. There are many tracks throughout. Drainage lines are shallow with *Gahnia* sp. dominating. | **Fair condition.** Fire, tracks and weeds along the edges. Away from the edges the forest is relatively intact. Is part of a larger intact tract of vegetation. | Erosion in area of fire and sedimentation downstream in Burrill Lake. 4WD tracks occur throughout. |
| 34 | Scribbly Gum Woodland | Located behind the sports oval upslope from an unnamed creek. This Scribbly Gum woodland is dominated by Old-man Banksia, Silver Banksia, Black She-oak, Large-leaf Hop-bush, Smooth Geebung and Lomandra. | **Good condition.** Few impacts away from the edges. Some tracks, minor dumping and weeds around edges. Is part of a larger tract of vegetation. | Ingress of weeds and dumping. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
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| 35a | **Swamp Sclerophyll Forest - EEC** | Badly degraded strip of Swamp Sclerophyll Forest which follows an unnamed creek line. Substantial edge effects and clearing have taken place. | **Very poor condition.** This whole reserve is in extremely poor condition. A sewerage treatment plant is located to the north of this EEC. Massive disturbance including clearing, tracks, dumping and weed invasion throughout. Provides habitat for a range of species. | Lack of management of this area is the most substantial threat. |
| 35b | Cleared and modified | This area was cleared for the construction of the sewerage treatment works. | **Very poor condition.** Cleared and highly modified. May provide some habitat for water dependent bird species. | Lack of management. |
| 35c | Scribbly Gum Woodland | This section is very badly impacted by inappropriate use and access. | **Very poor condition.** Tracks, dumping, clearing and weed infestation. Would provide habitat for a range of species and a link to the coast. | Lack of management. |
| 36 | Coastal scrub | Dominated by Coastal Rosemary, Coast Banksia and Coastal Wattle. | **Fair condition.** This area appears to have undergone some rehabilitation and appears to be maintained in fairly good condition. Provides a vegetated coastal link. | None under the current management regime. |
| 37a | **Bangalay Sand Forest - EEC** | The majority of Warden Headland is dominated by Bangalay Sand Forest. Dominated by Bangalay, Coastal Rosemary, *Monotoca elliptica* , Hillock Bush and *Allocasuarina distyla* . | **Fair condition – good condition.** Away from the edges and the cleared sporting ovals this reserve is in good condition. The area has well formed and maintained tracks throughout. Large patch of vegetated headland which is increasingly rare. | Erosion and weed invasion. Threat reduced with current management regime. |
| 37b | Coastal scrub | Areas outside of the Bangalay Sand Forest are predominately coastal scrub which grades back into heath then EEC. | **Fair condition.** Although weedy on the edges as a whole this area is in fairly good condition. Large patch of vegetated headland which is increasingly rare. | Erosion and weed invasion. Threat reduced with current management regime. |

| VINCENTIA NORTH | | | | |
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| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| 1a | **Bangalay Sand Forest – EEC** | Community is moderately intact with most impacts apparent where it borders urbanisation. Dominated by Bangalay, Scribbly Gum, Black She-oak, Hairpin Banksia, *Monotoca elliptica* with Common Bracken, Tall Saw-sedge and Blady Grass in the understorey. | **Fair condition**. Away from the edges the community is moderately intact with all layers present. Part of a larger tract of vegetation. | Urban impacts. Weed invasion, dumping and trampling. |
| 1b | Cleared | A cleared and degraded area occurs in the south-east corner of this reserve where it borders urbanisation and the STP access road. | **Very poor condition**. The area is cleared and grassed and is impacted by high levels of human activity. Elevation levels have also been altered. It has minimal ecological value. | Lack of management. Human impacts. Weed invasion. |
| 2a | **Swamp Oak Floodplain Forest – EEC** | This remnant EEC is largely dominated by Swamp Oak with *Gahnia* sp. in the understorey. It borders Moona Moona Creek to the north. | **Poor condition**. This degraded area is particularly impacted by edge effects and dumping. Provides an important buffer to Moona Moona Creek. | Ongoing management. Its proximity to Moona Moona Creek makes management of this area important in the protection of this waterway. |
| 2b | **Bangalay Sand Forest – EEC** | This degraded EEC is very open. Trees are scattered and understorey is absent in most areas. It is dominated by Bangalay with Swamp Oak occurring along the edges. Sweet Pittosporum and Common Bracken are common in the understorey. | **Poor condition**. This degraded area is particularly impacted by edge effects and dumping. Building rubble is common throughout. Provides an important buffer to Moona Moona Creek. | Ongoing management. Its proximity to Moona Moona Creek makes management of this area important in the protection of this waterway. |

| VINCENTIA SOUTH | | | | |
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| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| 1 | Coastal vegetation | A coastal strip of less than 100 m wide down to Orion Beach. It is dominated by Coast Banksia, Sweet Pittosporum, Red Bloodwood and Lomandra. Understorey is largely weed dominated with Asparagus Fern and other garden escapes present. Grades into Scribbly Gum further east. | **Poor condition**. Erosion of the cliff line along this section is destabilising the vegetation and weed invasion from neighbouring properties is common. Narrow strip provides connectivity along the shoreline. | Erosion and uncontrolled weeds outcompeting native species. |
| 2 | Coastal vegetation | Fringing vegetation along the cliff line of Barfleur Beach and Plantation Point is dominated by Swamp Oak and Coast Banksia with Water Gum, Brush Box, Norfolk Island Pine and Coast Rosemary also occurring. | **Fair condition**. The area is cleared right up to the cliff edge and grassed over large areas and is impacted by high levels of human activity. Narrow strip provides connectivity along the shoreline. | Human impacts. |
| 3 | Red Bloodwood – Scribbly Gum heathy woodland | Stuart King Reserve borders Nelsons Beach. It is a woodland patch dominated by Eucalypts with a dense and diverse understorey. Red Bloodwoods show signs of glider feed scars. Scribbly Gum, Black Wattle, Hairpin Banksia, Coast Banksia and the occasional Swamp Oak also occur in the canopy. The intact understorey includes Kangaroo Grass, Curly Wig, Coast Teatree, Blue Flax-lily, Sandfly Zieria and Tall Saw-sedge. Weeds are mostly limited to the very degraded drainage line at the northern end. | **Fair condition**. White Sands Walk passes through this area with several lookout points and access areas from neighbouring houses. This area is intact with weeds mostly confined to the edges and the badly degraded drainage channel in the northern section. Representative of a patch of woodland rather than a narrow cleared strip. Provides habitat for gliders and other fauna. | Weed invasion and other human induced impacts. Lack of management of the drainage line. |
| 4 | Picnic Area | Blenheim Beach Reserve is maintained as a picnic area. The reserve has been cleared of understorey and only large trees remain. | **Poor condition**. A grassed picnic area. Provides an important link to areas north including Stuart King Reserve. | Senescence of old large trees without replacement planting. |
| 5 | Eucalypt tall open forest | This is a tall Eucalypt open forest is dominated by Blackbutt. Trees with hollows are common. Also present were Coast Banksia, *Monotoco elliptica* , Blue Flax-lily, Common Bracken and Purple Coral Pea. A large concrete channel leading from a pump station is located in the northern section of this reserve. | **Fair condition**. Some changes have been made to drainage lines and tracks are present throughout. Minor weed invasion mostly confined to the edges. A strong vegetated link along the coastline and from areas to the west. | Erosion and weed invasion. Overuse. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
|---|---|---|---|---|
| 6 | Open Eucalypt sandstone woodland | This open woodland is located on a sandstone outcrop between Blenheim Beach and Greenfield Beach. The large old Scribbly Gums contain many hollows. This area may have been semi-cleared or selectively logged in the past as vegetation is sparser than adjacent areas. The sparse understorey is comprised of Coastal Wattle, Monotoca elliptica, Old-man Banksia and Lomandra. | **Poor condition**. Neighbouring urban development has resulted in impacts on the area, including tracks, fires, dumping. Provides an important coastal link to areas north and south of the site. | Lack of management. Human induced impacts. |

| WOOLLAMIA, MYOLA & HUSKISSON | | | | |
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| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| 1 | Modified | Park just north of the boat ramp on Currambene Creek. Modified area with some remaining Swamp Oak with a grassy understorey. | **Poor condition**. The area is cleared and grassed and is impacted by high levels of human activities. It has minimal ecological value. | Human impacts. Weed invasion. Senescence of trees without replacement trees being planted. |
| 2 | Modified | Park just south of the boat ramp on Currambene Creek. Modified area with some remaining Swamp Oak with a grassy understorey. Also present are planted shrubs and trees. | **Poor condition**. The area is cleared and grassed and is impacted by high levels of human activities. It has minimal ecological value. | Human impacts. Weed invasion. Senescence of trees without replacement trees being planted. |
| 3a | **Bangalay Sand Forest – EEC** | Dense Bangalay Sand Forest dominated by Bangalay with Red Bloodwood. Also present are Common Bracken, *Monotoca elliptica* , Old-man Banksia, Climbing Guinea Flower and Trailing Guinea Flower. | **Fair condition**. The denseness of the community has precluded access to some areas and these are in fair condition. Areas along the edges and tracks are more degraded through trampling, weed invasion and dumping. Provides a buffer to Currambene Creek. | Human impacts caused by proximity to boat ramp and urbanisation have resulted in track formation, burning and illegal rubbish dumping. |
| 3b | **Coastal Saltmarsh - EEC** | This area of saltmarsh has been degraded through trampling and formation of tracks. Dead trees throughout indicate that the drainage patterns in this area have changed substantially overtime. This area now only supports common saltmarsh species including, Creeping Brookweed and *Sarcocornia quinqueflora* . | **Poor condition**. This area of saltmarsh has been degraded through trampling and formation of tracks. Provides a buffer to Currambene Creek. | Trampling, changes to drainage patterns, rubbish dumping, track formation. |
| 4 | Modified | Council activity centre is located on this site. It is a grassed area planted with *Callistemon* sp. and Paperbarks along the boundary. There is also some regrowth of Sweet Pittosporum and the occasional Black Wattle, Spotted Gum and Red Bloodwood. | **Poor condition**. The area is cleared and grassed and is impacted by high levels of human activities. It has minimal ecological value. | Weed invasion, human impacts. |
| 5 | Modified | This area is located at the mouth of Currambene Creek within Huskisson. It has been cleared and grassed and contains a public swimming pool. | **Poor condition**. The area is cleared and grassed and is impacted by high levels of human activities. It has minimal ecological value. | Weed invasion, human impacts. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
|---|---|---|---|---|
| 6 | Modified mixed Eucalypt associations | This mixed Eucalypt community fringes Tapalla Point and clings to the edges of the seacliffs. Red Bloodwoods have glider feed scars and Spotted Gums contain hollows. Swamp Oak is present at the bottom of the slope. As it gains in elevation away from the cliff line, vegetation changes to Turpentine and Blackbutt. | **Fair condition**. Weeds occur in the understorey and erosion and trampling are common. Provides erosion protection and fauna habitat for hollow-dependent species. | A wide range of human induced impacts. |
| 7 | Modified mixed Eucalypt association | This mixed Eucalypt community is located in front of a caravan park and fringes Tapalla Point and clings to the edges of the seacliffs. Blackbutt are common with Bangalay occurring occasionally. | **Fair condition**. Weeds occur in the understorey and erosion and trampling are common. Provides erosion protection and fauna habitat for hollow-dependent species. | A wide range of human induced impacts. |
| 8 | **Bangalay Sand Forest – EEC** | This EEC community is highly modified and is represented by trees typical of Bangalay Sand Forest. The understorey has been cleared. Lomandra occurs in clumps around some of the trees. | **Poor condition**. The area is cleared and grassed and is impacted by high levels of human activity. Provides erosion protection and fauna habitat for hollow-dependent species. | A wide range of human induced impacts. Senescence of trees without replacement planting. |
| 9 | **Bangalay Sand Forest – EEC** | This remnant area of Bangalay Sand Forest would have been part of the Bangalay Sand Forest to the east (No. 8). Severe weed infestations occur throughout. Grades into a much wetter vegetation community to the south-west. | **Very poor condition**. This remnant EEC is severely degraded through dumping, weed infestations, changes to drainage patterns and elevations. Provides habitat for a range of fauna. | Lack of management. Rehabilitation is required. |
| 10 | Modified | This area has been cleared and grassed and now contains a caravan park. Occasional trees and shrubs are present. | **Poor condition**. The area is cleared and grassed and is impacted by high levels of human activity. It has minimal ecological value. | Weed invasion, human impacts. |
| 11 | Scribbly Gum – Blackbutt | Open parkland with a grassed understorey. Large trees with hollows are present including Scribbly Gum, Blackbutt with the occasional Bangalay. Coast Banksia, Coast Teatree, Coastal Wattle and Coastal Rosemary occur along the seaward margins of the site. | **Poor condition**. Clearing and installation of car parking and an amenities block. The trees provide habitat for fauna and the area provides a buffer to Moona Moona Creek and Jervis Bay. | Human induced impacts and senescence of trees without replacement planting. |

| YATTE YATTAH & CONJOLA PARK | | | | |
|---|---|---|---|---|
| **Land Number** | **Vegetation Community** | **Description** | **Broad Condition / Value** | **Threat** |
| 1a | **Swamp Oak Floodplain Forest - EEC** | Swamp Oak Floodplain Forest dominates across the majority of this block. The vegetation composition varies with drainage but is generally dominated by monospecific stands of Swamp Oak with either a dense understorey of Tall Saw-sedge or a groundcover of Swamp Weed. | **Good condition.** Intact community dominated by native species. Forms part of a large intact forested area including national park. | Weed invasion and edge effects from the west. |
| 1b | **Swamp Sclerophyll Forest - EEC** | The eastern edge of the block grades from Swamp Oak Floodplain Forest to Swamp Sclerophyll Forest as the elevation gently rises. Swamp Mahogany dominates throughout with dense stands of Tall Saw-sedge. | **Good condition**. Intact community dominated by native species. Forms part of a large intact forested area including national park. | Weed invasion and edge effects from adjoining cleared rural residential block. |
| 1c | **Coastal Saltmarsh** | Where this block adjoins Narrawallee Creek small areas of saltmarsh occur. This area appears to the be the largest of this saltmarsh community | **Good condition.** Intact community dominated by native species. Forms part of a large intact forested area including national park. | In general saltmarsh communities are susceptible to run off and sedimentation. |
| 2a | **Swamp Oak Floodplain Forest - EEC** | This largely agricultural block retains Swamp Oak Floodplain Forest adjacent to Narrawallee Creek. It is dominated by monospecific stands of Swamp Oak largely without understorey. | **Poor condition.** Past grazing and clearing has resulted in degraded vegetation communities. | Weed invasion and nutrient enrichment from adjacent agriculture. |
| 2b | Cleared | This section of the block has been cleared and is currently used for the grazing of cattle. It is dominated by pasture grasses with a scattering of Swamp Oak along a drainage channel on the northern boundary. | **Very poor condition.** Complete clearing of the block for grazing makes it unlikely that restoration could proceed without extensive intervention including substantial planting of native vegetation. | On-going land use. |
| 3 | Cleared / Turpentine – Blackbutt Forest | Clearing of this block was undertaken historically and today it is still used as a cattle stud. Cattle exclusion and revegetation of some areas of Narrawallee Creek has assisted in restoration of parts of this creek. The central and western areas of Narrawallee Creek on this block have occasional old remnant rainforest trees (e.g. Lilly Pilly) remaining indicating that this whole area may once have been covered in rainforest. As the block rises to the north the ridgeline is dominated with Turpentine, Grey Ironbark and Blackbutt. Understorey is scarce and this may reflect its grazing history. | **Poor condition.** Past grazing and clearing has resulted in degraded riparian communities although restoration work is currently being undertaken. Forested areas supply important links from Narrawallee Creek to Pointer Mountain. | Weed invasion and nutrient enrichment from adjacent agriculture. |

| Land Number | Vegetation Community | Description | Broad Condition / Value | Threat |
|---|---|---|---|---|
| 4a | Cleared / Turpentine – Blackbutt Forest | Around 75% of this block has regrowth and remnant vegetation communities dominated by Turpentine, Blackbutt and Grey Ironbark and forms part of the large tract of wilderness to the west including Morton National Park. | **Good condition**. Although there are tracks, signs of minor personal logging and edge effects this area is largely weed free and forms a contiguous area with wilderness to the west. | Edge effects. |
| 4b | **Milton Ulladulla Subtropical Rainforest - EEC** | A linear patch of a dry subtropical rainforest occurs along a drainage line that was dry at the time of assessment. This vegetation community probably represents Milton Ulladulla Subtropical Rainforest but would need to be confirmed to determine if the soils are derived from the Milton Monzonite. The canopy was dominated by Bangalay, Sandpaper Fig and Sassafras. Common Bracken dominated the ground layer but other native species were also present. No obvious weed invasion. | **Good condition**. Although this patch of rainforest is adjacent to a powerline easement this area is largely weed free and forms a contiguous area with wilderness to the west and represents an EEC which has been substantially cleared and is spatially restricted. | Edge effects and weed invasion from upstream. |

# APPENDIX C

# MAPS

Basin View
Bawley Point
Bendalong, Manyana and Cunjurong Point
Berry
Bomaderry and North Nowra
Burrill Lake
Callala
Cudmirrah and Berrara
Culburra
Currarong
Hyams Beach
Jaspers Brush
Kioloa
Lake Tabourie
Mollymook
Narrawallee and Milton
Orient Point
Sanctuary Point
Sanctuary Point SE, Bream Beach and Wrights Beach
Shoalhaven Heads
St Georges Basin
Sussex Inlet, Swan Haven
Ulladulla
Vincentia North
Vincentia South
Woollamia, Myola and Huskisson
Yatte Yattah and Conjola Park (separate maps)


C:\GIS\AH Ecology\609 EEC mapping 2 Jan 27, 2010

0 210 420 Metres

*Figure 9* EEC Mapping of Lands - Basin View

AH Ecology

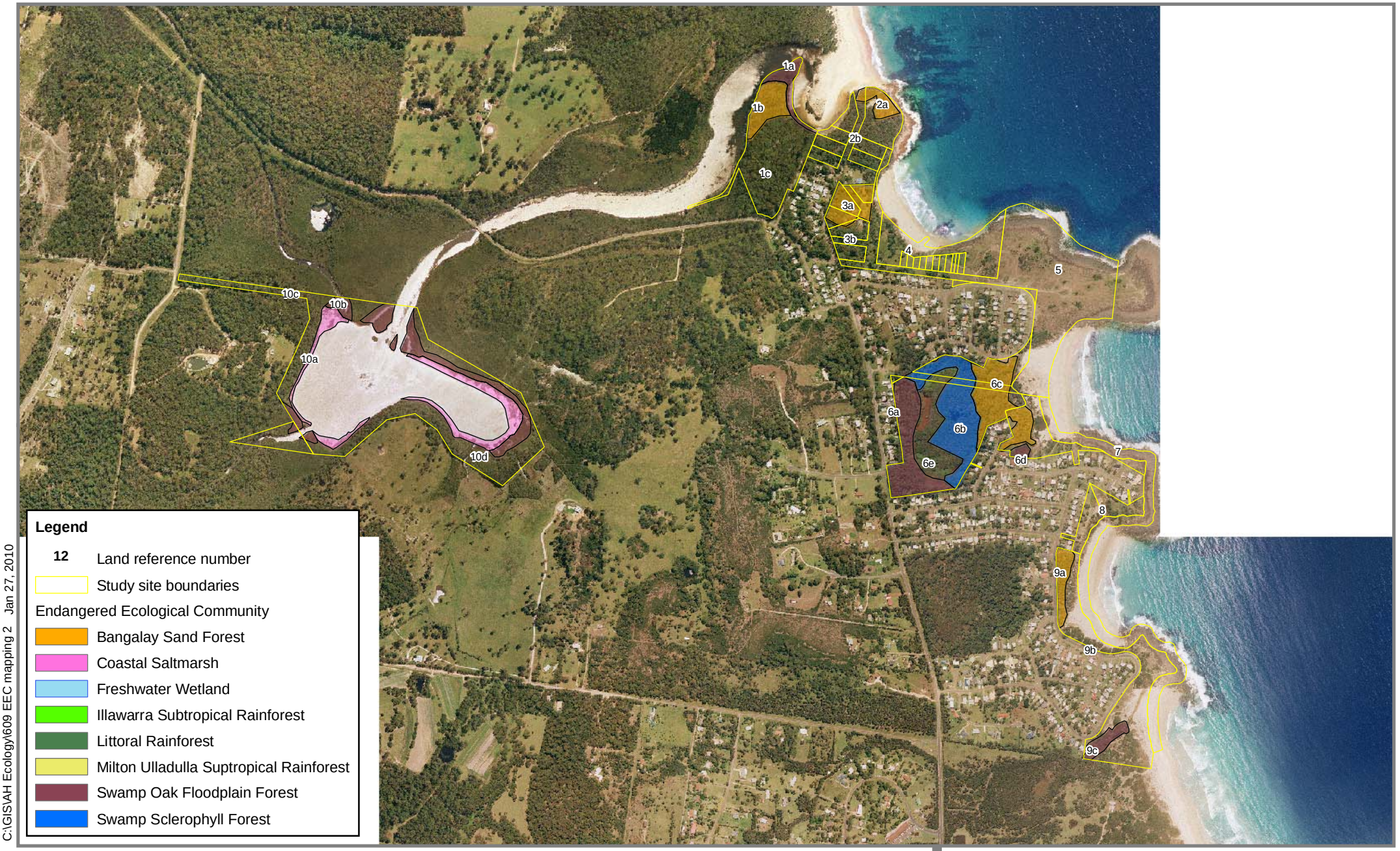
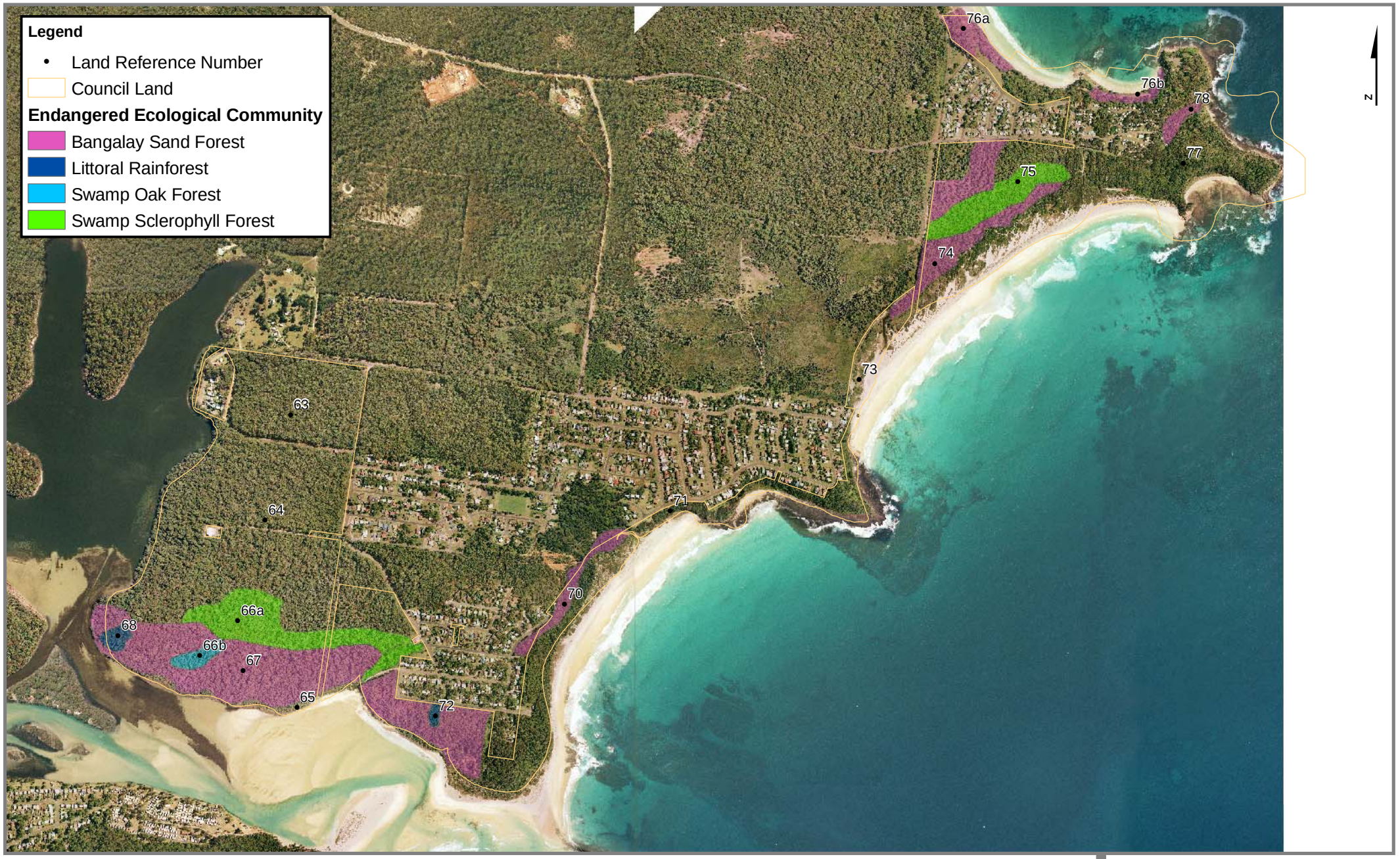



*Figure 17* EEC Mapping of Lands - Bawley Point

AH Ecology




C:\GIS\AHA Ecology\2507 EEC Mapping Shoalhaven Jan 7, 2008

AHA Ecology

0 0.4 0.8 Kilometres

*Figure 6*

EEC Mapping of Council Lands
Bendalong, Manyana and Cunjarong

AHA Ecology


C:\GIS\AH Ecology\609 EEC mapping 2 Oct 19, 2009

Kilometres
0 0.2 0.4

*Figure 3* EEC Mapping of Lands - Berry

AH Ecology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0 0.25 0.5 Kilometres

*Figure 2* EEC Mapping of Lands - Bomaderry

AH Ecology


*Figure 16* EEC Mapping of Lands - Burrill Lake

AH Ecology


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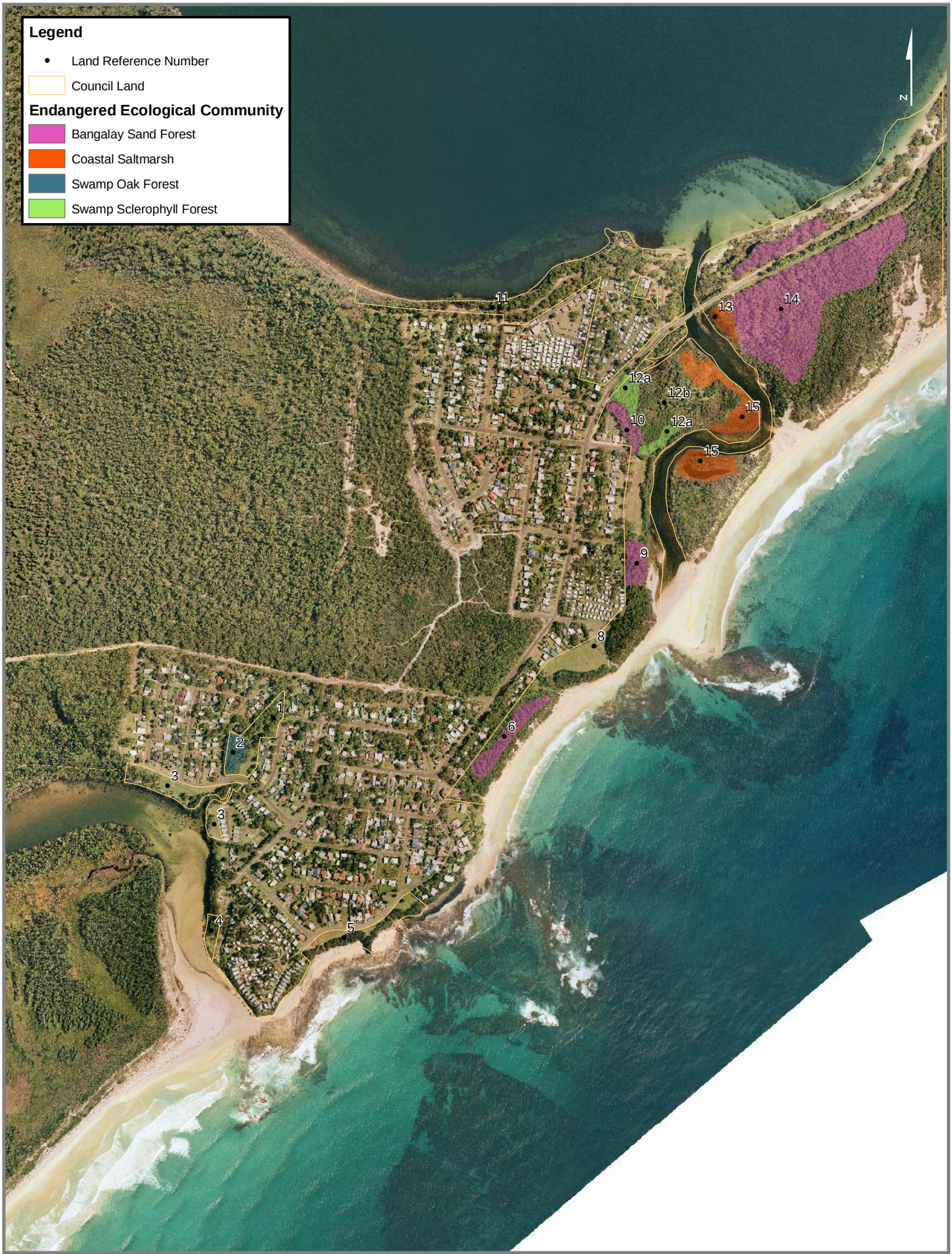
AHA Ecology

0 0.3 0.6 Kilometres

*Figure 4*

EEC Mapping of Council Lands
Callala

AHA Ecology

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AHA Ecology
Ecological Consultants

0 0.25 0.5 Kilometres

*Figure 5*

EEC Mapping of Council Lands
Cudmirrah and Berrara

AHA Ecology


*Figure 3* EEC Mapping of Lands - Culburra

AH Ecology


*Figure 4* EEC Mapping of Lands - Currarong

AH Ecology

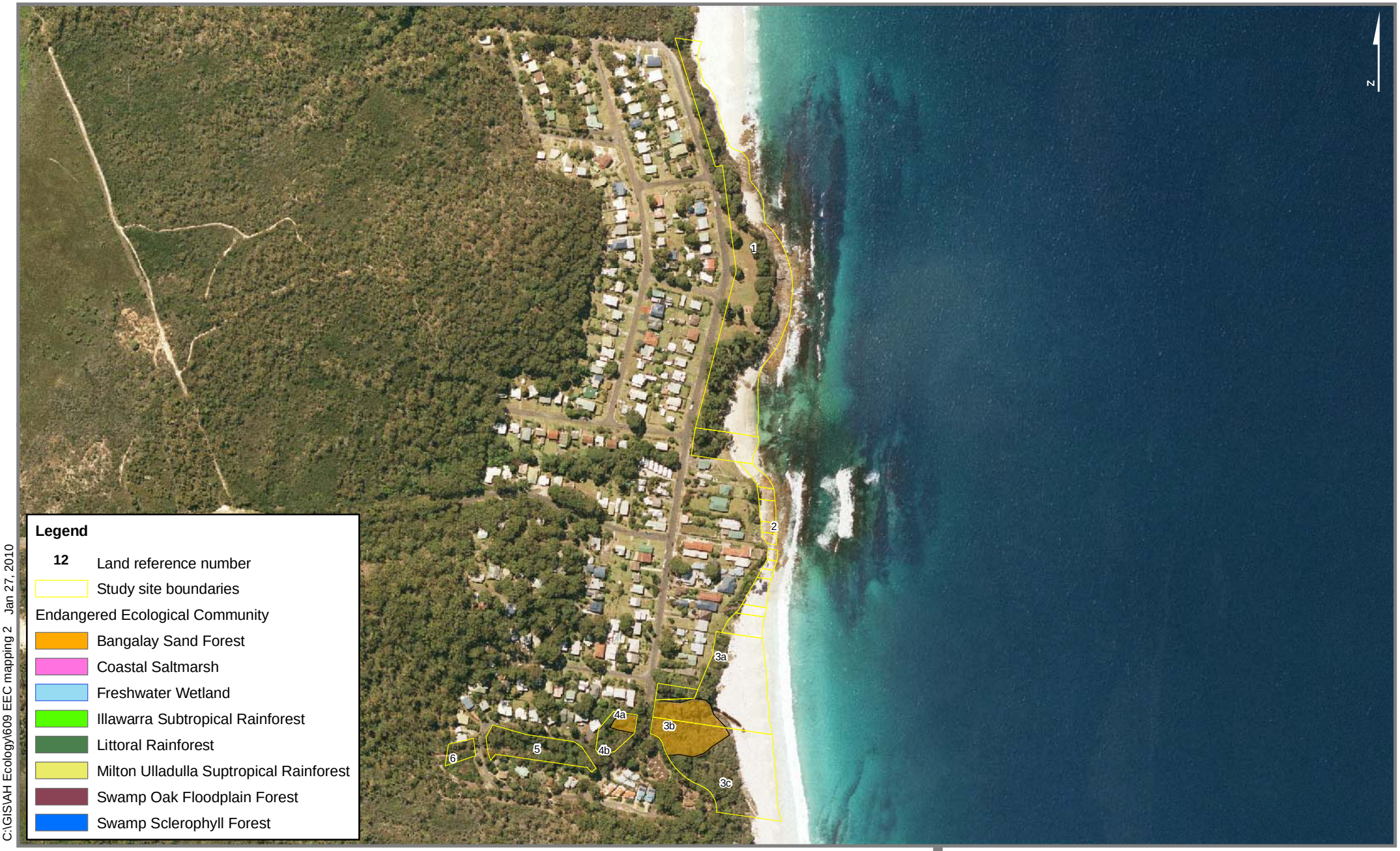
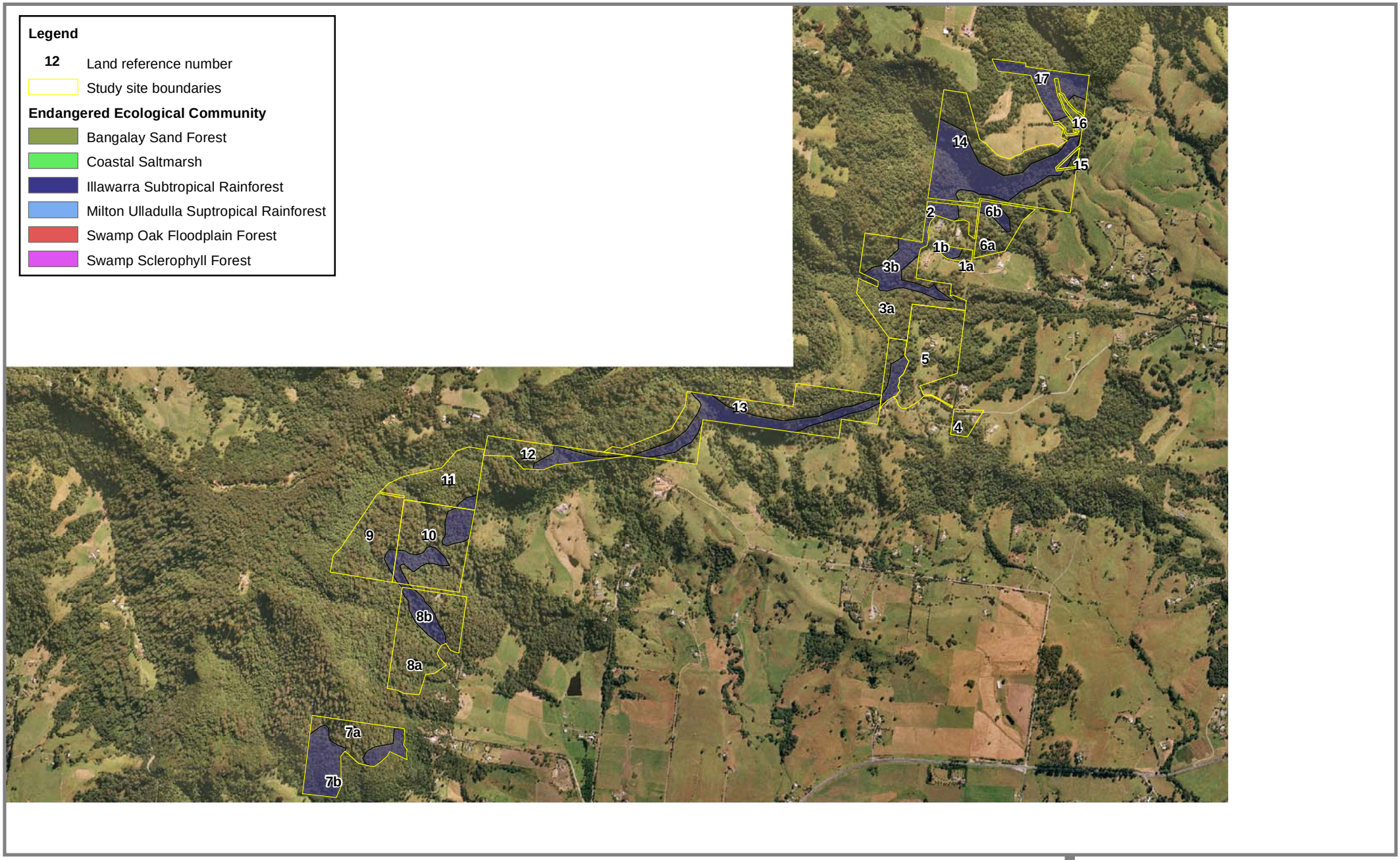



*Figure 8* EEC Mapping of Lands - Hyams Beach

AH Ecology

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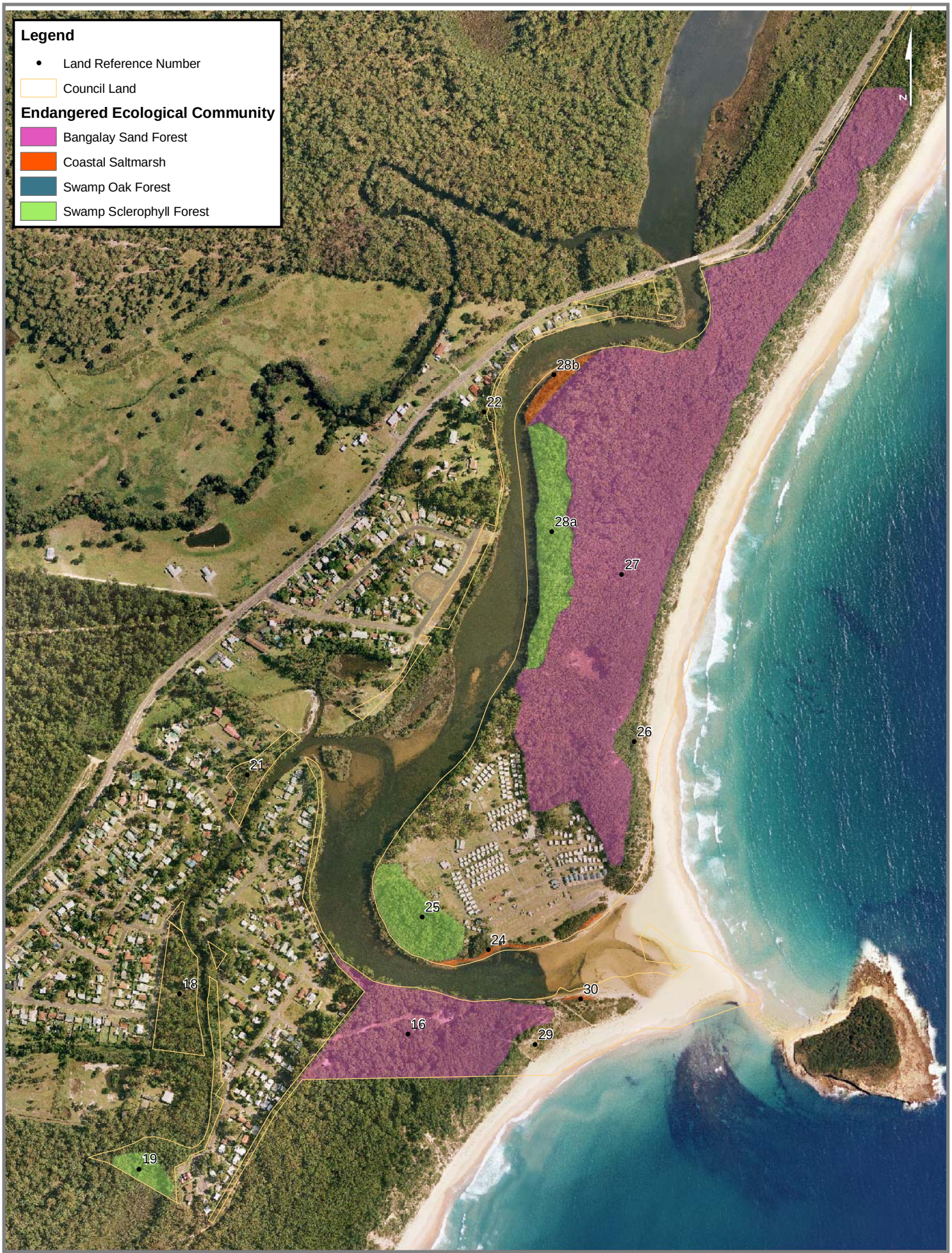
Kilometres
0 0.3 0.6

*Figure 2* EEC Mapping of Lands - Jaspers Brush

AH Ecology


*Figure 18* EEC Mapping of Lands - Kioloa

AH Ecology

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0 0.2 0.4 Kilometres

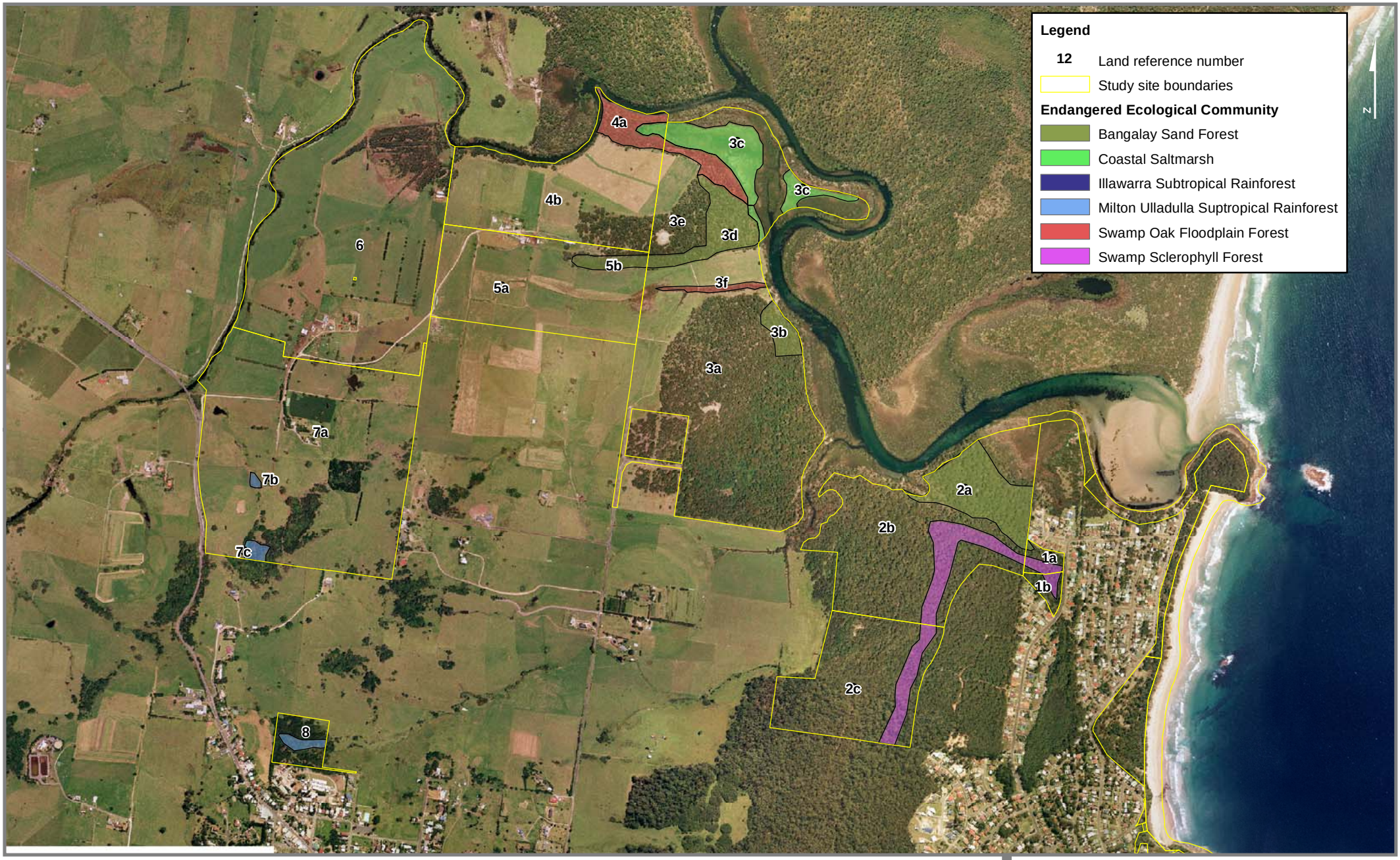
*Figure 7*

EEC Mapping of Council Lands
Tabourie Lake

AHA Ecology


*Figure 14* EEC Mapping of Lands - Mollymook

AH Ecology




C:\GIS\AH Ecology\609 EEC mapping 2 Oct 19, 2009

Kilometres
0 0.2 0.4

*Figure 6* EEC Mapping of Lands - Narrawallee and Milton

AH Ecology


C:\GIS\AHA Ecology\2507 EEC Mapping Shoalhaven Jan 7, 2008

AHA Ecology
Ecological Consultants

0 0.3 0.6 Kilometres

*Figure 3*

EEC Mapping of Council Lands
Orient Point

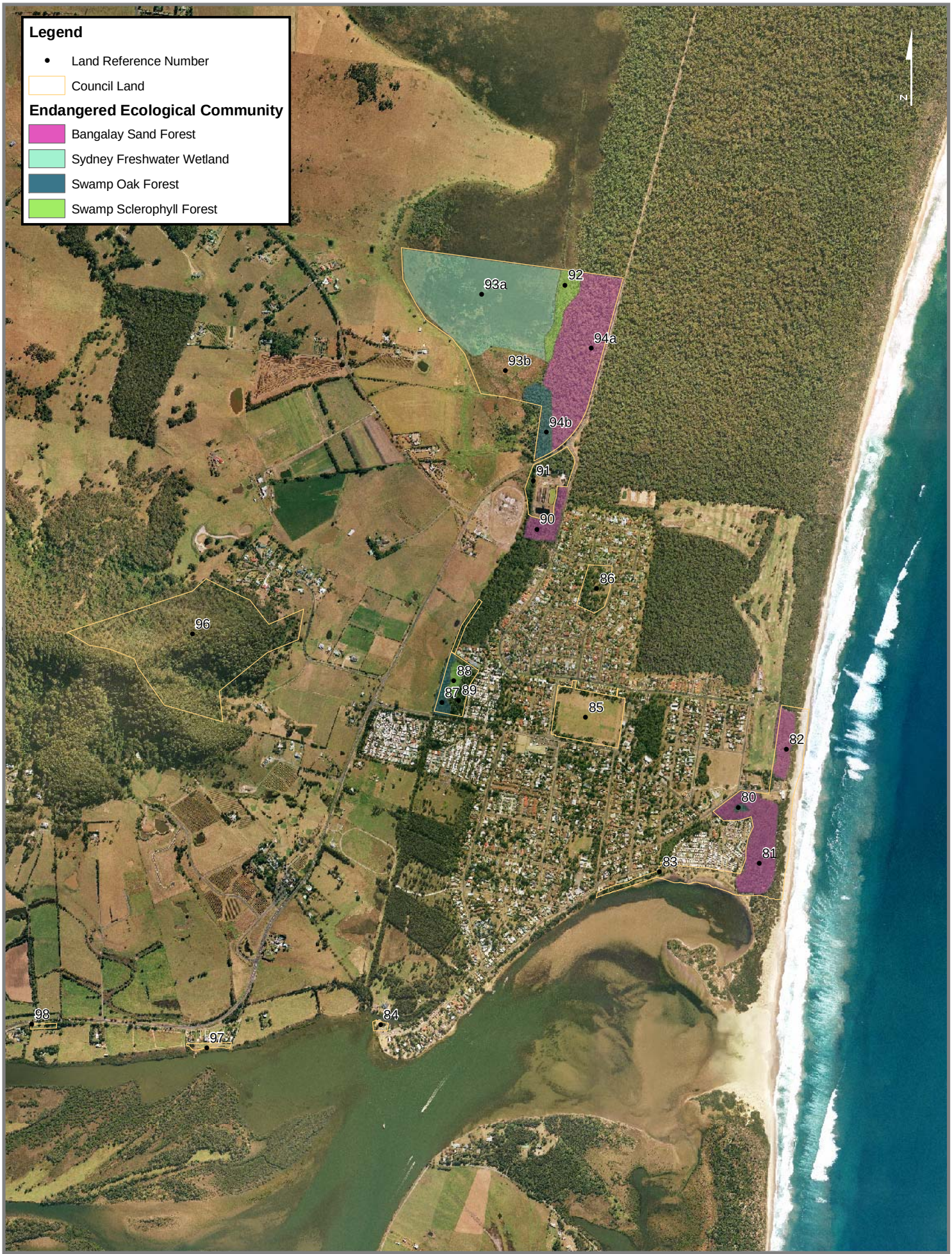
AHA Ecology


*Figure 11* EEC Mapping of Lands - Sanctuary Point

AH Ecology


*Figure 12* EEC Mapping of Lands - Sanctuary Point SE

AH Ecology

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AHA Ecology
Ecological Consultants

0 0.5 1 Kilometres

*Figure 2*

EEC Mapping of Council Lands
Shoalhaven Heads

AHA Ecology


*Figure 10* EEC Mapping of Lands - St Georges Basin

AH Ecology


*Figure 13* EEC Mapping of Lands - Sussex Inlet - Swan Haven

AH Ecology

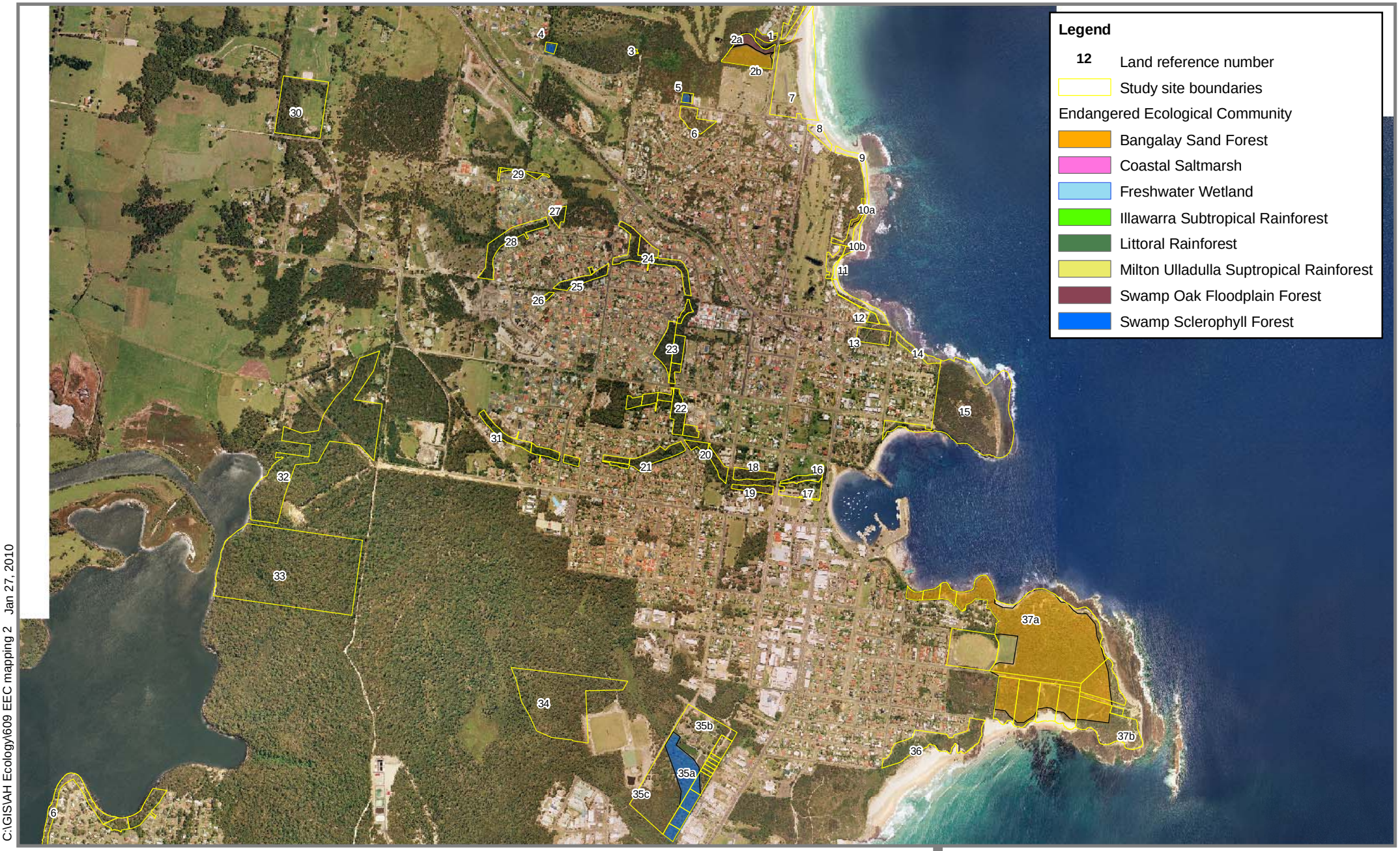


*Figure 15* EEC Mapping of Lands - Ulladulla

AH Ecology


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0 0.075 0.15 Kilometres

*Figure 6* EEC Mapping of Lands - Vincentia North

AH Ecology


*Figure 7* EEC Mapping of Lands - Vincentia South

AH Ecology


*Figure 5* EEC Mapping of Lands - Woollamia, Myola and Huskisson

AH Ecology

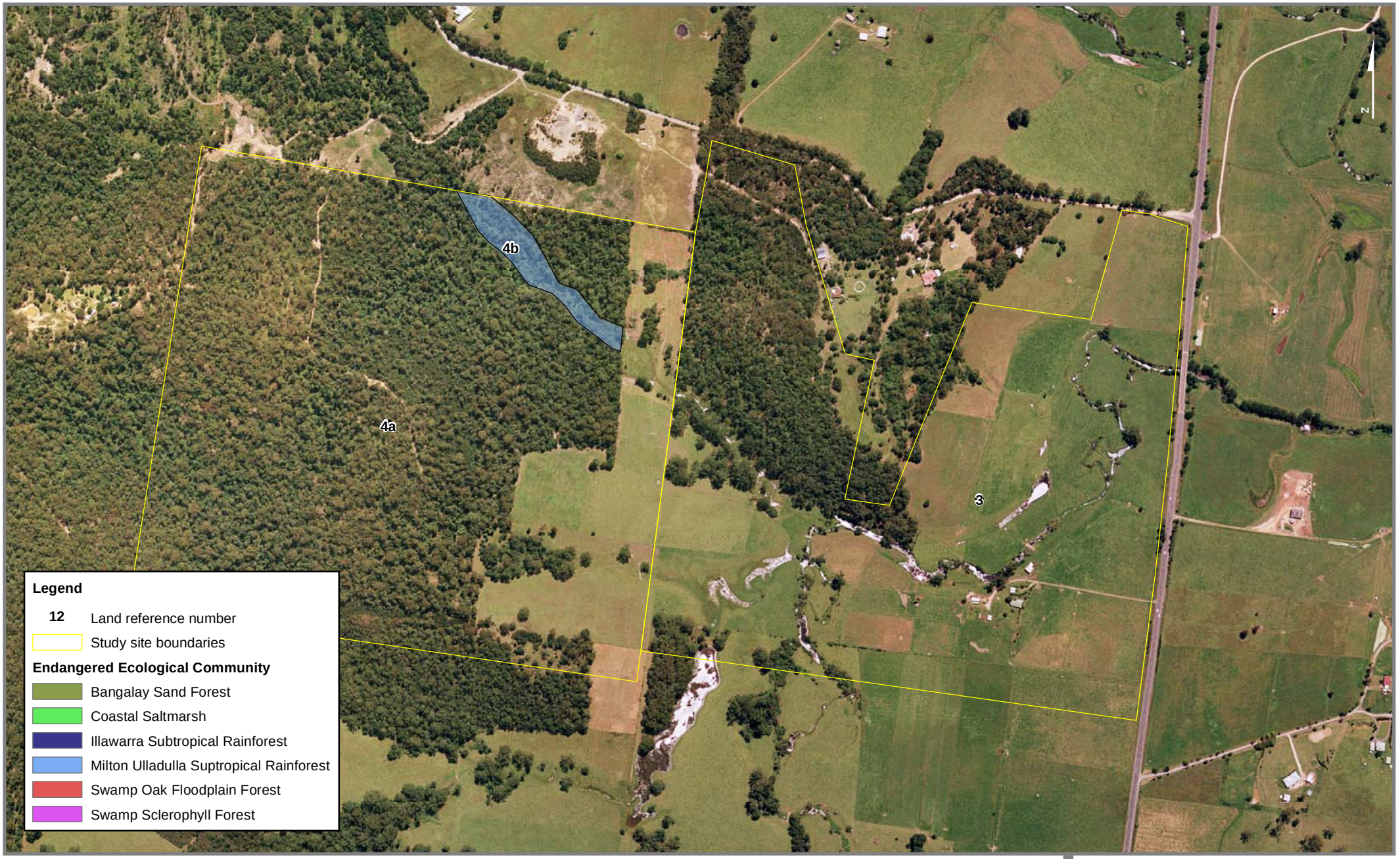


*Figure 5* EEC Mapping of Lands - Yatte Yattah

AH Ecology

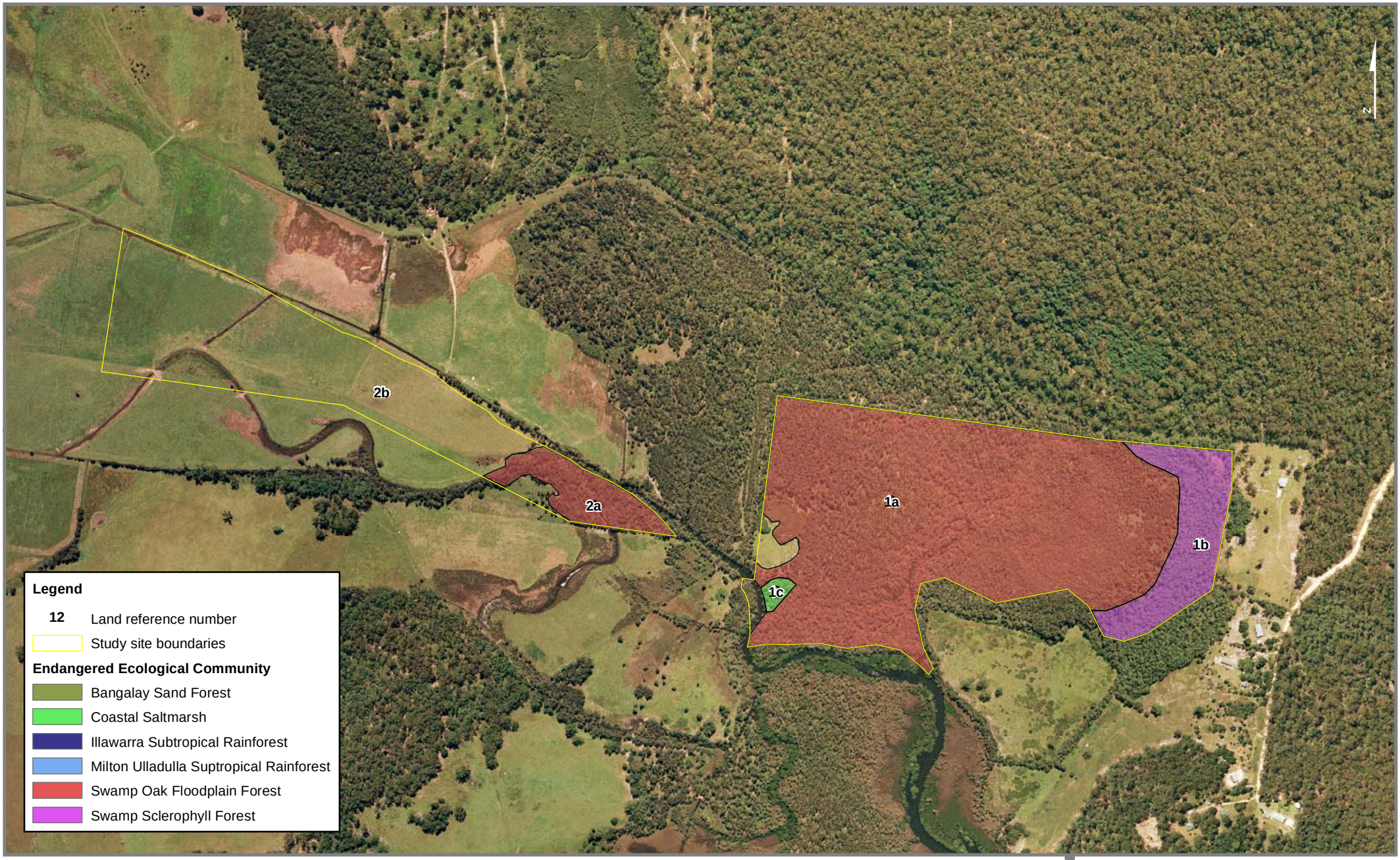


*Figure 4* EEC Mapping of Lands - Conjola Park

AH Ecology

# APPENDIX D

# FINAL DETERMINATIONS

# Bangalay sand forest, Sydney Basin and South East Corner bioregions - endangered ecological community listing

## NSW Scientific Committee - final determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions as an ENDANGERED ECOLOGICAL COMMUNITY in Part 3 of Schedule 1 of the Act. Listing of endangered ecological communities is provided for by Part 2 of the Act.

The Scientific Committee has found that:

1. Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions is the name given to the ecological community associated with coastal sand plains of marine or aeolian origin. It occurs on deep, freely draining to damp sandy soils on flat to moderate slopes within a few km of the sea and at altitudes below 100 m. Bangalay Sand Forest is characterised by the assemblage of species listed in paragraph 2 and typically comprises a relatively dense or open tree canopy, an understorey of mesophyllous or sclerophyllous small trees and shrubs, and a variable groundcover dominated by sedges, grasses or ferns.

2. Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions is characterised by the following assemblage of species:

| | |
|---|---|
| *Acacia longifolia* | *Acacia sophorae* |
| *Acmena smithii* | *Allocasuarina littoralis* |
| *Astroloma pinifolium* | *Banksia integrifolia* subsp. *integrifolia* |
| *Banksia serrata* | *Billardiera scandens* |
| *Breynia oblongifolia* | *Cassytha pubescens* |
| *Carex longebrachiata* | *Casuarina glauca* |
| *Commelina cyanea* | *Desmodium gunnii* |
| *Dianella caerulea* var. *caerulea* | *Dianella crinoides* |
| *Dichondra repens* | *Echinopogon ovatus* |
| *Entolasia marginata* | *Eucalyptus botryoides* |
| *Eucalyptus pilularis* | *Geranium potentilloides* |
| *Glycine clandestina* | *Gonocarpus teucrioides* |
| *Hardenberia violacea* | *Hibbertia scandens* |
| *Imperata cylindrica* var. *major* | *Isolepis nodosa* |
| *Kennedia rubicunda* | *Lagenifera stipitata* |
| *Lepidosperma concavum* | *Leptospermum laevigatum* |
| *Lomandra longifolia* | *Marsdenia rostrata* |
| *Microlaena stipoides* var. *stipoides* | *Monotoca elliptica* |
| *Notelaea longifolia* | *Oplismenus imbecillus* |
| *Parsonsia straminea* | *Pittosporum revolutum* |
| *Pittosporum undulatum* | *Pratia purpurascens* |
| *Pteridium esculentum* | *Ricinocarpus pinifolius* |
| *Rubus parvifolius* | *Solanum pungentium* |
| *Stephania japonica* var. *discolor* | *Stellaria flaccida* |
| *Themeda australis* | *Viola hederacea* |

3. The total species list of the community is larger than that given above, with many species present only in one or two sites, or in low abundance. The species composition of a site will be influenced by the size of the site, recent rainfall or drought conditions and by its disturbance (including grazing, land clearing and fire) history. The number and relative abundance of species will change with time since fire, and may also change in response to changes in fire frequency or grazing regime. At any one time, above-ground individuals of some species may be absent, but the species may be represented below ground in the soil seed banks or as dormant structures such as bulbs, corms, rhizomes, rootstocks or lignotubers. The list of species given above is mainly of vascular plant species, however the community also includes micro-organisms, fungi, cryptogamic plants and a diverse fauna, both vertebrate and invertebrate. These components of the community are poorly documented.

4. Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions typically has a dense to open tree canopy, approximately 5 - 20 m tall, depending on exposure and disturbance history. The most common tree species include *Eucalyptus botryoides* (Bangalay) and *Banksia integrifolia* subsp. *integrifolia* (Coast Banksia), while *Eucalyptus pilularis* (Blackbutt) and *Acmena smithii* (Lilly Pilly) may occur in more sheltered situations, and *Casuarina glauca* (Swamp Oak) may occur on dunes exposed to salt-bearing sea breezes or where Bangalay Sand Forest adjoins Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions, as listed under the *Threatened Species Conservation Act 1995*. The open shrub stratum may be dominated by sclerophyllous species,

such as *Banksia serrata* (Old Man Banksia), *Leptospermum laevigatum* (Coast Teatree) and *Monotoca elliptica*, or mesophyllous, species, such as *Breynia oblongifolia* (Coffee Bush) and *Pittosporum undulatum* (Sweet Pittosporum), or a combination of both. Shrubs may vary in height from one to ten m tall. The groundcover varies from open to dense, and may be sparse where the tree canopy is dense or where there is a thick litter of leaves and branches. Dominant species include *Dianella* spp. (Blue Flax Lilies), *Lepidosperma concavum, Lomandra longifolia* (Spiny-headed Matrush), *Pteridium esculentum* (Bracken), and the grasses *Imperata cylindrica* var. *major* (Blady Grass), *Microlaena stipoides* var. *stipoides* (Weeping Grass) and *Themeda australis* (Kangaroo Grass), while herbs, such as *Desmodium gunnii*, *Dichondra repens* (Kidney Weed), *Pratia purpurascens* (Whiteroot) and *Viola hederacea* (Ivy-leaved Violet), are scattered amongst the larger plants. Vines of *Glycine clandestina, Hardenbergia violacea* (False Sarsparilla), *Kennedia rubicunda* (Running Postman)*, Marsdenia rostrata* (Common Milk Vine) and *Stephania japonica* var. *discolor* (Snake Vine) scramble through the groundcover and occasionally over shrubs or tree trunks.

5. Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions is currently known from parts of the Local Government Areas of Sutherland, Wollongong, Shellharbour, Kiama, Shoalhaven, Eurobodalla and Bega Valley but may occur elsewhere in these bioregions. Bioregions are defined in Thackway and Creswell (1995).

6. A number of vegetation surveys and mapping studies have been carried out across the range of Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions. In the Sydney-South Coast region, this community includes 'Ecotonal Coastal Hind Dune Swamp Oak-Bangalay Shrub Forest' (ecosystem 27) excluding those stands that are dominated by *Casuarina glauca* and 'Coastal Sands Shrub/Fern Forest' (ecosystem 28) of Thomas *et al*. (2000); 'Littoral Thicket' (map unit 63) and part of 'Coastal Sand Forest' (map unit 64) of Tindall *et al*. (2004); 'Coastal Sand Bangalay-Blackbutt Forest' (map unit 25) of NPWS (2002); and 'Dry Dune Shrub Forest' of Keith and Bedward (1999). Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions is included within the 'South Coast Sands Dry Sclerophyll Forests' vegetation class of Keith (2002, 2004). There may be additional or unmapped occurrences of Bangalay Sand Forest within and beyond these surveyed areas.

7. Near its northern limit in the Bundeena area, Bangalay Sand Forest co-occurs with Kurnell Dune Forest in the Sutherland Shire and City of Rockdale, which is listed as an Endangered Ecological Community in Part 3 of Schedule 1 of the Act. In this area, Bangalay Sand Forest is generally restricted to foredunes and hind dunes of beaches, while Kurnell Dune Forest generally occurs on sheltered sand flats further from the immediate influence of the sea. Characteristic species of Kurnell Dune Forest, such as *Angophora costata, Banksia ericifolia, Cupaniopsis anacardioides, Endiandra sieberi, Eucalyptus robusta* and *Maclura cochinchinensis*, are not common components of Bangalay Sand Forest. However, the two communities may intergrade where they co-occur. This Determination and the Determination of Kurnell Dune Forest collectively encompass all intermediate stands of vegetation between the two communities.

8. Another Endangered Ecological Community, Umina Coastal Sandplain Woodland in the Sydney Basin bioregion, occupies a similar sandplain habitat to the north of Sydney. However, this community occupies podsolised sands that are rich in iron (Burges & Drover 1952), as distinct from the humic podsols that characterise Bangalay Sand Forest, and is dominated by *Angophora floribunda* with *E. paniculata*, while *E. botryoides* predominates only in the vicinity of the beach. In addition, Umina Coastal Sandplain Woodland includes a greater diversity of mesic understorey species and *Acacia* species than Bangalay Sand Forest.

9. Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions is threatened by land clearing; degradation and disturbance associated with heavy recreational use; frequent burning; rubbish dumping; and weed invasion. These threats are generally associated with existing and proposed urban development along the coast. However, areas of Bangalay Sand Forest within conservation reserves, including Royal, Seven Mile Beach, Conjola, Meroo, Murramarang, Eurobodalla and Biamanga National Parks, are exposed to degradation by visitor overuse due to their proximity to popular beaches and camping areas.

10. Available vegetation mapping indicates that Bangalay Sand Forest has suffered substantial levels of clearing. The coastline between Gerroa and Bermagui includes an estimated area of about 3450 hectares, representing one-quarter of the estimated pre-1750 distribution of the community (ecosystems 27 and 28 of Thomas *et al*. 2000). Similarly, Tindall *et al*. (2004) map about 2200 hectares of Littoral Thicket, representing about one-third of the its estimated pre -European distribution between Sydney and Moruya. South of Bermagui, Keith & Bedward (1999) mapped a further 650 hectares, representing less than two-fifths of the estimated pre-1750 distribution. However, recent reconnaissance suggests that these studies may have over-estimated the remaining area of Bangalay Sand Forest (J. Miles, pers. comm.). North of Gerroa, only small fragments of the community persist, for example, on Minnamurra Spit (Mills 2000), around Primbee and Windang (NPWS 2002), Bundeena and Taren Point. Overall, these estimates indicate large reductions in the geographic distribution of the community. Clearing of native vegetation is listed as a Key Threatening Process under the *Threatened Species Conservation Act (1995)*.

11. Some areas of Bangalay Sand Forest are exposed to frequent burning, particularly around camping areas, towns and other sources of ignition. High frequency fire alters species composition by favouring fire-tolerant rhizomatous grasses, sedges and ferns at the expense of woody plants that are slow to regenerate after fire (Keith 1996). Elimination of woody species by frequent burning is likely to be accelerated by grazing. These processes of degradation represent large reductions in the ecological function of the community. High frequency fire resulting in disruption of life cycle processes in plants and animals and loss of vegetation structure and composition is listed as a Key Threatening Process under the *Threatened Species Conservation Act (1995)*.

12. Weed invasion occurs where Bangalay Sand Forest is exposed to disturbance and degradation. Common weed species include *Asparagus* spp., *Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush), introduced forms of *Cynodon dactylon* (Couch), *Cirsium vulgare* (Spear Thistle)*, Conyza bonariensis* (Fleabane)*, Hypochaeris radicata* (Cats Ear)*, Ipomea* spp. (Morning Glory spp.), *Lantana camara, Pennisetum clandestinum* (Kikuyu). These and other weed species may achieve considerable abundance within stands of Bangalay Sand Forest, indicating a large reduction in ecological function of the community. Invasion of native plant communities by exotic perennial grasses is listed as a Key Threatening Process under the *Threatened Species Conservation Act (1995)*.

13. Additions to the coastal reserve system and land use zoning have protected some stands of Bangalay Sand Forest from clearing. However, pressures associated with increasing human populations and recreational activity on the coast continue to intensify, especially where stands of the community occur in the vicinity of coastal villages and urban centres, and where new reserves involve the establishment of camping areas and other visitor infrastructure. Disturbance associated with increased human access contributes particularly to habitat degradation, increased frequencies of bushfire ignitions, and weed invasion, posing major threats even on land managed for conservation. In addition to the processes outlined above, activities such as illegal fire wood collection by campers and coastal residents may threaten habitat for vertebrate and invertebrate fauna and disrupt nutrient and carbon cycling. Removal of dead wood and dead trees is listed as a Key Threatening Process under the *Threatened Species Conservation Act (1995)*. These processes may result in a large reduction in ecological function of the community.

14. In view of the above, the Scientific Committee is of the opinion that Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions it is likely to become extinct in nature in New South Wales unless the circumstances and factors threatening its survival cease to operate.

Dr Lesley Hughes
Chairperson
Scientific Committee

Proposed Gazettal date: 21/10/05
Exhibition period 21/10/05 - 16/12/05

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About the NSW Scientific Committee

Page last updated: 12 February 2008

# Coastal saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological community listing

## NSW Scientific Committee - final determination

**Final Determination**

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list the Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions, as an ENDANGERED ECOLOGICAL COMMUNITY in Part 3 of Schedule 1 of the Act. Listing of endangered ecological communities is provided for by Part 2 of the Act.

The Scientific Committee has found that:

1. Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions is the name given to the ecological community occurring in the intertidal zone on the shores of estuaries and lagoons including when they are intermittently closed along the NSW coast. Coastal saltmarsh has been recorded from sites along the NSW coast. (NSW North Coast, Sydney Basin and South East Corner Bioregions).

2. Characteristic vascular plant species of Coastal Saltmarsh are:

| | |
|---|---|
| *Baumea juncea* | *Isolepis nodosa* |
| *Juncus kraussii* | *Samolus repens* |
| *Sarcocornia quinqueflora* | *Selliera radicans* |
| *Sporobolus virginicus* | *Suaeda australis* |
| *Triglochin striata* | *Zoysia macrantha* |

The total list of species is larger, with many species present in low abundance or at few sites. A more extensive list of species is provided by Adam *et al.* (1988). The sediment surface may support a diversity of both micro-algae and macro-algae.

3. Communities with similar floristic composition, but with a different fauna, are found supratidally on exposed headlands (Adam *et al.* 1988). These headland communities and those of inland saline areas are not included within this Determination of the Coastal Saltmarsh Ecological Community.

4. Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions provide habitat for a diverse invertebrate fauna, which includes both marine (crabs and molluscs) and terrestrial (insects and spiders) elements. During tidal flooding a number of fish species utilise saltmarsh habitats. Grazing by macropods may occur between tidal events. Some coastal saltmarshes provide important high tide roosts for migratory wading birds, and a range of other birds also utilise coastal saltmarsh as habitat. Diversity of macrofauna in mangrove forests adjacent to saltmarsh has been found to be greater than in mangroves that do not border saltmarsh (Yerman & Ross 2004)

5. Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions is frequently found as a zone landward of mangrove stands. Occasional scattered mature *Avicennia marina* trees occur through saltmarsh at some sites, and *Avicennia* (and less frequently *Aegiceras corniculatum*) seedlings may occur throughout saltmarsh. In brackish areas dense stands of tall reeds (*Phragmites australis*, *Bulboschoenus* spp., *Schoenoplectus* spp., *Typha* spp.) may occur as part of the community.

6. West *et al.* (1985) estimated the total area of coastal saltmarsh in NSW was approximately 5700 hectares distributed in fragmented patches mostly less than 100 hectares. Since this estimate, further reduction and fragmentation have occurred.

7. Species composition within Coastal Saltmarsh varies with elevation. *Sarcocornia quinqueflora* dominates at lower, and hence more frequently flooded, levels than *Sporobolus virginicus* which dominates the mid saltmarsh, while *Juncus kraussii* and *Baumea juncea* are upper saltmarsh species. There is also geographic variation, with much more extensive stands of *Sporobolus virginicus* being found in northern NSW, and conversely more extensive *Sarcocornia quinqueflora* stands in the south. Coastal Saltmarsh in southern NSW is generally more species rich than further north, with *Austrostipa stipoides*, *Gahnia filum*, *Limonium australe* and *Sclerostegia arbuscula* forming a characteristic southern suite of species. A number of other species with restricted distribution in Coastal Saltmarsh include *Distichlis distichophylla* (endangered), *Halosarcia pergranulata* subsp. *pergranulata, Wilsonia backhousei* (vulnerable) and *Wilsonia rotundifolia* (endangered).

8. Saltmarshes are globally threatened, and many of the threatening processes identified by Adam (2002) operate in NSW including infilling, modified tidal flow, weed invasion, damage by domestic and feral animals, human disturbance, altered fire regimes and climate change.

9. Historically, substantial areas of saltmarsh have been infilled for roads and aerodromes and for residential, recreational, waste disposal, industrial and agricultural purposes. With increased recognition of the ecological value of saltmarshes, the threat of further large-scale reclamation is less, but smaller scale infilling still occurs (Harty and Cheng 2003).

10. Patterns of tidal flow have been restricted by artificial structures in many NSW saltmarshes (Williams and Watford 1997), while discharge of stormwater alters salinity regimes, increases nutrient levels and facilitates the spread of *Phragmites* and weeds.

11. In recent decades there has been widespread invasion of saltmarsh in southeast Australia by mangroves (Mitchell and Adam 1989, Saintilan and Williams 1999, 2000). The factors driving mangrove invasion are still unclear. The mangrove invasion limits the use of saltmarshes by birds that would normally make use of this habitat and has been a factor in their decline (Saintilan 2003, Straw 1999, 2000).

12. A large number of weed species occur in NSW saltmarshes (Adam 1981, Adam *et al.* 1988). In terms of change to the community structure and function, the most serious weed is *Juncus acutus*; other major weeds include *Baccharis halimifolia, Cortaderia selloana* and *Hydrocotyle bonariensis*. The upper saltmarsh zone may be dominated by introduced annuals or shortlived perennials, including *Parapholis incurva, Plantago coronopus* and *Polypogon monspeliensis*.

13. Damage to saltmarshes by recreational vehicles, including four wheel drives, is widespread, and deep wheel ruts persist for many years even after exclusion of vehicles. Use of BMX and mountain bikes is increasing, and even saltmarshes within conservation reserves have been seriously damaged (Adam 2002).

14. Grazing and trampling by domestic stock and feral herbivores occurs at a number of sites. Stock grazing has been shown to substantially change the vegetation composition and structure (Adam 1990), while on muddy substrates trampling can cause loss of plant cover and modify drainage patterns.

15. Saltmarshes have frequently been used for casual rubbish dumping and are at risk from waterborne pollution - including oil and chemical spills, both from shipping and road accidents, and catchment runoff of nutrients and agricultural chemicals.

16. Upper saltmarsh stands dominated by *Juncus kraussii* and *Baumea juncea* have high flammable fuel loads. While the natural incidence of fire in saltmarshes is likely to have been low, a number of saltmarshes have been burnt in recent years. The recovery of these sites is relatively slow and the long-term impacts of burning are uncertain.

17. Global warming and increased relative sea level are likely to pose an increasing threat to the survival of many areas of Coastal Saltmarsh (Adam 2002, Hughes 2003).

18. Coastal Saltmarsh occurs in a number of conservation reserves including the Ramsar listed sites at Towra Point and Kooragang Island Nature Reserves. Reserve status, however, does not confer protection from mangrove and weed invasion, recreational vehicles, pollution, fire or sea level rise without active management.

19. In view of the above the Scientific Committee is of the opinion that the Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions is likely to become extinct in nature in New South Wales unless the circumstances and factors threatening its survival cease to operate.

Dr Lesley Hughes

Deputy Chairperson

Scientific Committee

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About the NSW Scientific Committee

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Environment, Climate Change & Water



# Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological community listing

## NSW Scientific Committee - final determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions, as an ENDANGERED ECOLOGICAL COMMUNITY in Part 3 of Schedule 1 of the Act. Listing of endangered ecological communities is provided for by Part 2 of the Act.

The Scientific Committee has found that:

1. Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is the name given to the ecological community associated with periodic or semi-permanent inundation by freshwater, although there may be minor saline influence in some wetlands. They typically occur on silts, muds or humic loams in depressions, flats, drainage lines, backswamps, lagoons and lakes associated with 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 (adapted from Speight 1990). Freshwater Wetlands on Coastal Floodplains generally occur below 20 m elevation in the NSW North Coast, Sydney Basin and South East Corner bioregions. The structure of the community may vary from sedgelands and reedlands to herbfields, and woody species of plants are generally scarce. Typically these wetlands form mosaics with other floodplain communities, and often they include or are associated with ephemeral or semi-permanent standing water (e.g. Goodrick 1970).

The composition of Freshwater Wetlands on Coastal Floodplains is primarily determined by the frequency, duration and depth of waterlogging and may be influenced by the level of nutrients and salinity in the water and substrate. The community is characterised by the following assemblage of species:

| | |
|---|---|
| *Alisma plantago-aquatica* | *Azolla filiculoides* var. *rubra* |
| *Azolla pinnata* | *Baumea articulata* |
| *Baumea rubiginosa* | *Bolboschoenus caldwellii* |
| *Bolboschoenus fluviatilis* | *Brasenia schreiberi* |
| *Carex appressa* | *Centipeda minima* |
| *Ceratophyllum demersum* | *Cyperus lucidus* |
| *Eclipta platyglossa* | *Eclipta prostrata* |
| *Eleocharis acuta* | *Eleocharis equisetina* |
| *Eleocharis minuta* | *Eleocharis sphacelata* |
| *Fimbristylis dichotoma* | *Gratiola pedunculata* |
| *Hemarthria uncinata* | *Hydrilla verticillata* |
| *Hydrocharis dubia* | *Juncus polyanthemos* |
| *Juncus usitatus* | *Leersia hexandra* |
| *Lemna* spp. | *Lepironia articulata* |
| *Ludwigia peploides* subsp. *montevidensis* | *Marsilea mutica* |
| *Maundia triglochinoides* | *Myriophyllum crispatum* |
| *Myriophyllum latifolium* | *Myriophyllum propinquum* |
| *Myriophyllum variifolium* | *Najas marina* |
| *Najas tenuifolia* | *Nymphaea gigantea* |
| *Nymphoides geminata* | *Nymphoides indica* |
| *Ottelia ovalifolia* | *Panicum obseptum* |
| *Panicum vaginatum* | *Paspalum distichum* |
| *Persicaria attenuata* | *Persicaria decipiens* |
| *Persicaria hydropiper* | *Persicaria lapathifolia* |
| *Persicaria strigosa* | *Philydrum lanuginosum* |
| *Phragmites australis* | *Potamogeton crispus* |
| *Potamogeton ochreatus* | *Potamogeton perfoliatus* |
| *Potamogeton tricarinatus* | *Pseudoraphis spinescens* |
| *Ranunculus inundatus* | *Schoenoplectus litoralis* |
| *Schoenoplectus mucronatus* | *Schoenoplectus validus* |
| *Spirodella* spp. | *Triglochin procera* sensu lato |
| *Typha orientalis* | *Utricularia australis* |
| *Vallisneria* spp. | *Wolffia* spp. |

2. The total species list of the community is considerably larger than that given above, with many species present at only one or two sites or in low abundance. The species composition of a site will be influenced by the size of the site, recent rainfall or drought conditions and by its disturbance history (including grazing, flooding, land clearing and pollution in the catchment). The number and relative abundance of species will change with time since flooding or significant rainfall, and may also change in response to changes in grazing regimes and land use in the catchment. At any one time, above-ground individuals of some species may be absent, but the species may be represented below ground in the soil seed banks or as

dormant structures such as bulbs, corms, rhizomes, rootstocks or lignotubers. The list of species given above is of vascular plant species, the community also includes micro-organisms, fungi, cryptogamic plants and a diverse fauna, both vertebrate and invertebrate. These components of the community are poorly documented.

3. Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is known from parts of the Local Government Areas of Tweed, Byron, Lismore, Ballina, Richmond Valley, Clarence Valley, Coffs Harbour, Bellingen, Nambucca, Kempsey, Hastings, Greater Taree, Great Lakes, Port Stephens, Maitland, Newcastle, Cessnock, Lake Macquarie, Wyong, Gosford, Hawkesbury, Baulkham Hills, Blacktown, Penrith, Fairfield, Liverpool, Wollondilly, Camden, Campbelltown, Wollongong, Shellharbour, Kiama, Shoalhaven, Eurobodalla and Bega Valley but may occur elsewhere in these bioregions. Bioregions are defined in Thackway and Creswell (1995). Examples include Swan Bay, Gundurimba wetland, Bungawalbin Swamp, Dyraaba Creek and Tuckean Swamp on the Richmond floodplain; Southgate wetlands and Trenayr Swamp on the Clarence floodplain; Seven Oaks Swamp, Swan Pool, Kinchela Creek and Upper Belmore Swamp on the Macleay floodplain; Great Swamp on the Manning floodplain; Wentworth Swamp, Hexham Swamp, Wallis Creek and Ellalong Lagoon on the Hunter floodplain; Bushells, Pitt Town, Long Neck and Broadwater Lagoons on the Hawkesbury floodplain; Coomonderry Swamp on the Shoalhaven floodplain; Pedro and Old Man Bed Swamps on the Moruya floodplain; and Jellat Jellat Swamp on the Bega floodplain (Goodrick 1970).

4. Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is dominated by herbaceous plants and have very few woody species. The structure and composition of the community varies both spatially and temporally depending on the water regime (Yen and Myerscough 1989, Boulton and Brock 1999). Wetlands or parts of wetlands that lack standing water most of the time are usually dominated by dense grassland or sedgeland vegetation, often forming a turf less than 0.5 metre tall and dominated by amphibious plants including *Paspalum distichum* (water couch), *Leersia hexandra* (swamp rice-grass), *Pseudoraphis spinescens* (mud grass) and *Carex appressa* (tussock sedge). Wetlands or parts of wetlands subject to regular inundation and drying may include large emergent sedges over 1 metre tall, such as *Baumea articulata, Eleocharis equisetina* and *Lepironia articulata*, as well as emergent or floating herbs such as *Hydrocharis dubia* (frogbit), *Philydrum lanuginosum* (frogsmouth), *Ludwigia peploides* subsp. *montevidensis* (water primrose), *Marsilea mutica* (nardoo) and *Myriophyllum* spp. (milfoils). As standing water becomes deeper or more permanent, amphibious and emergent plants become less abundant, while floating and submerged aquatic herbs become more abundant. These latter species include *Azolla filiculoides* var. *rubra*, *Ceratophyllum demersum* (hornwort), *Hydrilla verticillata* (water thyme), *Lemna* spp. (duckweeds), *Nymphaea gigantea* (giant waterlily), *Nymphoides indica* (water snowflake), *Ottelia ovalifolia* (swamp lily) and *Potamageton* spp. (pondweeds). The threatened aquatic plants, *Aldrovanda vesiculosa* and *Najas marina*, also occur within this community. The composition and structure of the vegetation is also influenced by grazing history, changes to hydrology and soil salinity, catchment runoff and disturbance, and may have a substantial component of exotic grasses and forbs. Artificial wetlands created on previously dry land specifically for purposes such as sewerage treatment, stormwater management and farm production, are not regarded as part of this community, although they may provide habitat for threatened species.

5. Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions has a distinctive fauna that includes frogs, fish, freshwater tortoises, waterbirds and a diversity of micro- and macro-invertebrates. The frog families represented are Myobatrachidae (southern frogs) and Hylidae (tree frogs), including the threatened Green and Golden Bell Frog (*Litoria aurea*). Waterbirds include Black Swan (*Cygnus atratus*), Pacific Black Duck (*Anas superciliosa*), Australian Grey Teal (*Anas gracilis*), Pacific Heron (*Ardea pacifica*), White-faced Heron (*Ardea novaehollandiae*), Great Egret (*Ardea alba*), Intermediate Egret (*Ardea intermedia*), Little Egret (Ardea garzetta), Straw-necked Ibis (*Threskiornis spinicollis*), Sacred Ibis (*Threskiornis aethiopica*), Black-necked Stork (*Ephippiorhynchus asiaticus*), Royal Spoonbill (*Platalea regia*), Yellow-billed Spoonbill (*Platalea flavipes*), Japanese Snipe (*Gallinago hardwickii*), Black-winged Stilt (*Himantopus himantopus*), Dusky Moorhen (*Gallinula tenebrosa*), Comb-crested jacana (*Jacana gallinacea*) and Purple swamphen (*Porphyrio porphyrio*).

6. Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions forms part of a complex of forested wetland and treeless wetland communities found throughout the coastal floodplains of NSW. A recent analysis of available quadrat data from these habitats identified several types of forested wetlands that are distinct from this treeless wetland community (Keith and Scott 2005). The combination of features that distinguish Freshwater Wetlands on Coastal Floodplains from other endangered ecological communities on the coastal floodplains include its scarcity or complete absence of woody plant species and the presence of amphibious, emergent, floating or submerged aquatic forbs, grasses or sedges. It generally occupies low-lying parts of floodplains, alluvial flats, depressions, drainage lines, backswamps, lagoons and lakes; habitats where flooding is periodic and standing fresh water persists for at least part of the year in most years. The community also occurs in backbarrier landforms where floodplains adjoin coastal sandplains (e.g. Pressey and Griffith 1992). However, it is distinct from Sydney Freshwater Wetlands, which may include a component of woody plant species and are associated with sandplains in the Sydney Basin bioregion.

7. Freshwater Wetlands on Coastal Floodplains may adjoin or intergrade with several other endangered ecological communities, which collectively cover all remaining native vegetation on the coastal floodplains of New South Wales. These include Lowland Rainforest on Floodplain in the NSW North Coast bioregion, Subtropical Floodplain Forest of the NSW North Coast bioregion, River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (including the formerly listed Sydney Coastal River-flat Forest in the Sydney Basin bioregion), Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (including the formerly listed Sydney Coastal Estuary Swamp Forest Complex in the Sydney Basin bioregion) and Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions. For example, Freshwater Wetlands on Coastal Floodplains are sometimes fringed by trees, such as *Casuarina glauca* (swamp oak) and *Melaleuca quinquenervia* (paperbark), indicating transitional zones to forested communities of the floodplains. The boundaries between these communities are dynamic and may shift in response to changes in hydrological regimes, fire regimes or land management practices (e.g. Johnston *et al.* 2003, Stevenson 2003). In addition, Freshwater Wetlands on Coastal Floodplains may adjoin or intergrade with Coastal Saltmarsh of the NSW North Coast, Sydney Basin and South East Corner bioregions and Sydney Freshwater Wetlands of the Sydney Basin bioregion. The Determinations for these communities collectively encompass the full range of intermediate assemblages.

8. A number of vegetation surveys and mapping studies have been conducted across the range of Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions. This community includes 'Fresh meadows', Seasonal fresh swamps', 'Semi-permanent fresh swamps', and 'Open fresh waters' in the general coastal

wetlands classification of Goodrick (1970). In the Tweed valley lowlands, this community includes '*Eleocharis equisetina* tall closed sedgeland' (E2) and '*Triglochin procera* tall forbland to tall open forbland' (E3) of Pressey and Griffith (1992) and parts of the 'Floodplain Wetland Complex' (FL) that are dominated by herbaceous plants (Pressey and Griffith 1992). In the lower Hunter valley, 'Freshwater Wetland Complex' (map unit 46) of NPWS (2000) falls within this community. In the Sydney region, this community includes 'Freshwater wetlands on the floodplains' of Benson and Howell (1990); 'Freshwater reed swamps' (map unit 28a) of Benson (1992) and Ryan *et al.* (1996) in the Penrith-St Albans district; '*Lepironia* freshwater swamp' (map unit 75 and part of map unit 79) of NPWS (2002a) in the Warragamba area; and 'Freshwater wetlands' (map unit 36) of Tozer (2003) on the Cumberland Plain. On the Illawarra plain, this community includes 'Floodplain Wetland' (map unit 54) of NPWS (2002b). In the Comprehensive Regional Assessment of southern New South Wales (Thomas et al. 2000), this community includes 'Coastal alluvial valley floor wetlands' (map unit 189). This community also includes those parts of 'Coastal freshwater lagoon' (map unit 313) of Tindall et al. (2004), on the south coast of NSW, and parts of 'Floodplain Wetlands' (map unit 60) of Keith and Bedward (1999), in the Eden region, that are dominated by herbaceous aquatic plants. Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is included within the 'Coastal Freshwater Lagoons' vegetation class of Keith (2002, 2004). There may be additional or unmapped occurrences of Freshwater Wetlands on Coastal Floodplains within and beyond these surveyed areas.

9. The extent of the Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions prior to European settlement has not been mapped across its entire range. Estimates of wetland area also vary, depending on the scale of mapping (coarse scale maps may exclude many small wetlands), wetland definition and the occurrence of recent flooding. Mapping carried out by Kingsford *et al.* (2004), for example, focused on areas of open water and thus excluded many wetlands attributable to this community. One estimate based on a compilation of regional vegetation maps suggests that Coastal Freshwater Lagoons, which include Freshwater Wetlands on Coastal Floodplains, currently cover 90-160 km2, representing less than 60-90% of the original extent of this broadly defined vegetation class (Keith 2004). However, the remaining area of Freshwater Wetlands on Coastal Floodplains is likely to represent much less than 60-90% of its original range, because this combined estimate for the Coastal Freshwater Wetlands class (Keith 2004) is likely to include a considerable area of freshwater wetlands on coastal sandplains, which are excluded from this Determination. Goodrick (1970) estimated that approximately 21 700 ha of 'Fresh meadows', 'Seasonal fresh swamps', 'Semi-permanent fresh swamps', and 'Open fresh waters' remained on NSW coastal floodplains in 1969, representing less than 39% of their original area. Continued clearing and drainage works in the 35 years since Goodrick's (1970) survey are likely to have resulted in a substantial diminution of Freshwater Wetlands on Coastal Floodplains. More detailed surveys have identified the following areas attributable to Freshwater Wetlands on Coastal Floodplains: less than 150 ha on the Tweed lowlands in 1985 (Pressey and Griffith 1992); about 10 600 ha on the lower Clarence floodplain in 1982 (Pressey 1989a); about 11 200 ha on the lower Macleay floodplain in 1983 (Pressey 1989b); about 3500 ha in the lower Hunter - central Hunter region in 1990s (NPWS 2000); less than 2700 ha on the NSW south coast from Sydney to Moruya in the mid 1990s (Tindall *et al*. 2004), including about 660 ha on the Cumberland Plain in 1998 (Tozer 2003) and about 100 ha on the Illawarra Plain in 2001 (NPWS 2002); and less than 1000 ha in the Eden region in 1990 (Keith and Bedward 1999). The wetlands included in these estimates exist in various states of modification.

10. Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions has been extensively cleared and modified. Large areas that formerly supported this community are occupied by exotic pastures grazed by cattle, market gardens, other cropping enterprises (e.g. sorghum, corn, poplars, etc.) and, on the far north coast, canefields. On the Tweed lowlands, Pressey and Griffith (1992) estimated that less than 3% of the original Floodplain Wetlands remained in 1985. Similar estimates are likely to apply to Freshwater Wetlands on Coastal Floodplains in other parts of the NSW North Coast bioregion (Pressey 1989a, 1989b). In the lower Hunter - central coast region, about two-thirds was estimated to have remained during the 1990s (NPWS 2000), while approximately 40% remained on the Cumberland Plain in 1998 (Tozer 2003). In the Sydney - South Coast region, about 70% was estimated to remain in the mid 1990s (Tindall *et al*. 2004), in the Eden region about 30% was estimated to remain during the 1990s (Keith and Bedward 1999).

11. Land clearing continues to threaten Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions. A small minority of the remaining area occurs on public land (e.g. Pressey 1989a, b; Pressey and Griffith 1992), with most occurring on productive agricultural land or in close proximity to rural centres. The remaining stands are severely fragmented by past clearing and are further threatened by continuing fragmentation and degradation, flood mitigation and drainage works, filling associated with urban and industrial development, pollution and eutrophication from urban and agricultural runoff, weed invasion, overgrazing, trampling by livestock, soil disturbance by pigs, activation of 'acid sulfate soils' and rubbish dumping (e.g. Goodrick 1970; Pressey 1989a, b; Pressey and Griffith 1992; Boulton and Brock 1999, Johnston *et al*. 2003). The native fauna of Freshwater Wetlands on Coastal Floodplains is threatened by predation, particularly by mosquito fish and cane toads. Anthropogenic climate change may also threaten Freshwater Wetlands on Coastal Floodplains if sea levels rise and future flooding regimes change as predicted (IPCC 2001; Hughes 2003). Clearing of native vegetation; Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands; Invasion of native plant communities by exotic perennial grasses; Predation, habitat destruction, competition and disease transmission by feral pigs; and Anthropogenic climate change are listed as Key Threatening Processes under the Threatened Species Conservation Act (1995).

12. Large areas of habitat formerly occupied by Freshwater Wetlands on Coastal Floodplains have been directly drained by construction of artificial channels (e.g. Pressey 1989a, Boulton and Brock 1999). By the early 1900s, drainage unions or trusts were formed on the major floodplains to enable adjacent landholders to arrange for co-ordinated drainage systems, which were designed and constructed by the former NSW Department of Public Works. Additional areas that have not been directly drained may have been altered hydrologically by changed patterns of flooding and drainage following flood mitigation works, particularly the construction of drains, levees and floodgates (Pressey and Griffith 1992). On the north coast of NSW, expansion of *Melaleuca quinquenervia* and *Casuarina glauca* into open floodplain swamps has been attributed to artificial drainage and shortening of the hydroperiod (Johnston *et al*. 2003, Stevenson 2003). These changes appear to be closely associated with enhanced acidity, altered ionic ratios, increased dissolved organic carbon and sulfide oxidation in the soil profile (Johnston *et al*. 2003). Conversely, alteration of tidal flows may have led to decreased soil salinity and localised expansion of Freshwater Wetland into areas that previously supported Coastal Saltmarsh or mangroves (Stevenson 2003). Re-instatement of tidal flows and other natural hydrological processes may therefore lead to contraction of Freshwater Wetlands. In addition, sedimentation and eutrophication of wetlands is associated with development of their

catchments for intensive agriculture or urban or industrial infrastructure. Harmful runoff from developed catchments may include herbicides, pesticides, fertilisers, sewerage, industrial waste and polluted stormwater. The widespread degradation of Freshwater Wetlands on Coastal Floodplains has led to regional declines in their dependent fauna including Magpie Geese (*Anseranas semipalmata*), Cotton Pygmy Geese (*Nettapus coromandelianus*), Hardhead (*Aythya australis*), Black-necked Stork (*Ephippiorhynchus asiaticus*), and Wandering Whistling Duck (*Dendrocygna arcuata*).

13. Very few examples of Freshwater Wetlands on Coastal Floodplains remain unaffected by weeds. The causes of weed invasion include physical disturbance to the vegetation structure of the community; the dumping of landfill, rubbish and garden refuse; eutrophication and polluted runoff from urban and agricultural areas; construction of roads and other utilities; soil disturbance by feral pigs and grazing by domestic livestock. In addition, mechanical and chemical methods of controlling aquatic weeds may threaten native components of the flora. The principal weed species affecting Freshwater Wetlands on Coastal Floodplains include *Alternanthera philoxeroides* (alligatorweed), *Baccharis halimifolia* (groundsel bush), *Echinochloa crus-galli* (barnyard grass), *Eichhornia crassipes* (water hyacinth), *Hygrophila costata* (glush weed), *Ludwigia longifolia, L. peruviana*, *Nymphaea capensis* (Cape waterlily), *Panicum repens* (torpedo grass), *Pennisetum clandestinum* (kikuyu) and *Salvinia molesta,* (Sainty and Jacobs 1981).

14. Small areas of Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions are contained within existing conservation reserves, including Ukerebagh, Tuckean, Tabbimoble Swamp, Hexham Swamp, Pambalong and Pitt Town Nature Reserves and Bungawalbin, Scheyville and Seven Mile Beach National Parks, although these are unevenly distributed throughout the range and unlikely to represent the full diversity of the community. In addition, wetlands within protected areas are exposed to hydrological changes that were, and continue to be initiated outside their boundaries. Some Freshwater Wetlands on Coastal Floodplains are protected by State Environmental Planning Policy 14, although this has not always precluded impacts on wetlands from the development of major infrastructure.

15. Given the dynamic hydrological relationship between Freshwater Wetlands on Coastal Floodplains, Coastal Saltmarsh and other endangered ecological communities on coastal floodplains, future management of water and tidal flows may result in the expansion of some communities at the expense of others. Proposals for the restoration of natural hydrological regimes and for the rehabilitation of acid sulfate soils may also result in changes to the distribution and composition of floodplain communities. Co-ordinated planning and management approaches across whole catchments will be required to address and resolve priorities between different management objectives.

16. In view of the above the Scientific Committee is of the opinion that Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is likely to become extinct in nature in New South Wales unless the circumstances and factors threatening its survival or evolutionary development cease to operate.

Associate Professor Paul Adam

Chairperson

Scientific Committee

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About the NSW Scientific Committee

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# Illawarra subtropical rainforest in the Sydney Basin Bioregion - end ecological community listing

## NSW Scientific Committee - final determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Dete the Illawarra Subtropical Rainforest in the Sydney Basin Bioregion as an ENDANGERED ECOLOGICAL COM of Schedule 1 of the Act. The listing of endangered ecological communities is provided for by Part 2 of the

The Scientific Committee has found that:

1. Illawarra Subtropical Rainforest is the name given to the ecological community on high nutrient soils in within the Sydney Basin Bioregion and is characterised by the following assemblage of species.

- *Adiantum formosum*
- *Alectryon subcinereus*
- *Alphitonia excelsa*
- *Baloghia inophylla*
- *Brachychiton acerifolius*
- *Cassine australis*
- *Cayratia clematidea*
- *Celastrus australis*
- *Cissus antarctica*
- *Citriobatus pauciflorus*
- *Dendrocnide excelsa*
- *Diospyros pentamera*
- *Diploglottis australis*
- *Doodia aspera*
- *Ehretia acuminata*
- *Ficus*spp.
- *Guioa semiglauca*
- *Hibiscus heterophyllus*
- *Legnephora moorei*
- *Maclura cochinchinensis*
- *Malaisia scandens*
- *Pennantia cunninghamii*
- *Piper novaehollandiae*
- *Planchonella australis*
- *Podocarpus elatus*
- *Scolopia braunii*
- *Streblus brunonianus*
- *Toona ciliata*
- *Wilkiea huegliana*

2. The total species list of the community is considerably larger than that given above, with many species one or two sites or in very small quantity. The species composition of a site will be influenced by the size rainfall or drought condition and by its disturbance (including fire) history. The number of species, and the relative abundance of species will change with time since fire, and may also change in response to change (including changes in fire frequency). At any one time, above ground individuals of some species may be species may be represented below ground in the soil seed banks or as dormant structures such as bulbs, rootstocks or lignotubers. The list of species given above is of vascular plant species, the community also organisms, fungi, cryptogamic plants and a diverse fauna, both vertebrate and invertebrate. These compo community are poorly documented.

3. Illawarra Subtropical Rainforest has been recorded from the local government areas of Wollongong City City, Shoalhaven City and Kiama Municipality (within the Sydney Basin Bioregion) and may occur elsewhe Bioregion.

4. Illawarra Subtropical Rainforest includes Subtropical Rainforest (Type 1), Moist Subtropical Rainforest ( Subtropical Rainforest (Type 3) of Mills, K & Jakeman, J. (1995 *Rainforests of the Illawarra District* (Coach Jamberoo). (The classification of Mills & Jakeman was developed specifically for the Illawarra - in a broade the community recognised here would fall within dry forest (suballiance 23) in Floyd, A. G. (1990). *Austra New South Wales* (Vols 1 and 2, Surrey Beatty and Sons, Chipping Norton). Although rainforest canopies closed, in highly disturbed stands the canopy may be irregular and open. Canopy height varies considerab structurally some stands are scrub.

5. Characteristic tree species in the Illawarra Subtropical Rainforest are *Baloghia inophylla, Brachychiton Dendrocnide excelsa, Diploglottis australis, Ficus* spp., *Pennantia cunninghamii* and *Toona ciliata.* Stands of *Eucalyptus*, *Syncarpia* and *Acacia* as emergents or incorporated into the dense canopy.

6. Illawarra Subtropical Rainforest occurred mainly on the coastal Permian volcanics, but can occur on a r substrates, mainly between Albion Park and Gerringong (termed the Illawarra Brush by Mills and Jakemar of Lake Illawarra on the Berkeley Hills (termed the Berkeley Brush by Mills & Jakeman 1995). The Illawar Berkeley Brush originally covered about 13 600 ha and made up about 60% of the rainforest of the Illawa occurrences of Illawarra Subtropical Rainforest also occur south to the Shoalhaven River and westwards ir Valley, where areas of Permian volcanic soils occur. The community generally occurs on the coastal plain foothills, rarely extending onto the upper escarpment slopes.

7. Illawarra Subtropical Rainforest provides habitat for the tree*Daphnandra* sp. C Illawarra, and in some d endangered vine *Cynanchum elegans*. The shrub *Zieria granulata* may grow near stands of Illawarra Subt and in regrowth stands (K. Mills pers. comm.).

8. Small areas of Illawarra Subtropical Rainforest occur in Budderoo National Park, Macquarie Pass Nation National Park, Cambewarra Range Nature Reserve, Devils Glen Nature Reserve and Rodway Nature Reser

9. Large areas of Illawarra Subtropical Rainforest have been cleared for agriculture. Only about 3400 ha r 13% of this (440 ha) in reserved areas (Mills & Jakeman 1995, L. Mitchell pers. comm). Illawarra Subtrop occurs mainly on private land and is inadequately protected. Compared with warm temperate rainforest it represented in conservation reserves.

10. Remnants are small and fragmented and their long term viability is threatened. Weed invasion is a ma invasive exotic species include *Lantana camara, Araujia sericiflera, Ageratina riparia, Ageratina adenopho odorata, Senna pendula*var *glabra, Senna septemtrionalis, Tradescantia fluminensis, Cinnamomum camph europea*subsp*. africana, Hedychium gardnerianum, Ligustrum lucidum, Ligustrum sinense, Passiflora subp Solanum mauritianum*. Other threats include further clearing, quarrying, grazing, inappropriate fire regim dumping and hobby farm developments.

In view of the above the Scientific Committee is of the opinion that Illawarra Subtropical Rainforest in the Bioregion is likely to become extinct in nature in NSW unless the circumstances and factors threatening it evolutionary development cease to operate.

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About the NSW Scientific Committee

# Littoral rainforest in the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological community listing

## NSW Scientific Committee - final determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions as an ENDANGERED ECOLOGICAL COMMUNITY in Part 3 of Schedule 1 of the Act, and as a consequence, to omit reference to the Sutherland Shire Littoral Rainforest from Part 3 of Schedule 1 (Endangered Ecological Community) of the Act. Listing of endangered ecological communities is provided for by Part 2 of the Act.

The Scientific Committee has found that:

1. Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions is generally a closed forest, the structure and composition of which is strongly influenced by proximity to the ocean. The plant species in this ecological community are predominantly rainforest species with evergreen mesic or coriaceous leaves. Several species have compound leaves, and vines may be a major component of the canopy. These features differentiate littoral rainforest from sclerophyll forest or scrub, but while the canopy is dominated by rainforest species, scattered emergent individuals of sclerophyll species, such as *Angophora costata*, *Banksia integrifolia, Eucalyptus botryoides* and *E. tereticornis* occur in many stands. Littoral Rainforest in NSW is found at locations along the entire NSW Coast in the NSW North Coast Bioregion, Sydney Basin Bioregion and South East Corner Bioregion. The areas mapped for inclusion in State Environmental Planning Policy 26 Littoral Rainforest are examples of the Littoral Rainforest ecological communities, but the mapping for SEPP 26 is not exhaustive and stands of the Littoral Rainforest ecological community occur at locations not mapped under SEPP 26. Some stands may be regrowth or in the process of regenerating. The Sutherland Shire Littoral Rainforest Endangered Ecological Community which was previously listed as an endangered ecological community is included within this Community.

2. Littoral rainforest occurs on both sand dunes and on soils derived from underlying rocks (McKinley *et al*. 1999). Stands on headlands exposed to strong wind action may take the form of dense windpruned thickets (for example the Bunga Head Rainforest illustrated by Keith & Bedward 1999, or MU5 Littoral Windshear Thicket in NPWS 2002). In more sheltered sites, and in hind dunes, the community is generally taller, although still with wind pruning on the windward side of stands. Floristically there is a high degree of similarity between stands on different substrates. Most stands of Littoral Rainforest occur within 2 km of the sea, but may occasionally be found further inland, but within reach of maritime influence.

3. Littoral Rainforest comprises the *Cupaniopsis anacardioides - Acmena* spp. alliance of Floyd (1990). This alliance as described by Floyd includes five sub-alliances - *Syzygium leuhmannii - Acmena hemilampra, Cupaniopsis anacardioides, Lophostemon confertus, Drypetes - Sarcomelicope - Cassine - Podocarpus* and *Acmena smithii - Ficus - Livistona - Podocarpus.* The distribution of some of these sub-alliances is geographically restricted - the *Syzygium luehmannii - Acmena hemilampra* sub-alliance is restricted to the north coast, while the most widespread sub-alliance *Acmena smithii - Ficus - Livistona - Podocarpus* is the only one present on the coast south of Sydney. The *Lophostemon confertus* suballiance, synonymous with Forest Type 25 Headland Brush Box (Forestry Commission of NSW 1989) is restricted to exposed headlands in the North Coast Bioregion. There is considerable floristic variation between stands and in particular areas localised variants may be recognised (for example on the south coast a number of variants within the *Acmena smithii - Ficus - Livistona - Podocarpus* sub-alliance have been described, see Mills 1996, Mills & Jakeman 1995; Keith & Bedward 1999, NCC 1999, NPWS 2002). Small, depauperate stands may be difficult to assign to sub alliances. A number of species characteristic of Littoral Rainforest in NSW reach their southern limits at various places along the coast (for example *Cupaniopsis anacardioides* reaches its southern limit between Sydney and the Illawarra) but a number of temperate species are restricted to the south coast, and the total Littoral Rainforest flora declines from north to south. Characteristic species of littoral rainforest include:

| | | | |
|---|---|---|---|
| · | *Acacia binervata* | · | *Acmena hemilampra* |
| · | *Acmena smithii* | + | *Acronychia imperforata* |
| · | *Acronychia oblongifolia* | + | *Alpinia caerulea* |
| · | *Alectryon coriaceus* | · | *Alyxia ruscifolia* |
| + | *Aphananthe philippinensis* | + | *Archontophoenix cunninghamiana* |
| · | *Arthropteris tenella* | + | *Arytera divaricata* |
| · | *Asplenium australasicum* | + | *Baloghia marmorata* |
| · | *Banksia integrifolia* subsp. *integrifolia* | + | *Beilschmiedia obtusifolia* |
| · | *Breynia oblongifolia* | + | *Bridelia exaltata* |
| + | *Calamus muelleri* | · | *Canthium coprosmoides* |

| | | | |
|---|---|---|---|
| + | *Capparis arborea* | | *Cayratia clematidea* |
| | *Celtis paniculata* | | *Cissus antarctica* |
| | *Cissus hypoglauca* | | *Cissus sterculiifolia* |
| | *Claoxylon australe* | + | *Cordyline congesta* |
| + | *Cordyline stricta* | | *Cryptocarya glaucescens* |
| | *Cryptocarya microneura* | + | *Cryptocarya triplinervis* |
| | *Cupaniopsis anacardioides* | | *Cynanchum elegans* |
| | *Dendrocnide excelsa* | + | *Dendrocnide photinophylla* |
| | *Dioscorea transversa* | | *Diospyros australis* |
| | *Diospyros pentamera* | | *Doodia aspera* |
| | *Duboisia myoporoides* | + | *Dysoxylum fraserianum* |
| | *Ehretia acuminata* | + | *Elaeocarpus obovatus* |
| + | *Elattostachys nervosa* | | *Endiandra discolor* |
| | *Endiandra sieberi* | | *Eucalyptus botryoides* |
| | *Eucalyptus tereticornis* | | *Eupomatia laurina* |
| | *Eustrephus latifolius* | | *Ficus coronata* |
| | *Ficus obliqua* | | *Ficus rubiginosa* |
| + | *Ficus watkinsiana* | | *Flagellaria indica* |
| | *Geitonoplesium cymosum* | | *Glochidion ferdinandi* |
| | *Glycine clandestina* | + | *Gossia bidwillii* |
| | *Guioa semiglauca* | + | *Ixora beckleri* |
| + | *Jagera pseudorhus* | + | *Lepidozamia peroffskyana* |
| | *Litsea reticulata* | | *Livistona australis* |
| | *Lomandra longifolia* | + | *Lophostemon confertus* |
| | *Maclura cochinchinensis* | + | *Mallotus philippensis* |
| | *Melaleuca quinquenervia* | | *Melicope micrococca* |
| + | *Melicope vitiflora* | + | *Mischocarpus pyriformis* |
| + | *Monococcus echinophorus* | + | *Morinda jasminoides* |
| + | *Mucuna gigantea* | | *Myoporum acuminatum* |
| | *Notelaea longifolia* | + | *Olea paniculata* |
| | *Oplismenus imbecillis* | + | *Pandanus pedunculatus* |
| | *Pandorea pandorana* | | *Pararchidendron pruinosum* var. *pruinosum* |
| | *Parsonsia straminea* | + | *Pentaceras australis* |
| | *Piper novae-hollandiae* | + | *Pisonia umbellifera* |
| | *Pittosporum multiflorum* | | *Pittosporum undulatum* |
| | *Platycerium bifurcatum* | | *Podocarpus elatus* |
| | *Pollia crispata* | | *Polyscias elegans* |
| | *Pouteria australis* | | *Pouteria cotinifolia* var. *cotinifolia* |
| + | *Pouteria myrsinoides* | | *Rapanea variabilis* |
| | *Rhodamnia rubescens* | + | *Rhodomyrtus psidioides* |
| | *Ripogonum album* | | *Ripogonum discolor* |
| | *Sarcomelicope simplicifolia* | | *Scolopia braunii* |
| | *Smilax australis* | | *Smilax glyciphylla* |
| + | *Sophora tomentosa* subsp. *australis* | | *Stephania japonica* var. *discolor* |
| | *Synoum glandulosum* | | *Syzygium australe* |
| + | *Syzygium luehmannii* | | *Syzygium oleosum* |
| | *Syzygium paniculatum* | + | *Tetrastigma nitens* |
| | *Trophis scandens* subsp. *scandens* | | *Viola banksii* |
| | *Wilkiea huegeliana* | | |

Those species marked '+' are found in littoral rainforest north of Sydney, with some restricted to the north coast or in only a few sites south of the North Coast Bioregion. The other species are geographically more widespread.

Given the small size of many stands and the history of fragmentation, the number of characteristic species in any stand is likely to be smaller than this list. In addition, the total richness of stands declines with increasing latitude and a number of the species listed above are absent or rare in the south.

4. The total species list of the community is considerably larger than that given above, with many species present in only one or two sites or in low abundance. The species composition of a site will be influenced by the size of the site, recent rainfall or drought condition and by its disturbance (including fire) history. The list of species given above is of vascular plant species, the community also includes micro-organisms, fungi, cryptogamic plants and a diverse fauna, both vertebrate and invertebrate. These components of the community are poorly documented but the assemblage in individual stands will depend on geographic location, size of stand, degree of exposure, history of disturbance and, if previously disturbed, stage of regeneration.

5.Threatened species and populations for which Littoral Rainforest is known or likely habitat include:

| | |
|---|---|
| *Acronychia littoralis* | *Cryptocarya foetida* |
| *Archidendron hendersonii* | *Macadamia tetraphylla* |
| *Cynanchum elegans* | *Hicksbeachia pinnatifolia* |
| *Fontainea oraria* | *Syzygium moorei* |
| *Senna acclinis* | *Xylosma terrae-reginae* |
| *Syzygium paniculatum* | |

| | |
|---|---|
| *Amaurornis olivaceus* | Bush-hen |
| *Coracina lineata* | Barred Cuckoo-shrike |
| *Lichenostomus faciogularis* | Mangrove Honeyeater |
| *Monarchia leucotis* | White-eared Monarch |
| *Ninox strenua* | Powerful Owl |
| *Pandion haliaetus* | Osprey |
| *Ptilinopus magnificus* | Wompoo Fruit-dove |
| *Ptilinopus regina* | Rose-crowned Fruit-dove |
| *Ptilinopus superbus* | Superb Fruit-dove |
| *Tyto tenebricosa* | Sooty Owl |
| *Dasyurus maculatus* | Spotted-tailed Quoll |
| *Kerivoula papuensis* | Golden-tipped Bat |
| *Mormopterus beccarii* | Beccari's Freetail-bat |
| *Mormopterus norfolkensis* | Eastern Freetail-bat |
| *Myotis adversus* | Large-footed Myotis |
| *Nyctimene robinsoni* | Eastern Tube-nosed Bat |
| *Potorous tridactylus* | Long-nosed Potoroo |
| *Pteropus alecto* | Black Flying Fox |
| *Pteropus poliocephalus* | Grey-headed Flying Fox |
| *Syconycteris australis* | Eastern Blossom Bat |
| *Thylogale stigmarica* | Red-legged Pademelon |
| *Coeranoscincus reticulatus* | Three-toed Snake-tooth Skink |
| *Hoplocephalus bitorquatus* | Pale-headed Snake |
| *Thersites mitchellae* | Mitchell's Rainforest Snail |

Emu, *Dromaius novaehollandiae*, population in the NSW North Coast Bioregion and Port Stephens Local Government Area

*Menippus fugitivus* (Lea), a beetle population in the Sutherland Shire

Most of the species included in this list are found at only some sites, or vary in occurrence and abundance. As such they are not regarded as part of the characterisation of the community. Nevertheless, they are of conservation significance and need to be considered in recovery planning.

6. Littoral Rainforest occurs in numerous, small stands and in total comprises less than 1% of the total area of rainforest in NSW. The largest known stand occurs in Iluka Nature Reserve, which is approximately 136 ha. Many, but not all, stands of

Littoral Rainforest have been included in mapping for State Environmental Planning Policy 26 Littoral Rainforest, but degradation of the ecological community is still occurring.

7. Weed species that threaten the integrity of particular stands include *Ambrosia artemisifolia*, *Anredera cordifolia, Arecastrum romanzoffianum, Asparagus* spp*., Cardiospermum grandiflorum, Chrysanthemoides monilifera, Coprosma repens, Ehrharta* spp., *Gloriosa superba, Ipomoea* spp; *Impatiens walleriana, Lantana camara, Macfadyena unguis-cati, Rivina humilis, Pennisetum clandestinim, Schefflera actinophylla, Senna septemtrionalis, Solanum mauritianum Thunbergia alata* and *Tradescantia fluminensis.*

8. Other threats include loss of canopy integrity arising from salt and wind damage as a result of clearing or damage to stand margins; clearing of understorey (including for firewood collection); grazing and physical disturbance of understorey including by feral deer; inappropriate collection of a range of plant species (including, but not restricted to, epiphytes); fire, particularly fire incursion along boundaries: visitor disturbance including soil compaction, soil disturbance, erosion from foot, cycle, trail bike and 4 wheel drive tracks, introduction of pathogens, and disturbance from creation of new planned and unplanned tracks; increased visitation and resulting increased demand for and use of, visitor facilities such as walking tracks, viewing platforms, toilet blocks, picnic areas etc; dumping of garden waste causing weed infestation; car and other rubbish dumping. Loss of fauna due to predation by feral animals, road kill, loss of habitat and feeding resources, disturbance from human visitation (faunal elements are essential to the ecological functioning of littoral rainforest and loss, or reduction, in pollinators and seed dispersal agents will adversely affect long term vegetation health); fragmentation resulting in loss of connectivity and possibly reduced genetic exchange between populations. For stands not protected by State Environmental Planning Policy 26, clearing and development remains a possibility. (Adam 1987, 1992; Floyd 1990; Mills 1996).

9. In view of the above the Scientific Committee is of the opinion that Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions is likely to become extinct in nature in New South Wales unless the circumstances and factors threatening its survival or evolutionary development cease to operate.

Associate Professor Paul Adam

Chairperson

Scientific Committee

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About the NSW Scientific Committee

Page last updated: 12 February 2008

# Milton Ulladulla subtropical rainforest in the Sydney Basin Bioregion - endangered ecological community listing

## NSW Scientific Committee - final determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list the Milton Ulladulla Subtropical Rainforest in the Sydney Basin Bioregion as an ENDANGERED ECOLOGICAL COMMUNITY in Part 3 of Schedule 1 of the Act. The listing of endangered ecological communities is provided for by Part 2 of the Act.

The Scientific Committee has found that:

1. The Milton Ulladulla Subtropical Rainforest is the name given to the ecological community that occurs on basaltic soils (on Milton Monzonite), deep alluvium and soils of the Conjola Formation enriched by monzonite in the Milton Ulladulla area (within the Sydney Basin Bioregion) and is characterised by the following assemblage of species

- *Acmena smithii*
- *Adiantum flabellifolium*
- *Alectryon subcinereus*
- *Aphanopetalum resinosum*
- *Arthropteris tenella*
- *Baloghia inophylla*
- *Breynia oblongifolia*
- *Cissus antarctica*
- *Cissus hypoglauca*
- *Citriobatus pauciflorus*
- *Clayoxylon australe*
- *Dendrocnide excelsa*
- *Diospyros australis*
- *Doodia aspera*
- *Eustrephus latifolius*
- *Ficus*spp.
- *Geitonoplesium cymosum*
- *Gymnostachys anceps*
- *Legnephora moorei*
- *Malaisia scandens*
- *Marsdenia rostrata*
- *Notelaea venosa*
- *Oplismenus imbecillus*
- *Pandorea pandorana*
- *Pellaea falcata*
- *Pittosporum undulatum*
- *Plectranthus parviflorus*
- *Sarcopetalum harveyanum*
- *Smilax australis*
- *Stephania japonica*
- *Streblus brunonianus*
- *Syzygium australe*
- *Toona ciliata*

2. The total species list of the community is considerably larger than that given above, with many species present in only one or two sites or in very small quantity. The species composition of a site will be influenced by the size of the site, recent rainfall or drought condition and by its disturbance (including fire) history. The number of species, and the above ground

relative abundance of species will change with time since fire, and may also change in response to changes in fire regime (including changes in fire frequency). At any one time, above ground individuals of some species may be absent, but the species may be represented below ground in the soil seed banks or as dormant structures such as bulbs, corms, rhizomes, rootstocks or lignotubers. The list of species given above is of vascular plant species, the community also includes micro-organisms, fungi, cryptogamic plants and a diverse fauna, both vertebrate and invertebrate. These components of the community are poorly documented.

3. The structure of Milton Ulladulla Subtropical Rainforest is dense forest up to 15 m high with an emergent tree layer to over 25 m often present. Characteristic tree species in the Milton Ulladulla Subtropical Rainforest include *Clayoxylon australe, Acmena smithii, Dendrocnide excelsa, Ficus*species, *Syzygiumaustrale*, *Streblus brunonianus, Baloghia inophylla* and *Toona ciliata* (K. Mills pers. comm.). There is generally a sparse shrub layer and ground cover with a diverse mix of lianas, vines, and ferns, or if disturbed there are components of indigenous native species sufficient to facilitate the restoration of the characteristic habitat.

4. The name Milton Ulladulla Subtropical Rainforest is an appropriate description for rainforest in the Milton-Ulladulla area. In a broader context the rainforests in the area fall into both subtropical (suballiance 14) and dry rainforest (suballiance 23) in Floyd's 1990 classification (Floyd, A.G. 1990. *Australian rainforests in New South Wales* Vols. 1 and 2. Surrey Beatty and Sons, Chipping Norton).

5. Milton Ulladulla Subtropical Rainforest provides habitat for several threatened species including the Powerful Owl, *Ninox strenua* and the Grey-headed Flying Fox, *Pteropus poliocephalus*. The community contains many "subtropical" rainforest plant species that are found no further to the south, and are rare on the South Coast (K. Mills pers. comm.).

6. Milton Ulladulla Subtropical Rainforest has been recorded from the local government area of Shoalhaven (within the Sydney Basin Bioregion) and may occur elsewhere in the Bioregion.

7. Milton Ulladulla Subtropical Rainforest occurs in one conservation reserve, Yatteyattah Nature Reserve.

8. Large areas of Milton Ulladulla Subtropical Rainforest have been cleared leaving remnants that are small and fragmented and surrounded by agricultural land. Remnant rainforest in this region has been found to suffer from edge effects, associated with grazing, light intrusion, wind and weed invasion. Other threats include urban developments, cutting of trees for firewood, fires, rubbish dumping, road widening and utility easements.

In view of the above the Scientific Committee is of the opinion that Milton Ulladulla Subtropical Rainforest in the Sydney Basin Bioregion is likely to become extinct in nature in NSW unless circumstances and factors threatening its survival or evolutionary development cease.

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About the NSW Scientific Committee

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# River-flat eucalypt forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological community listing

**NSW Scientific Committee - final determination**

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions, as an ENDANGERED ECOLOGICAL COMMUNITY in Part 3 of Schedule 1 of the Act, and as a consequence to omit reference to Sydney Coastal River-Flat Forest from Part 3 of Schedule 1 of the Act. Listing of endangered ecological communities is provided for by Part 2 of the Act.

The Scientific Committee has found that:

1. River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is the name given to the ecological community associated with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with 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 (adapted from Speight 1990). River-Flat Eucalypt Forest on Coastal Floodplains generally occurs below 50 m elevation, but may occur on localised river flats up to 250 m above sea level in the NSW North Coast, Sydney Basin and South East Corner bioregions. The structure of the community may vary from tall open forests to woodlands, although partial clearing may have reduced the canopy to scattered trees. Typically these forests and woodlands form mosaics with other floodplain forest communities and treeless wetlands, and often they fringe treeless floodplain lagoons or wetlands with semi-permanent standing water (e.g. Goodrick 1970).

The composition of River-Flat Eucalypt Forest on Coastal Floodplains is primarily determined by the frequency and duration of waterlogging and the texture, nutrient and moisture content of the soil. Composition also varies with latitude. The community is characterised by the following assemblage of species:

| | |
|---|---|
| *Acacia floribunda* | *Acacia parramattensis* |
| *Acmena smithii* | *Adiantum aethiopicum* |
| *Angophora floribunda* | *Angophora subvelutina* |
| *Austrostipa ramosissima* | *Backhousia myrtifolia* |
| *Breynia oblongifolia* | *Bursaria spinosa* |
| *Casuarina cunninghamiana* subsp. *cunninghamiana* | *Casuarina glauca* |
| *Cayratia clematidea* | *Centella asiatica* |
| *Cheilanthes sieberi* subsp. *sieberi* | *Clematis aristata* |
| *Clematis glycinoides* | *Commelina cyanea* |
| *Cymbopogon refractus* | *Desmodium varians* |
| *Dichelachne micrantha* | *Dichondra repens* |
| *Digitaria parviflora* | *Doodia aspera* |
| *Echinopogon caespitosus* var. *caespitosus* | *Echinopogon ovatus* |
| *Einadia hastata* | *Einadia trigonos* |
| *Entolasia marginata* | *Entolasia stricta* |
| *Eragrostis leptostachya* | *Eucalyptus amplifolia* |
| *Eucalyptus baueriana* | *Eucalyptus benthamii* |
| *Eucalyptus botryoides* | *Eucalyptus elata* |
| *Eucalyptus grandis* | *Eucalyptus longifolia* |
| *Eucalyptus moluccana* | *Eucalyptus ovata* |
| *Eucalyptus saligna* | *Eucalyptus tereticornis* |
| *Eucalyptus viminalis* | *Euchiton sphaericus* |
| *Eustrephus latifolius* | *Galium propinquum* |
| *Geitonoplesium cymosum* | *Geranium solanderi* |
| *Glycine clandestina* | *Glycine microphylla* |
| *Glycine tabacina* | *Hardenbergia violacea* |
| *Hydrocotyle peduncularis* | *Hymenanthera dentata* |
| *Hypolepis muelleri* | *Imperata cylindrica* var. *major* |
| *Livistona australis* | *Lomandra filiformis* |
| *Lomandra longifolia* | *Lomandra multiflora* subsp. *multiflora* |
| *Melaleuca decora* | *Melaleuca linariifolia* |
| *Melaleuca styphelioides* | *Melia azedarach* |
| *Microlaena stipoides* var. *stipoides* | *Opercularia diphylla* |
| *Oplismenus aemulus* | *Oxalis perennans* |
| *Ozothamnus diosmifolius* | *Pandorea pandorana* |
| *Paspalidium distans* | *Persicaria decipiens* |
| *Phyllanthus gunnii* | *Plectranthus parviflorus* |
| *Poranthera microphylla* | *Pratia purpurascens* |
| *Pteridium esculentum* | *Rubus parvifolius* |

| | |
|---|---|
| *Sigesbeckia orientalis* subsp*. orientalis* | *Solanum prinophyllum* |
| *Stephania japonica* var*. discolor* | *Themeda australis* |
| *Trema aspera* | *Tristaniopsis laurina* |
| *Vernonia cinerea* | *Veronica plebeia* |
| *Viola hederacea* | *Wahlenbergia gracilis* |

2. The total species list of the community is considerably larger than that given above, with many species present at only one or two sites or in low abundance. The species composition of a site will be influenced by the size of the site, recent rainfall or drought conditions and by its disturbance (including fire, grazing, flooding and land clearing) history. The number and relative abundance of species will change with time since fire, flooding or significant rainfall, and may also change in response to changes in grazing regimes. At any one time, above-ground individuals of some species may be absent, but the species may be represented below ground in the soil seed banks or as dormant structures such as bulbs, corms, rhizomes, rootstocks or lignotubers. The list of species given above is of vascular plant species, the community also includes micro-organisms, fungi, cryptogamic plants and a diverse fauna, both vertebrate and invertebrate. These components of the community are poorly documented.

3. River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is known from parts of the Local Government Areas of Port Stephens, Maitland, Singleton, Cessnock, Lake Macquarie, Wyong, Gosford, Hawkesbury, Baulkham Hills, Blacktown, Parramatta, Penrith, Blue Mountains, Fairfield, Holroyd, Liverpool, Bankstown, Wollondilly, Camden, Campbelltown, Sutherland, Wollongong, Shellharbour, Kiama, Shoalhaven, Eastern Capital City Regional, Eurobodalla and Bega Valley but may occur elsewhere in these bioregions. Bioregions are defined in Thackway and Creswell (1995). Major examples once occurred on the floodplains of the Hunter, Hawkesbury, Moruya, Bega and Towamba Rivers, although many smaller floodplains and river flats also contain examples of the community.

4. River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions has a tall open tree layer of eucalypts, which may exceed 40 m in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality. While the composition of the tree stratum varies considerably, the most widespread and abundant dominant trees include *Eucalyptus tereticornis* (forest red gum)*, E. amplifolia* (cabbage gum)*, Angophora floribunda* (rough-barked apple) and *A. subvelutina* (broad-leaved apple)*. Eucalyptus baueriana* (blue box)*, E. botryoides* (bangalay) and *E. elata* (river perppermint) may be common south from Sydney, *E. ovat*a (swamp gum) occurs on the far south coast, *E. saligna* (Sydney blue gum) and *E. grandis* (flooded gum) may occur north of Sydney, while *E. benthamii* is restricted to the Hawkesbury floodplain. Other eucalypts including *Eucalyptus longifolia* (woollybutt)*, E. moluccana* (grey box) and *E. viminalis* (ribbon gum) may be present in low abundance or dominant in limited areas of the distribution. A layer of small trees may be present, including *Melaleuca decora, M. styphelioides* (prickly-leaved teatree)*, Backhousia myrtifolia* (grey myrtle)*, Melia azaderach* (white cedar)*, Casuarina cunninghamiana* subsp. *cunninghamiana* (river oak) and *C. glauca* (swamp oak). Scattered shrubs include *Bursaria spinosa* subsp*. spinosa* (blackthorn)*, Solanum prinophyllum* (forest nightshade)*, Rubus parvifolius* (native raspberry)*, Breynia oblongifolia* (coffee bush), *Ozothamnus diosmifolius, Hymenanthera dentata* (tree violet)*, Acacia floribunda* (white sally) and *Phyllanthus gunnii*. The groundcover is composed of abundant forbs, scramblers and grasses including *Microlaena stipoides* (weeping grass)*, Dichondra repens* (kidney weed)*, Glycine clandestina, Oplismenus aemulus, Desmodium gunnii, Pratia purpurascens* (whiteroot)*, Entolasia marginata* (bordered panic)*, Oxalis perennans* and *Veronica plebeia* (trailing speedwell). The composition and structure of the understorey is influenced by grazing and fire history, changes to hydrology and soil salinity and other disturbance, and may have a substantial component of exotic shrubs, grasses, vines and forbs.

5. River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions provides habitat for a broad range of animals, including many that are dependent on trees for food, nesting or roosting (Law *et al*. 2000a, b). These include cormorants (*Phalacrocorax* spp.) and egrets (*Ardea* spp. and *Egrettia* spp.), the Osprey (*Pandion haliaetus*), Whistling Kite (*Haliastur sphenurus*), White-bellied Sea-eagle (*Haliaeetus leucogaster*), as well as the Brush-tailed Phascogale (*Phascogale tapoatafa*), Yellow-bellied Glider (*Petaurus australis*), Squirrel Glider (*Petaurus norfolcensis*) (Law *et al*. 2000a), Sugar Glider (*Petaurus breviceps*) and Grey-headed Flying Fox (*Pteropus poliocephalus*). The fauna of River-Flat Eucalypt Forest also includes a number of species of frogs in the families Myobatrachidae and Hylidae, particularly *Litoria* spp., and many species of forest birds including honeyeaters, kingfishers, cuckoos, owls, doves, whistlers and fantails.

6. River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions forms part of a complex of forested wetland and treeless wetland communities found throughout the coastal floodplains of NSW. A recent analysis of available quadrat data from these habitats identified a distinct grouping of vegetation samples attributable to this community (Keith and Scott 2005). The combination of features that distinguish River-Flat Eucalypt Forest on Coastal Floodplains from other endangered communities on the coastal floodplains include: its dominance by either a mixed eucalypt canopy or by a single species of eucalypt belonging to either the genus *Angophora* or the sections *Exsertaria* or *Transversaria* of the genus *Eucalyptus* (Hill 2002); the relatively low abundance or sub-dominance of *Casuarina* and *Melaleuca* species; the relatively low abundance of *Eucalyptus robusta*; and the prominent groundcover of soft-leaved forbs and grasses. It generally occupies central parts of floodplains and raised levees; habitats where flooding is periodic and soils are rich in silt, without deep humic horizons and show little or no influence of saline ground water.

7. River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions includes and replaces Sydney Coastal River-Flat Forest Endangered Ecological Community. River-Flat Eucalypt Forest on Coastal Floodplains may adjoin or intergrade with several other endangered ecological communities, which collectively cover all remaining native vegetation on the coastal floodplains of New South Wales. These include Lowland Rainforest on Floodplain in the NSW North Coast bioregion, Subtropical Floodplain Forest of the NSW North Coast bioregion, Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (including the formerly listed Sydney Coastal Estuary Swamp Forest in the Sydney Basin bioregion), Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions and Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions. For example, northwards from the Hunter valley, River-Flat Eucalypt Forest on Coastal Floodplains may intergrade with, or be replaced by, Subtropical Floodplain Forest of the NSW North Coast bioregion. As soil salinity increases, River-Flat Eucalypt Forest may adjoin or intergrade with Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions. The

boundaries between all of these communities are dynamic and may shift in response to changes in hydrological regimes, fire regimes or land management practices. The Determinations for these communities collectively encompass the full range of intermediate assemblages in transitional habitats.

8. A number of vegetation surveys and mapping studies have been conducted across the range of River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions. In the Comprehensive Regional Assessment of the north-eastern NSW (NPWS 1999), areas that were mapped on coastal floodplains of the Manning River as 'Forest Ecosystem 47, Escarpment Red Gums' are included within this community. In the lower Hunter valley, 'Central Hunter Riparian Forest' (map unit 13), 'Wollombi Redgum-River Oak Woodland' (map unit 14) and 'Redgum Roughbarked Apple Swamp Forest' (map unit 38) of NPWS (2000) fall within this community. On the Cumberland Plain, 'Riparian Forest' (map unit 12) of Tozer (2003) and parts of 'Alluvial Woodland' (map unit 11) that are dominated by eucalypts (Tozer 2003) are included within this community. Benson's (1992) 'Camden White Gum Forest' (map unit 6d) and those parts of 'River Flat Forest' (map unit 9f) dominated by eucalypts also fall within this community, as do parts of the 'River-flat forests' of Benson and Howell (1990) and Benson *et al.* (1996) that are dominated by eucalypts. In the Warragamba catchment, small areas of 'Burragorang River Flat Forest' (map unit 88b) and 'Oakdale Alluvial Rough-barked Apple Forest' (map unit 88c) of NPWS (2002) are included within this community. On the south coast of NSW, this community includes those parts of 'Ecotonal Coastal Swamp Forest' (forest ecosystem 27) of Thomas *et al.* (2000) dominated by eucalypts, those parts of 'Coastal Lowlands Riparian Herb/Grass Forest' (forest ecosystem 48) and 'Southern Hinterland Shrub/Herb/Grass Riparian Forest' (forest ecosystem 49) of Thomas *et al*. (2000) mapped on alluvial soils, and those parts of 'Cumberland River Flat Forest' (map unit 33) and 'Floodplain Swamp Forest' (map unit 105) of Tindall et al. (2004) that are dominated by eucalypts. In the Eden region, this community includes forested parts of 'Floodplain Wetlands' (map unit 60) that are dominated by eucalypts and parts of 'Bega Wet Shrub Forest' (map unit 19) that are mapped on floodplains (Keith and Bedward 1999). River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is included within the 'Coastal Floodplain Wetlands' vegetation class of Keith (2002, 2004). There may be additional or unmapped occurrences of River-Flat Eucalypt Forest on Coastal Floodplains within and beyond these surveyed areas.

9. The extent of the River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions prior to European settlement has not been mapped across its entire range. However, one estimate based on a compilation of regional vegetation maps suggests that Coastal Floodplain Wetlands, which include Temperate Eucalypt Forest on Coastal Floodplains, currently cover 800-1400 km2, representing less than 30% of the original extent of this broadly defined vegetation class (Keith 2004). Compared to this combined estimate, the remaining area of River-Flat Eucalypt Forest on Coastal Floodplains is likely to be considerably smaller and is likely to represent much less than 30% of its original range. Major occurrences include: about 2000 ha in the lower Hunter region in 1990s (NPWS 2000); less than 10 000 ha on the NSW south coast from Sydney to Moruya in the mid 1990s (Tindall et al. 2004), of which up to about three-quarters occurred on the Cumberland Plain in 1998 (Tozer 2003); and less than 1000 ha in the Eden region in 1990 (Keith and Bedward 1999).

10. River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions has been extensively cleared and modified. Large areas that formerly supported this community are occupied by exotic pastures grazed by cattle, market gardens and other cropping enterprises (e.g. turf). In the lower Hunter region, about one-quarter of the original extent was estimated to have remained during the 1990s (NPWS 2000), while less than one-quarter remained on the Cumberland Plain in 1998 (Tozer 2003). In the Sydney - South Coast region, less than one-fifth was estimated to remain in the late 1990s (Tindall et al. 2004), in the Eden region about 30% was estimated to remain during the 1990s (Keith and Bedward 1999).

11. Land clearing continues to threaten River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions. A small minority of the remaining area occurs on public land (e.g. Benson and Howell 1990), with most occurring on productive agricultural land or in close proximity to rural centres. The remaining stands are severely fragmented by past clearing and are further threatened by continuing fragmentation and degradation, flood mitigation and drainage works, landfilling and earthworks associated with urban and industrial development, pollution from urban and agricultural runoff, weed invasion, overgrazing, trampling and other soil disturbance by domestic livestock and feral animals including pigs, activation of 'acid sulfate soils', removal of dead wood and rubbish dumping (e.g. Benson and Howell 1990, Boulton and Brock 1999, Johnston *et al*. 2003). Anthropogenic climate change may also threaten River-Flat Eucalypt Forest on Coastal Floodplains if this affects future flooding regimes (IPCC 2001, Hughes 2003). Localised areas, particularly those within urbanised regions, may also be exposed to frequent burning which reduces the diversity of woody plant species. Clearing of native vegetation; Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands; Invasion of native plant communities by exotic perennial grasses; Predation, habitat destruction, competition and disease transmission by feral pigs; Anthropogenic climate change; High frequency fire; and Removal of dead wood and dead trees are listed as Key Threatening Processes under the Threatened Species Conservation Act (1995).

12. Very few examples of River-Flat Eucalypt Forest on Coastal Floodplains remain unaffected by weeds. The causes of weed invasion include physical disturbance to the vegetation structure of the community, dumping of landfill rubbish and garden refuse, polluted runoff from urban and agricultural areas, construction of roads and other utilities, and grazing by domestic livestock. The principal weed species affecting River-Flat Eucalypt Forest on Coastal Floodplains include *Anredera cordifolia* (madeira vine), *Araujia sericiflora* (moth plant), *Asparagus asparagoides* (bridal creeper), *Axonopus fissifolius* (narrow-leaved carpet grass), *Bidens pilosa* (cobbler's peg), *Cardiospermum grandiflorum* (balloon vine), *Cirsium vulgare* (spear thistle), *Conyza bonariensis* (flaxleaf fleabane), *C. sumatrensis* (tall fleabane), *Gleditsea triacanthos* (honey locust), *Hypochaeris radicata* (catsear), *Ipomoea* spp. (morning glories), *Lantana camara* (lantana), *Ligustrum lucidum* (large-leaved privet), *L. sinense* (small-leaved privet), *Lonicera japonica* (Japanese honeysuckle), *Macfaydyena unguis-cati* (cat's claw creeper), *Olea europea* subsp. *cuspidata* (African olive), *Plantago lanceolata* (plantain), *Rubus* fruticosis agg. (blackberries), *Senecio madagascariensis* (fireweed), *Senna pendula* var. *glabrata, Setaria parviflora* (slender pigeon grass), *Sida rhombifolia* (paddy's lucerne), *Sonchus oleraceus* (common sowthistle), *Tradescantia fluminensis* (wandering jew), *Verbena bonariensis* (purpletop), *Paspalum dilatatum* (paspalum), *P. urvillei* and *Pennisetum clandestinum* (kikuyu) (Tozer 2003, Keith and Scott 2005, J. R. Hosking, pers. comm.).

13. Small areas of River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions are contained within existing conservation reserves, including Blue Mountains, Cattai, Dharug, Georges River, Marramarra, Morton, Deua and Wadbilliga National Parks, and Gulguer and Mulgoa Nature Reserves, and these are

unevenly distributed throughout the range and unlikely to represent the full diversity of the community. The reserved examples are on localised, sheltered river flats between hills, rather than the large open floodplains that comprised the majority of the original habitat (Keith 2004).

14. In view of the above the Scientific Committee is of the opinion that River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is likely to become extinct in nature in New South Wales unless the circumstances and factors threatening its survival or evolutionary development cease to operate.

Associate Professor Paul Adam

Chairperson

Scientific Committee

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About the NSW Scientific Committee

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# Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological community listing

**NSW Scientific Committee - final determination**

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions, as an ENDANGERED ECOLOGICAL COMMUNITY in Part 3 of Schedule 1 of the Act. Listing of endangered ecological communities is provided for by Part 2 of the Act.

The Scientific Committee has found that:

1. Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions is the name given to the ecological community associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with 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 (adapted from Speight 1990). Swamp Oak Floodplain Forest generally occurs below 20 m (rarely above 10 m) elevation in the NSW North Coast, Sydney Basin and South East Corner bioregions. The structure of the community may vary from open forests to low woodlands, scrubs or reedlands with scattered trees. Typically these forests, woodlands, scrubs and reedlands form mosaics with other floodplain forest communities and treeless wetlands, and often they fringe treeless floodplain lagoons or wetlands with semi-permanent standing water (e.g. Pressey 1989a).

The composition of Swamp Oak Floodplain Forest is primarily determined by the frequency and duration of waterlogging and the level of salinity in the groundwater. Composition also varies with latitude. The community is characterised by the following assemblage of species:

*Acmena smithii*
*Alternanthera denticulata*
*Blechnum indicum*
*Carex appressa*
*Centella asiatica*
*Crinum pedunculatum*
*Cynodon dactylon*
*Entolasia marginata*
*Flagellaria indica*
*Geitonoplesium cymosum*
*Glochidion sumatranum*
*Imperata cylindrica* var. *major*
*Juncus kraussii* subsp. *australiensis*
*Juncus usitatus*
*Lomandra longifolia*
*Maundia triglochinoides*
*Melaleuca ericifolia*
*Melaleuca styphelioides*
*Oplismenus imbecillis*
*Persicaria decipiens*
*Phragmites australis*
*Smilax australis*
*Viola banksii*
*Alphitonia excelsa*
*Baumea juncea*
*Callistemon salignus*
*Casuarina glauca*
*Commelina cyanea*
*Cupaniopsis anacardioides*
*Dianella caerulea*
*Enydra fluctuans*
*Gahnia clarkei*
*Glochidion ferdinandi*
*Hypolepis muelleri*
*Isolepis inundata*
*Juncus planifolius*
*Lobelia alata*
*Lophostemon suaveolens*
*Melaleuca alternifolia*
*Melaleuca quinquenervia*
*Myoporum acuminatum*
*Parsonsia straminea*
*Persicaria strigosa*
*Selliera radicans*
*Stephania japonica* var. *discolor*

2. The total species list of the community is considerably larger than that given above, with many species present at only one or two sites or in low abundance. The species composition of a site will be influenced by the size of the site, recent rainfall or drought conditions and by its disturbance (including fire, grazing, flooding and land clearing) history. The number and relative abundance of species will change with time since fire, flooding or significant rainfall, and may also change in response to changes in grazing regimes. At any one time, above-ground individuals of some species may be absent, but the species may be represented below ground in the soil seed banks or as dormant structures such as bulbs, corms, rhizomes, rootstocks or lignotubers. The list of species given above is of vascular plant species, the community also includes micro-organisms, fungi, cryptogamic plants and a diverse fauna, both vertebrate and invertebrate. These components of the community are poorly documented.

3. Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions is known from parts of the Local Government Areas of Tweed, Byron, Lismore, Ballina, Richmond Valley, Clarence Valley, Coffs Harbour, Bellingen, Nambucca, Kempsey, Hastings, Greater Taree, Great Lakes, Port Stephens, Maitland, Newcastle, Cessnock, Lake Macquarie, Wyong, Gosford, Pittwater, Warringah, Hawkesbury, Baulkham Hills, Hornsby, Lane Cove, Blacktown, Auburn, Parramatta, Canada Bay, Rockdale, Kogarah, Sutherland, Penrith, Fairfield, Liverpool, Bankstown, Wollondilly, Camden, Campbelltown, Wollongong, Shellharbour, Kiama, Shoalhaven, Eurobodalla and Bega Valley but may occur elsewhere in these bioregions. Bioregions are defined in Thackway and Creswell (1995). Major examples once occurred on the floodplains of the Clarence, Macleay, Hastings, Manning, Hunter, Hawkesbury, Shoalhaven and Moruya Rivers.

4. Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions has a dense to sparse tree layer in which *Casuarina glauca* (swamp oak) is the dominant species northwards from Bermagui. Other trees including *Acmena smithii* (lilly pilly), *Glochidion* spp. (cheese trees) and *Melaleuca* spp. (paperbarks) may be present as subordinate species, and are found most frequently in stands of the community northwards from Gosford. Tree diversity decreases with latitude, and *Melaleuca ericifolia* is the only abundant tree in this community south of Bermagui (Keith and Bedward 1999). The understorey is characterised by frequent occurrences of vines, *Parsonsia straminea* (common silkpod)*, Geitonoplesium cymosum* (scrambling lily) and *Stephania japonica* var. *discolor* (snake vine), a sparse cover of shrubs, and a continuous groundcover of forbs, sedges, grasses and leaf litter. The composition of the ground stratum varies depending on levels of salinity in the groundwater. Under less saline conditions prominent ground layer plants include forbs such *Centella asiatica* (pennywort)*, Commelina cyanea, Persicaria decipiens* (slender knotweed) and *Viola banksii*; graminoids such as *Carex appressa* (tussock sedge)*, Gahnia clarkei* (a saw-sedge)*, Lomandra longifolia* (spiny-headed mat-rush)*, Oplismenus imbecillis*; and the fern *Hypolepis muelleri* (batswing fern). On the fringes of coastal estuaries, where soils are more saline, the ground layer may include the threatened grass species, *Alexfloydia repens*, as well as *Baumea juncea, Juncus kraussii* subsp*. australiensis* (sea rush)*, Phragmites australis* (common reed)*, Selliera radicans* and other saltmarsh species. The composition and structure of the understorey is also influenced by grazing history, changes to hydrology and soil salinity and other disturbance, and may have a substantial component of exotic grasses, vines and forbs.

5. Unlike most other coastal floodplain communities, Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions are not a significant habitat for waterbirds (Goodrick 1970). However, they do sometimes provide food resources for the Glossy Black Cockatoo (*Calyptorhynchus lathami lathami*), and Yellow-tailed Black Cockatoo (*Calyptorhynchus funereus*) (Marchant and Higgins 1990 ). The fauna of Swamp Oak Floodplain Forest also includes the Squirrel Glider (*Petaurus norfolcensis*) and several species of frogs in the families Myobatrachidae (southern frogs) and Hylidae (tree frogs).

6. Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions forms part of a complex of forested wetland and treeless wetland communities found throughout the coastal floodplains of NSW. A recent analysis of available quadrat data from these habitats identified a distinct grouping of vegetation samples attributable to this community (Keith and Scott 2005). The combination of features that distinguish Swamp Oak Floodplain Forest from other endangered ecological communities on the coastal floodplains include: its dominance by a tree canopy of either *Casuarina glauca* or, more rarely, *Melaleuca ericifolia* with or without subordinate tree species; the relatively low abundance of *Eucalyptus* species; and the prominent groundcover of forbs and graminoids. It generally occupies low-lying parts of floodplains, alluvial flats, drainage lines, lake margins and fringes of estuaries; habitats where flooding is periodic and soils show some influence of saline ground water. This latter habitat feature sets it apart from other floodplain communities.

7. Swamp Oak Floodplain Forest may adjoin or intergrade with several other endangered ecological communities, which collectively cover all remaining native vegetation on the coastal floodplains of New South Wales. These include Lowland Rainforest on Floodplain in the NSW North Coast bioregion, Subtropical Floodplain Forest of the NSW North Coast bioregion, River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (including the formerly listed Sydney Coastal River-Flat Forest in the Sydney Basin bioregion), Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (including the formerly listed Sydney Coastal Estuary Swamp Forest in the Sydney Basin bioregion) and Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions. For example, in less saline habitats, Swamp Oak Floodplain Forest may adjoin or intergrade with several other endangered ecological communities including River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions and Subtropical Floodplain Forest of the NSW North Coast bioregion. The most saline forms of Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions may adjoin or intergrade with Coastal Saltmarsh of the NSW North Coast, Sydney Basin and South East Corner bioregions. The boundaries between these communities are dynamic and may shift in response to changes in hydrological regimes, fire regimes or land management practices (e.g. Johnston *et al.* 2003). The Determinations for these communities collectively encompass the full range of intermediate assemblages in transitional habitats.

8. A number of vegetation surveys and mapping studies have been conducted across the range of Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions. This community includes 'Sheoak Swamps' in the general coastal wetlands classification of Goodrick (1970). In the Tweed valley lowlands, this community includes '*Casuarina glauca* tall to very tall open to closed forest' (F10) of Pressey and Griffith (1992) and parts of the 'Floodplain Wetland Complex' (FL) that include *Casuarina glauca* with *Melaleuca* spp. (Pressey and Griffith 1992). In the Comprehensive Regional Assessment of the north-eastern NSW (NPWS 1999), areas mapped as 'Forest Ecosystem 143, Swamp Oak', fall within this community. In the lower Hunter valley, 'Swamp Oak - Rushland Forest' (map unit 40) and 'Swamp Oak Sedge Forest' (map unit 41) of NPWS (2000) fall within this community. On the Cumberland Plain, 'Riparian Woodland' (map unit 5) of Tozer (2003) and parts of 'Alluvial Woodland' (map unit 11) dominated by *Casuarina glauca* (Tozer 2003) are included within this community, while those parts of Benson's (1992) 'River Flat Forest' (map unit 9f) dominated by *C. glauca* also fall within this community, as do parts of the 'River-flat forests' of Benson and Howell (1990) and Benson et al. (1996) that are dominated by *C. glauca*. On the Illawarra Plain, 'Coastal Swamp Oak Forest' (map unit 36) of NPWS (2002) occurs within this community. In the Comprehensive Regional Assessment of southern New South Wales (Thomas *et al*. 2000), this community includes 'Coastal Wet Heath Swamp Forest' (forest ecosystem 24), 'South Coast Swamp Forest' complex (forest ecosystem 25) and those parts of 'Ecotonal Coastal Swamp Forest' (forest ecosystem 27) dominated by *Casuarina glauca.* In the Sydney - South Coast region, this community includes parts of 'Floodplain Swamp Forest' (map unit 105) dominated by *Casuarina glauca*, 'Estuarine Fringe Forest' (map unit 106) and 'Estuarine Creek Flat Scrub' (map unit 107) of Tindall *et al*. (2004). In the Eden region, this community includes 'Estuarine Wetland Scrub' (map unit 63) of Keith and Bedward (1999) and parts of 'Floodplain Wetlands' (map unit 60) that include *Casuarina glauca* or *Melaleuca ericifolia* (Keith and Bedward 1999). Swamp Oak Floodplain Forest South East Corner is included within the 'Coastal Floodplain Wetlands' vegetation class of Keith (2002, 2004). There may be additional or unmapped occurrences of Swamp Oak Floodplain Forest within and beyond these surveyed areas.

9. The extent of the Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions prior to European settlement has not been mapped across its entire range. However, one estimate based on a compilation of regional vegetation maps suggests that Coastal Floodplain Wetlands, which include Swamp Oak Floodplain Forest, currently cover 800-1400 km2, representing less than 30% of the original extent of this broadly defined vegetation class (Keith 2004). Compared to this combined estimate, the remaining area of Swamp Oak Floodplain Forest is likely to be

considerably smaller and is likely to represent much less than 30% of its original range. Major occurrences include: less than 350 ha on the Tweed lowlands in 1985 (Pressey and Griffith 1992); less than 650 ha on the lower Clarence floodplain in 1982 (Pressey 1989a); less than 400 ha on the lower Macleay floodplain in 1983 (Pressey 1989b); less than 3200 ha in the lower Hunter - central Hunter region in the 1990s (NPWS 2000); less than 5200 ha in the Sydney - South Coast region in the mid 1990s (Tindall *et al*. 2004), including up to 4700 ha on the Cumberland Plain in 1998 (Tozer 2003) and less than 250 ha on the Illawarra Plain in 2001 (NPWS 2002); and less than 1000 ha in the Eden region in 1990 (Keith and Bedward 1999).

10. Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions has been extensively cleared and modified. Large areas that formerly supported this community are occupied by exotic pastures grazed by cattle, market gardens, other cropping enterprises (e.g. sorghum, corn, poplars, etc.) and, on the far north coast, canefields. On the Tweed lowlands, Pressey and Griffith (1992) estimated that less than 3% of the original Floodplain Wetlands and Floodplain Forest remained in 1985. Similar estimates are likely to apply to Swamp Oak Floodplain Forests in other parts of the NSW North Coast bioregion (Pressey 1989a, 1989b, NPWS 1999). In the lower Hunter - central coast region, less than 30-40% was estimated to have remained during the 1990s (NPWS 2000), while approximately 13% remained on the Cumberland Plain in 1998 (Tozer 2003). In the Sydney - South Coast region, less than 20% was estimated to remain in the mid 1990s (Tindall *et al*. 2004), in the Eden region about 30% was estimated to remain during the 1990s (Keith and Bedward 1999).

11. Land clearing continues to threaten Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions. A small minority of the remaining area occurs on public land (e.g. Pressey 1989a, b; Pressey and Griffith 1992), with most occurring on productive agricultural land or in close proximity to rural centres. The remaining stands are severely fragmented by past clearing and further threatened by continuing fragmentation and degradation, flood mitigation and drainage works, landfilling and earthworks associated with urban and industrial development, pollution from urban and agricultural runoff, weed invasion, overgrazing, trampling and other soil disturbance by domestic livestock and feral animals including pigs, activation of 'acid sulfate soils' and rubbish dumping (e.g. Pressey 1989a, b; Pressey and Griffith 1992, Boulton and Brock 1999, Johnson *et al*. 2003). Anthropogenic climate change may also threaten Swamp Oak Floodplain Forest if sea levels rise as predicted or if future flooding regimes are affected (IPCC 2001, Hughes 2003). Localised areas, particularly those within urbanised regions, may also be exposed to frequent burning which reduces the diversity of woody plant species. Clearing of native vegetation; Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands; Invasion of native plant communities by exotic perennial grasses; Predation, habitat destruction, competition and disease transmission by feral pigs; Anthropogenic climate change and High frequency fire are listed as Key Threatening Processes under the Threatened Species Conservation Act (1995).

12. Large areas of habitat formerly occupied by Swamp Oak Floodplain Forest have been directly drained by construction of artificial channels (e.g. Pressey 1989a, Boulton and Brock 1999). By the early 1900s, drainage unions or trusts were formed on the major floodplains to enable adjacent landholders to arrange for co-ordinated drainage systems, which were designed and constructed by the NSW Department of Public Works. Additional areas that have not been directly drained may have been altered hydrologically by changed patterns of flooding and drainage following flood mitigation works, particularly the construction of drains, levees and floodgates (Pressey and Griffith 1992). On the north coast of NSW, expansion of *Melaleuca quinquenervia* and *Casuarina glauca* into open floodplain swamps has been attributed to artificial drainage and shortening of the hydroperiod (Johnston *et al*. 2003, Stevenson 2003). There have also been anecdotal reports of recruitment by *Casuarina glauca* in pastures during extended dry periods, though not necessarily by other components of the community. These changes appear to be closely associated with enhanced acidity, altered ionic ratios, increased dissolved organic carbon and sulfide oxidation in the soil profile (Johnston *et al*. 2003). Alteration of tidal flows may have lead to decreased soil salinity and localised expansion of *Casuarina glauca* into areas that previously supported Coastal Saltmarsh or mangroves (Stevenson 2003).

13. Very few examples of Swamp Oak Floodplain Forest remain unaffected by weeds. The causes of weed invasion include physical disturbance to the vegetation structure of the community, dumping of landfill rubbish and garden refuse, polluted runoff from urban and agricultural areas, construction of roads and other utilities, and grazing by domestic livestock. The principal weed species affecting Swamp Oak Floodplain Forest include *Araujia sericiflora* (moth plant)*, Asparagus asparagoides* (bridal creeper), *Baccharis halimifolia* (groundsel bush)*, Cyperus eragrostis* (umbrella sedge)*, Cinnamomum camphora* (camphor laurel), *Conyza* spp. (fleabanes)*, Hydrocotyle bonariensis* (American pennywort), *Ipomoea cairica*, *I. purpurea* and *I. indica* (morning glories), *Lantana camara, Paspalum dilatatum* (paspalum), *Pennisetum clandestinum* (kikuyu) *Rubus fruticosis* agg. (blackberries), *Solanum pseudocapsicum* (Madeira winter cherry)*, S. nigrum* (black-berry nightshade)*, Tradescantia fluminensis* (wandering jew) and *Verbena bonariensis* (purpletop), (Tozer 2003, Keith and Scott 2005). In general, remaining examples of Swamp Oak Floodplain Forest from the most saline environments are in better condition, while those from less saline habitats are generally more degraded.

14. Small areas of Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions are contained within existing conservation reserves, including Stotts Island, Ukerebagh, Tuckean, Pambalong, Wamberal, Towra Point and Cullendulla Creek Nature Reserves and Bongil Bongil, Myall Lakes and Conjola National Parks. These occurrences are unevenly distributed throughout the range and unlikely to represent the full diversity of the community. In addition, wetlands within protected areas are exposed to hydrological changes that were, and continue to be initiated outside their boundaries. Some areas of Swamp Oak Floodplain Forest are protected by State Environmental Planning Policy 14, although this has not always precluded impacts on wetlands from the development of major infrastructure.

15. Given the dynamic hydrological relationship between Swamp Oak Floodplain Forest, Coastal Saltmarsh and other endangered ecological communities on coastal floodplains, future management of water and tidal flows may result in the expansion of some communities at the expense of others. Proposals for the restoration of natural hydrological regimes and for the rehabilitation of acid sulfate soils may also result in changes to the distribution and composition of floodplain communities. Co-ordinated planning and management approaches across whole catchments will be required to address and resolve priorities between different management objectives.

16. In view of the above the Scientific Committee is of the opinion that Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions is likely to become extinct in nature in New South Wales unless the circumstances and factors threatening its survival or evolutionary development cease to operate.

Associate Professor Paul Adam

Chairperson

Scientific Committee

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About the NSW Scientific Committee

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# Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological listing

**NSW Scientific Committee - final determination**

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions, as an ENDANGERED ECOLOGICAL COMMUNITY in Part 3 of Schedule 1 of the Act, and as a consequence to omit reference to Sydney Coastal Estuary Swamp Forest in the Sydney Basin bioregion from Part 3 of Schedule 1 of the Act. Listing of endangered ecological communities is provided for by Part 2 of the Act.

The Scientific Committee has found that:

1. Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is the name given to the ecological community associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with 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 (adapted from Speight 1990). Swamp Sclerophyll Forest on Coastal Floodplains generally occurs below 20 m (though sometimes up to 50 m) elevation, often on small floodplains or where the larger floodplains adjoin lithic substrates or coastal sand plains in the NSW North Coast, Sydney Basin and South East Corner bioregions. The structure of the community is typically open forest, although partial clearing may have reduced the canopy to scattered trees. In some areas the tree stratum is low and dense, so that the community takes on the structure of scrub. The community also includes some areas of fernland and tall reedland or sedgeland, where trees are very sparse or absent. Typically these forests, scrubs, fernlands, reedlands and sedgelands form mosaics with other floodplain forest communities and treeless wetlands, and often they fringe treeless floodplain lagoons or wetlands with semi-permanent standing water (e.g. Pressey 1989a).

The composition of Swamp Sclerophyll Forest on Coastal Floodplains is primarily determined by the frequency and duration of waterlogging and the texture, salinity nutrient and moisture content of the soil. Composition also varies with latitude. The community is characterised by the following assemblage of species:

| | |
|---|---|
| *Acacia irrorata* | *Acacia longifolia* |
| *Acmena smithii* | *Adiantum aethiopicum* |
| *Allocasuarina littoralis* | *Banksia oblongifolia* |
| *Banksia spinulosa* | *Baumea articulata* |
| *Baumea juncea* | *Blechnum camfieldii* |
| *Blechnum indicum* | *Breynia oblongifolia* |
| *Callistemon salignus* | *Calochlaena dubia* |
| *Carex appressa* | *Casuarina glauca* |
| *Centella asiatica* | *Dianella caerulea* |
| *Dodonaea triquetra* | *Elaeocarpus reticulatus* |
| *Entolasia marginata* | *Entolasia stricta* |
| *Eucalyptus botryoides* | *Eucalyptus longifolia* |
| *Eucalyptus resinifera* subsp. *hemilampra* | *Eucalyptus robusta* |
| *Ficus coronata* | *Gahnia clarkei* |
| *Gahnia sieberiana* | *Glochidion ferdinandi* |
| *Glycine clandestina* | *Gonocarpus tetragynus* |
| *Hydrocotyle peduncularis* | *Hypolepis muelleri* |
| *Imperata cylindrica* var. *major* | *Isachne globosa* |
| *Leptospermum polygalifolium* subsp. *polygalifolium* | *Livistona australis* |
| *Lomandra longifolia* | *Lophostemon suaveolens* |
| *Melaeuca ericifolia* | *Melaleuca linariifolia* |
| *Melaleuca quinquenervia* | *Melaleuca sieberi* |
| *Melaleuca styphelioides* | *Morinda jasminoides* |
| *Omalanthus populifolius* | *Oplismenus aemulus* |
| *Oplismenus imbecillis* | *Parsonsia straminea* |
| *Phragmites australis* | *Polyscias sambucifolia* |
| *Pratia purpurascens* | *Pteridium esculentum* |
| *Stephania japonica* var. *discolor* | *Themeda australis* |
| *Villarsia exaltata* | *Viola banksii* |
| *Viola hederacea* | |

2. The total species list of the community is considerably larger than that given above, with many species present at only one or two sites or in low abundance. The species composition of a site will be influenced by the size of the site, recent rainfall or drought conditions and by its disturbance (including fire, grazing, flooding and land clearing) history. The number and relative abundance of species will change with time since fire, flooding or significant rainfall, and may also change in

response to changes in grazing regimes. At any one time, above-ground individuals of some species may be absent, but the species may be represented below ground in the soil seed banks or as dormant structures such as bulbs, corms, rhizomes, rootstocks or lignotubers. The list of species given above is of vascular plant species, the community also includes micro-organisms, fungi, cryptogamic plants and a diverse fauna, both vertebrate and invertebrate. These components of the community are poorly documented.

3. Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is known from parts of the Local Government Areas of Tweed, Byron, Lismore, Ballina, Richmond Valley, Clarence Valley, Coffs Harbour, Bellingen, Nambucca, Kempsey, Hastings, Greater Taree, Great Lakes and Port Stephens, Lake Macquarie, Wyong, Gosford, Hornsby, Pittwater, Warringah, Manly, Liverpool, Rockdale, Botany Bay, Randwick, Sutherland, Wollongong, Shellharbour, Kiama and Shoalhaven but may occur elsewhere in these bioregions. Bioregions are defined in Thackway and Creswell (1995). Major examples once occurred on the floodplains of the Tweed, Richmond, Clarence, Macleay, Hastings and Manning Rivers, although smaller floodplains would have also supported considerable areas of this community.

4. Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions has an open to dense tree layer of eucalypts and paperbarks, which may exceed 25 m in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality. For example, stands dominated by *Melaleuca ericifolia* typically do not exceed 8 m in height. The most widespread and abundant dominant trees include *Eucalyptus robusta* (swamp mahogany)*, Melaleuca quinquenervia* (paperbark) and, south from Sydney, *Eucalyptus botryoides* (bangalay) and *Eucalyptus longifolia* (woollybut). Other trees may be scattered throughout at low abundance or may be locally common at few sites, including *Callistemon salignus* (sweet willow bottlebrush)*, Casuarina glauca* (swamp oak) and *Eucalyptus resinifera* subsp*. hemilampra* (red mahogany), *Livistona australis* (cabbage palm) and *Lophostemon suaveolens* (swamp turpentine). A layer of small trees may be present, including *Acacia irrorata* (green wattle)*, Acmena smithii* (lilly pilly), *Elaeocarpus reticulatus* (blueberry ash), *Glochidion ferdinandi* (cheese tree), *Melaleuca linariifolia* and *M. styphelioides* (paperbarks). Shrubs include *Acacia longifolia* (Sydney golden wattle)*, Dodonaea triquetra* (a hopbush)*, Ficus coronata* (sandpaper fig), *Leptospermum polygalifolium* subsp*. polygalifolium* (lemon-scented tea tree) and *Melaleuca* spp. (paperbarks). Occasional vines include *Parsonsia straminea* (common silkpod)*, Morinda jasminoides* and *Stephania japonica* var. *discolor* (snake vine). The groundcover is composed of abundant sedges, ferns, forbs, and grasses including *Gahnia clarkei, Pteridium esculentum* (bracken)*, Hypolepis muelleri* (batswing fern)*, Calochlaena dubia* (false bracken)*, Dianella caerulea* (blue flax lily)*, Viola hederacea, Lomandra longifolia* (spiny-headed mat-rush) and *Entolasia marginata* (bordered panic) and *Imperata cylindrica* var*. major* (blady grass)*.* The endangered swamp orchids *Phaius australis* and *P. tankervillei* are found in this community. On sites downslope of lithic substrates or with soils of clay-loam texture, species such as *Allocasuarina littoralis* (black she-oak)*, Banksia oblongifolia, B. spinulosa* (var. *collina* or var. *spinulosa*) (hairpin banksia), *Ptilothrix deusta* and *Themeda australis* (kangaroo grass)*,* may also be present in the understorey*.* The composition and structure of the understorey is influenced by grazing and fire history, changes to hydrology and soil salinity and other disturbance, and may have a substantial component of exotic grasses, vines and forbs.

5. Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions provides habitat for a broad range of animals, including many that are dependent on trees for food, nesting or roosting (Law *et al*. 2000). The blossoms of *Eucalyptus robusta* and *Melaleuca quinquenervia* are also an important food source for the Grey-headed Flying Fox (*Pteropus poliocephalus*) and Common Blossom Bat (*Sycoyncteris australis*) (Law 1994), as well as the Yellow-bellied Glider (*Petaurus australis*), Sugar Glider (*Petaurus breviceps*), Regent Honeyeater (*Xanthomyza phrygia*) and Swift Parrot (*Lathamus discolor*). Other animals found in this community include the Osprey (*Pandion haliaetus*), Australasian Bittern (*Botaurus poiciloptilus*), Large-footed myotis (*Myotis adversus*), *Litoria olongburensis* and Wallum Froglet (*Crinia tinnula*).

6. Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions forms part of a complex of forested and treeless wetland communities found throughout the coastal floodplains of NSW. A recent analysis of available quadrat data from these habitats identified a distinct grouping of vegetation samples attributable to this community (Keith and Scott 2005). The combination of features that distinguish Swamp Sclerophyll Forest on Coastal Floodplains from other endangered ecological communities on the coastal floodplains include: its relatively dense tree canopy dominated by *Eucalyptus robusta, Melaleuca quinquenervia* or *E. botryoides*, the relatively infrequent occurrence of other eucalypts, *Casuarina glauca* or *Lophostemon suaveolens*; the occasional presence of rainforest elements as scattered trees or understorey plants; and the prominence of large sedges and ferns in the groundcover. It generally occupies small alluvial flats and peripheral parts of floodplains where they adjoin lithic substrates or coastal sandplains. The soils are usually waterlogged, stained black or dark grey with humus, and show little influence of saline ground water.

7. Swamp Sclerophyll Forest on Coastal Floodplains includes and replaces Sydney Coastal Estuary Swamp Forest in the Sydney Basin bioregion. It may adjoin or intergrade with several other endangered ecological communities, which collectively cover all remaining native vegetation on the coastal floodplains of New South Wales. These include Lowland Rainforest on Floodplain in the NSW North Coast bioregion, River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (including the formerly listed Sydney Coastal River-Flat Forest in the Sydney Basin bioregion), Subtropical Floodplain Forest, Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions and Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions. For example, as soils become less waterlogged, Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions may adjoin or intergrade with River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions. As soil salinity increases Swamp Sclerophyll Forest on Coastal Floodplains may intergrade with, and be replaced by, Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions. The boundaries between these communities are dynamic and may shift in response to changes in hydrological regimes, fire regimes or land management practices (e.g. Johnston *et al.* 2003, Stevenson 2003). The Determinations for these communities collectively encompass the full range of intermediate assemblages in transitional habitats.

8. A number of vegetation surveys and mapping studies have been conducted across the range of Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions. This community includes the *Eucalyptus robusta* (Swamp Mahogany) community identified on coastal alluvium by Douglas and Anderson (2002) and the Coastal Alluvium Swamp Forest complex defined by Anderson and Asquith (2002). In the Comprehensive Regional

Assessment of the north-eastern NSW (NPWS 1999), those areas on floodplains mapped as 'Forest Ecosystem 112, Paperbark', and those areas on floodplains mapped as 'Forest Ecosystem 142, Swamp Mahogany' are included within this community. On the Tweed lowlands, this community includes '*Eucalyptus robusta* mid-high to very tall closed forest' (F7), '*Archontophoenix cunninghamiana-Melaleuca quinquenervia* very tall feather palm swamp forest' (F9), those parts of *Melaleuca quinquenervia* tall to very tall open to closed forest' (F8) on alluvial soils and parts of 'Floodplain Wetland Complex' (FL) dominated by *Eucalyptus robusta* or *Melaleuca quinquenervia* (Pressey and Griffith 1992). In the lower Hunter district, this community includes 'Swamp Mahogany-Paperbark Swamp Forest' (map unit 37), Riparian Melaleuca Swamp Woodland (map unit 42) and Melaleuca Scrub (map unit 42a) of NPWS (2000). In the Sydney-Gosford region, this community includes those parts of 'Freshwater Swamp complex' (map unit 27a) dominated by *Eucalyptus robusta* or *E. botryoides* (Benson 1986, Benson and Howell 1994) and parts of the 'Freshwater wetlands - on the floodplains' of Benson and Howell (1990) and Benson et al. (1996). In the Illawarra, this community includes 'Alluvial swamp mahogany forest' (map unit 35) of NPWS (2002). On the south coast, this community includes 'Northern Coastal Lowlands Swamp Forest' (forest ecosystem 175) of Thomas *et al*. (2000) and 'Coastal Sand Swamp Forest' (map unit 45) of Tindall *et al*. (2004). Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is included within the 'Coastal Floodplain Wetlands' and 'Coastal Swamp Forest' vegetation classes of Keith (2002, 2004). There may be additional or unmapped occurrences of Swamp Sclerophyll Forest on Coastal Floodplains within and beyond these surveyed areas.

9. The extent of the Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions prior to European settlement has not been mapped across its entire range. However, one estimate estimate based on a compilation of regional vegetation maps suggests that Coastal Floodplain Wetlands, which include Swamp Sclerophyll Forest on Floodplains, currently cover 800-1400 km2, representing less than 30% of the original extent of this broadly defined vegetation class (Keith 2004). Compared to this combined estimate, the remaining area of Swamp Sclerophyll Forest on Coastal Floodplains is likely to be considerably smaller and is likely to represent much less than 30% of its original range. For example, there were less than 350 ha of native vegetation attributable to this community on the Tweed lowlands in 1985 (Pressey and Griffith 1992), less than 2500 ha on the Clarence floodplain in 1982 (Pressey 1989a), less than 700 ha on the Macleay floodplain in 1983 (Pressey 1989b), up to 7000 ha in the lower Hunter - central coast district during the 1990s (NPWS 2000), and less than 1000 ha in the Sydney - South Coast region in the mid 1990s (Tindall *et al*. 2004), including less than 40 ha on the Illawarra plain in 2001 (NPWS 2002) and about 450 ha on the South Coast in the 1990s (Thomas *et al*. 2000).

10. Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions has been extensively cleared and modified. Large areas that formerly supported this community are occupied by exotic pastures grazed by cattle, market gardens, other cropping enterprises (e.g. sorghum, corn, poplars, etc.) and, on the far north coast, canefields. On the Tweed lowlands, Pressey and Griffith (1992) estimated that less than 3% of the original Floodplain Wetlands and Floodplain Forest remained in 1985. Similar estimates are likely to apply to Swamp Sclerophyll Forest on Coastal Floodplains in other parts of the NSW North Coast bioregion (Goodrick 1970, Pressey 1989a, 1989b). In the lower Hunter - central coast district, about 30 % of the original area of Swamp mahogany - paperbark forest was estimated to remain in the 1990s (NPWS 2000).

11. Land clearing continues to threaten Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions. A small minority of the remaining area occurs on public land (e.g. Pressey and Griffith 1992, NPWS 2000), with most occurring on productive agricultural land or in close proximity to rural centres. The remaining stands are severely fragmented by past clearing and further threatened by continuing fragmentation and degradation, flood mitigation and drainage works, landfilling and earthworks associated with urban and industrial development, pollution from urban and agricultural runoff, weed invasion, overgrazing, trampling and other soil disturbance by domestic livestock and feral animals including pigs, activation of 'acid sulfate soils', removal of dead wood and rubbish dumping (e.g. Pressey 1989a, b; Pressey and Griffith 1992, Boulton and Brock 1999, Johnston *et al*. 2003). Anthropogenic climate change may also threaten Swamp Sclerophyll Forest on Coastal Floodplains if future flooding regimes are affected (IPCC 2001, Hughes 2003). Localised areas, particularly those within urbanised regions, may also be exposed to frequent burning which reduces the diversity of woody plant species. Clearing of native vegetation; Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands; Invasion of native plant communities by exotic perennial grasses; Predation, habitat destruction, competition and disease transmission by feral pigs; Anthropogenic climate change; High frequency fire and Removal of dead wood and dead trees are listed as Key Threatening Processes under the Threatened Species Act (1995).

12. Large areas of habitat formerly occupied by Swamp Sclerophyll Forest on Coastal Floodplains have been directly drained by construction of artificial channels (e.g. Pressey 1989a, Boulton and Brock 1999). While much of the early drainage works were associated with agricultural development, more recently they are associated with urban expansion. Additional areas that have not been directly drained may have been altered hydrologically by changed patterns of flooding and drainage following flood mitigation works, particularly the construction of drains, levees and floodgates (Pressey and Griffith 1992). On the north coast of NSW, expansion of *Melaleuca quinquenervia* into open floodplain swamps has been attributed to artificial drainage and shortening of the hydroperiod (Johnston *et al*. 2003, Stevenson 2003). These changes appear to be closely associated with enhanced acidity, altered ionic ratios, increased dissolved organic carbon and sulfide oxidation in the soil profile (Johnston *et al*. 2003).

13. Relatively few examples of Swamp Sclerophyll Forest on Coastal Floodplains remain unaffected by weeds. The causes of weed invasion include physical disturbance to the vegetation structure of the community, dumping of landfill rubbish and garden refuse, polluted runoff from urban and agricultural areas, construction of roads and other utilities, and grazing by domestic livestock. The principal weed species affecting Swamp Sclerophyll Forest on Coastal Floodplains include *Andropogon virginicus* (whiskey grass), *Anredera cordifolia* (Madeira vine)*, Ageratina adenophora* (crofton weed), *Baccharis halimifolia* (groundsel bush)*, Cinnamomum camphora* (camphor laurel), *Lantana camara* (lantana), *Ligustrum sinense* (small-leaved privet)*, Lonicera japonica* (Japanese honeysuckle) and *Ludwigia peruviana* (Keith and Scott 2005).

14. Small areas of Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions are contained within existing conservation reserves, including Bungawalbin, Tuckean and Moonee Beach Nature Reserves, and Hat Head, Crowdy Bay, Wallingat, Myall Lakes and Garigal National Parks. These occurrences are unevenly distributed throughout the range and unlikely to represent the full diversity of the community. In addition, wetlands within protected areas are exposed to hydrological changes that were, and continue to be initiated outside their

boundaries. Some areas of Swamp Oak Floodplain Forest are protected by State Environmental Planning Policy 14, although this has not always precluded impacts on wetlands from the development of major infrastructure.

15. Given the dynamic hydrological relationship between Swamp Sclerophyll Forest on Coastal Floodplains, Coastal Saltmarsh and other endangered ecological communities on coastal floodplains, future management of water and tidal flows may result in the expansion of some communities at the expense of others. Proposals for the restoration of natural hydrological regimes and for the rehabilitation of acid sulfate soils may also result in changes to the distribution and composition of floodplain communities. Co-ordinated planning and management approaches across whole catchments will be required to address and resolve priorities between different management objectives.

16. In view of the above the Scientific Committee is of the opinion that Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is likely to become extinct in nature in New South Wales unless the circumstances and factors threatening its survival or evolutionary development cease to operate.

Associate Professor Paul Adam

Chairperson

Scientific Committee

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About the NSW Scientific Committee

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# Sydney Freshwater Wetlands in the Sydney Basin Bioregion - endangered ecological community listing

**NSW Scientific Committee - final determination**

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list the Sydney Freshwater Wetlands in the Sydney Basin Bioregion as an ENDANGERED ECOLOGICAL COMMUNITY on Part 3 of Schedule 1 of the Act. The listing of Endangered Ecological Communities is provided for by Part 2 of the Act.

The Scientific Committee has found that:

1. Sydney Freshwater Wetlands is the name given to the plant community characterised by the assemblage of species listed in paragraph 2 that is restricted to freshwater swamps in swales and depressions on sand dunes and low nutrient sandplain sites in coastal areas. All sites are within the Sydney Basin Bioregion.

2. Sydney Freshwater Wetlands is characterised by the following assemblage of species.

- Banksia robur
- Baumea articulata
- Baumea juncea
- Baumea rubiginosa
- Callistemon citrinus
- Casuarina glauca
- Cladium procerum
- Eleocharis sphacelata
- Empodisma minus
- Gahnia clarkei
- Gahnia sieberiana
- Gleichenia dicarpa
- Goodenia paniculata
- Hakea teretifolia
- Hypolepis muelleri
- Lepironia articulata
- Leptocarpus tenax
- Leptospermum juniperinum
- Lomandra longifolia
- Ludwigia peploides subsp. montevidensis
- Melaleuca linariifolia
- Melaleuca nodosa
- Melaleuca quinquenervia
- Melaleuca styphelioides
- Persicaria decipiens
- Persicaria strigosa
- Philydrum lanuginosum
- Phragmites australis
- Pteridium esculentum
- Restio tetraphyllus
- Schoenus brevifolius
- Triglochin procerum sensu lato
- Typha orientalis
- Villarsia exaltata
- Viminaria juncea
- Xanthorrhoea resinifera

3. The total species flora and fauna list for the community is considerably larger than that given in 2 (above), with many species present in only one or two sites or in very small quantity. In any particular site not all of the assemblage listed in 2 may be present. Invertebrate species may be restricted to sediments for example. At any one time, propagules and seeds of some species may only be present in the soil seed bank with no above-ground individuals present. The species composition of the site will be influenced by the size of the site, recent rainfall or drought conditions and by its recent disturbance history. The community includes vertebrates and invertebrates, many of which are poorly known.

4. Sydney Freshwater Wetlands are a mosaic community with considerable variation due to fluctuating water levels and seasonal conditions. Characteristic vegetation is sedges and aquatics particularly Eleocharis sphacelata, Baumea juncea, Baumea rubiginosa, Baumea articulata, Gahnia sieberiana, Ludwigia peploides subsp. montevidensis and Persicaria species. There may be considerable areas of open water particularly where drainage conditions have been altered. There may be patches of emergent trees such as Melaleuca quinquenervia and shrubs.

5. Sydney Freshwater Wetlands are restricted to freshwater swamps in swales and depressions on sand dunes and low nutrient sandplain sites in coastal areas. These areas are generally on the sands of the Warriewood and Tuggerah Soil Landscapes (Chapman & Murphy 1989). Coastal Swamp Forest eg. Eucalyptus robusta and swamp on alluvium with a saline influence is not covered by this Endangered Ecological Community Determination.

6. Sydney Freshwater Wetlands are or have been known to occur in the local government areas of Lake Macquarie, Wyong, Gosford, Pittwater, Warringah, Woollahra, Waverley, Botany, Rockdale, Randwick, Sutherland and Wollongong- but may occur elsewhere in the Sydney Basin Bioregion.

7. Sydney Freshwater Wetlands were formerly particularly extensive in the Sydney Eastern Suburbs and Kurnell area. Occurrences have been reported to include Jewells Swamp, Wallarah wetland, Budgewoi wetlands, Porters Creek wetland, Wyong Golf Course, Tuggerah Oxbow, Bateau Bay; Iluka Lagoon; Everglades Lagoon Umina, Deep Creek Warringah, Dee Why Lagoon, Lachlan Swamps, Centennial Park, Botany Swamps at Eastlakes, La Perouse, Kurnell, Potter Point, Bundeena and Marley Lagoons and Coomaditchy Lagoon, but the ecological community may also occur elsewhere.

8. Sydney Freshwater Wetlands include vegetation described in Benson & Howell (1994), Adam & Stricker (1993) and Chafer (1997).

9. Disturbed remnants are considered to form part of the community described under this determination where the natural soil and associated seedbank is partially intact. At some sites changes to hydrology or drainage may be required to assist regeneration.

10. Sydney Freshwater Wetlands has been extensively cleared and filled for recreational purposes - playing fields, car parks, roads eg Marton Park Kurnell. Remnants are threatened with illegal filling with commercial, industrial and residential waste, dumping and burning of stolen vehicles, sand extraction and clearing for urban development. Threats include urban runoff associated with proximity to urban and agricultural areas, weed invasion e.g. Cortaderia selloana, Ludwigia peruviana, Salvinia molesta, Eichhornia crassipes; off-road vehicles and trail bikes, and introduced deer affecting Marley and Jibbon Lagoons in Royal National Park by grazing and trampling.

11. Small areas of Sydney Freshwater Wetlands have been reported to occur in Wyrrabalong, Royal and Botany Bay National Parks.

12. Animal species of conservation significance which may occur in Sydney Freshwater Wetlands are Australasian Bittern, Botaurus poiciloptilus, Wallum Froglet, Crinia tinnula, Green and Golden Bell Frog, Litoria aurea, and Large Footed Myotis, Myotis adversus.

13. In view of the small size of existing remnants, and the threat of further clearing, disturbance and degradation, the Scientific Committee is of the opinion that the Sydney Freshwater Wetlands in the Sydney Basin Bioregion are likely to become extinct in nature in New South Wales unless the circumstances and factors threatening its survival or evolutionary development cease to operate and that listing as an endangered ecological community is warranted.

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About the NSW Scientific Committee

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# Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological community listing

**NSW Scientific Committee - final determination**

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list *Themeda* grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions as an ENDANGERED ECOLOGICAL COMMUNITY in Part 3 of Schedule 1 of the Act. Listing of endangered ecological communities is provided for by Part 2 of the Act.

The Scientific Committee has found that:

1. *Themeda* grassland on seacliffs and coastal headlands in NSW is an ecological community described by Adam *et al*. (1989). The community is found in the NSW North Coast, Sydney Basin and South East Corner Bioregions, on seacliffs and coastal headlands. The structure of the community is typically closed tussock grassland, but may be open shrubland or open heath with a grassy matrix between the shrubs. The community belongs to the Maritime Grasslands vegetation class of Keith (2004).

2. The community is characterised by the following assemblage of species.

| | |
|---|---|
| *Acacia sophorae* | *Banksia integrifolia* subsp. *integrifolia* |
| *Commelina cyanea* | *Glycine clandestina* |
| *Glycine microphylla* | *Hibbertia scandens* |
| *Isolepis nodosa* | *Kennedia rubicunda* |
| *Lepidosperma* spp. | *Leptospermum laevigatum* |
| *Lomandra longifolia* | *Monotoca elliptica* |
| *Opercularia aspera* | *Pimelea linifolia* |
| *Poranthera microphylla* | *Sporobolus virginicus* |
| *Themeda australis* | *Viola banksii* |
| *Westringia fruticosa* | |

3. The total species list of the community is considerably larger than that given above, with many species present at only one or two sites, or in low abundance. The species composition of the site will be influenced by the size of the site, recent rainfall and drought conditions and by its disturbance history (including fire, grazing and land clearing). At any one time, above ground individuals of some species may be absent, but the species may be represented below ground in soil seed banks or as dormant structures such as bulbs, corms, rhizomes, rootstocks or lignotubers. The list of species given above is of the vascular plant species, the community also includes micro-organisms, fungi, cryptogamic plants and a diverse flora. These components of the community are poorly documented.

4. *Themeda australis* is the dominant species in the community. *Themeda australis* is an extremely widespread species, but in this community may have a distinctive appearance, being prostrate and having glaucous leaves. These features are retained in cultivation and the form is believed to be genetically distinct (SWL Jacobs, pers. comm.). Scattered shrubs occur in many stands, most frequently *Pimelea linifolia, Banksia integrifolia* and *Westringia fruticosa.* These and other woody species often have dwarf growth forms. Although a number of woody species are listed as part of the community, these are usually sparsely distributed and may be absent from some stands. Tussocks of *Poa poiformis* may be found in some stands of the community, but *Poa poiformis*-dominated tussock grassland is generally found lower on cliffs (closer to the sea and more exposed to spray) and on steeper slopes.

5. A number of threatened species occur in some stands of the community, including *Diuris* sp. aff. *chrysantha, Pultenaea maritima, Rutidosus heterogama, Thesium australe* (Cohn 2004) and *Zieria prostrata* (Hogbin 2001). The endangered population of the low growing form of *Zieria smithii* at Diggers Head is found in this community. The community is the major habitat for a number of other species, including *Chamaecrista maritima, Plectranthus cremnus* and *Stackhousia spathulata.* The presence of threatened species is a matter which will need to be addressed, on a stand by stand basis in management plans, but the presence of threatened species is not required for definition of the community.

6. The community is found on a range of substrates, although stands on sandstone are infrequent and small. Larger stands are found on old sand dunes above cliffs, as for example at Cape Banks and Henry Head in Botany Bay National Park (Adam *et al*. 1989), and on basalt headlands, as for example at Damerals Head in Moonee Beach National Park. Occurrences of the community in northern NSW are discussed by Griffith *et al.* (2003).

7. Individual stands of the community are often very small, a few square m, but at some sites larger stands of up to several hectares or tens of hectares occur. Overall, the community therefore has a highly restricted geographic distribution comprising small, but widely scattered patches.

8. *Themeda* grassland on seacliffs and coastal headlands has been affected by pasture improvement to accommodate livestock grazing to varying degrees throughout its range (e.g. in the Coffs Harbour and Shellharbour-Kiama districts). More recently, the distribution has been depleted by coastal development. While some stands are protected from further land use change, a major threat to the community is posed by invasion by shrubs, both introduced species such as *Chrysanthemoides monilifera* and *Lantana camara*, and native species including *Acacia sophorae, Banksia integrifolia* and *Westringia fruticosa*. Although native shrubs are a feature of the community, invasion and conversion to dense shrubland has occurred at a number of sites in recent years and this may threaten the persistence of grassland elements in the community. This may reflect changed fire regimes and reduced grazing pressure (including by rabbits). A further major threat is associated with recreational use, with weed invasion and erosion occurring adjacent to footpaths and from use of off-road vehicles. Collectively, these processes may result in a large reduction of the ecological function of the community.

9. In view of the highly restricted distribution, small patch size and ongoing threats to the community, the Scientific Committee is of the opinion that *Themeda* grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions is likely to become extinct in nature in New South Wales unless the circumstances and factors threatening its survival cease to operate.

Dr Lesley Hughes
Chairperson
Scientific Committee

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About the NSW Scientific Committee

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