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THE NATURAL VEGETATION IN THE CITY OF SHELLHARBOUR

**KEVIN MILLS & ASSOCIATES PTY LIMITED
ECOLOGICAL AND ENVIRONMENTAL CONSULTANTS**

SEPTEMBER 2001

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Prepared by

**KEVIN MILLS & ASSOCIATES PTY LIMITED
ECOLOGICAL AND ENVIRONMENTAL CONSULTANTS
114 NORTH CURRAMORE ROAD, JAMBEROO NSW 2533
ABN 56 003 441 610**

**for
SHELLHARBOUR CITY COUNCIL
PO BOX 155, SHELLHARBOUR CITY CENTRE NSW 2529**

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THE NATURAL VEGETATION IN THE CITY OF SHELLHARBOUR

1. INTRODUCTION

This report was prepared for Shellharbour City Council, to accompany a map of the natural vegetation in the Shellharbour local government area (LGA), prepared by Kevin Mills & Associates late in 1999. The map is stored digitally in Council's Geographic Information System (GIS). Figure 1 shows the boundaries of the City of Shellharbour.

The term "natural vegetation" refers, in this report, to areas of native vegetation that have retained most of their structural and floristic characteristics. The term also refers to regrowth that has achieved or has the potential to achieve a near natural structure. Very little vegetation in the Shellharbour LGA (or, indeed, anywhere in New South Wales) is in a completely natural condition; almost all areas, especially along the coast, have been logged, under-scrubbed, and partially cleared and/or burnt, at some time since European settlement.

2. METHODOLOGY

2.1 PREPARATION OF THE VEGETATION MAP

The vegetation map was prepared after intensive field surveys were undertaken in 1999, although the consultant had been studying the vegetation in the Shellharbour district for many years. Reference was also made to the 1:8,000 colour aerial photographs taken in 1998, and any reports containing vegetation maps and information on the vegetation in the Shellharbour LGA, although most of them only referred to small sites. Any appropriate information on the maps in those reports was included on the vegetation map.

The vegetation map is based on surveys in the Rural Lands Study Area (Kevin Mills & Associates 2000), but has been expanded to cover the entire local government area. It also incorporates information from several wetlands studies in the Shellharbour area, such as at Lake Illawarra (Kevin Mills & Associates 1997), Dunmore (Kevin Mills & Associates 1997), Shell Cove (Kevin Mills & Associates 1999) and elsewhere in the district (Kevin Mills & Associates 1996; Chafer 1997).

The boundaries of the vegetation communities were identified on the aerial photographs during the field surveys, and were then marked onto a set of maps prepared by Council at a scale of 1:8,000, showing rectified colour aerial photography (1997), roads and the boundary of the local government area. Council then digitised the boundaries directly into their Geographical Information System (GIS). A small version of the vegetation map is provided in Figure 2.

Although this study focuses on the natural vegetation in the Shellharbour LGA, a few non-natural communities were also included, in order to complete the vegetation map; most of those communities are dominated by introduced plants.

2.2 SURVEY METHODOLOGY

The survey methodology used during this study has been described in a paper on a survey methodology and vegetation classification system developed for the Shoalhaven LGA (Mills 1998). The methodology was developed because of the need for a uniform approach to vegetation surveys and vegetation classification in the Shoalhaven area. The same method was used during this study, because it has been so successful and is equally applicable to the Shellharbour LGA. Furthermore, with the development of Council's GIS system, there is a need to ensure that all future vegetation studies in the Shellharbour area conform to a benchmark standard. Eventually, vegetation maps from several local government areas in the region can be combined to produce a regional map; this will be particularly important for the work of the Regional Vegetation Management Committee presently being formed by the Department of Land and Water Conservation.

The methodology involved the collection of floristic data and other ecological information at locations considered to be representative of the vegetation community being sampled. The vegetation on each site was surveyed at all levels present, including the canopy (trees), middle canopy (trees), understorey (shrubs) and ground cover (plants less than one metre in height). The aim of the surveys was to describe the general character of the vegetation community, and record information such as the geology and altitude, etc.

Using the data from these and many previous surveys, the vegetation communities were then classified using the following two criteria: (i) the name(s) of the dominant species in the tallest stratum of the community, and (ii) the structure of the community. The vegetation communities in the Shellharbour LGA were therefore described using a binomial system; the first part refers to the common name(s) of the dominant species, usually a tree species, and the second part refers to the structure of the community, indicating whether it is forest, woodland, shrubland or grassland, etc.

The community was then assigned a six letter identification code. In order to achieve consistency throughout the Illawarra Region, the names of the communities and the identification codes used in the Shoalhaven LGA (Mills 1998) were applied to the Shellharbour LGA. However, because the Shellharbour LGA has several communities that do not occur in the Shoalhaven area, several additional vegetation communities were described and several new identification codes devised.

2.3 VEGETATION COMMUNITIES IN THE SHELLHARBOUR LGA

The vegetation communities in the City of Shellharbour are listed in Table 1. Forty (40) communities have been identified, grouped into eight broad categories ranging from rainforests, to eucalypt forests, shrublands, wetlands and grasslands. All of the communities are natural, with the exception of Wattle Forest (ACA-FOR), Miscellaneous/Mixed Forest (MIS-FOR), Lantana Shrubland (LAN-SHR) and Non-native Grassland (INT-GRL); those communities were included in the report for the sake of completeness. The vegetation map is provided in Figure 2.

The total area of vegetation mapped was 4,162.8 hectares, consisting of 3,895 hectares of natural vegetation (93.6%) and 267 hectares of vegetation (6.4%) that is not naturally occurring (the ACA-FOR, MIS-FOR and LAN-SHR communities). Approximately 26% of the 14,712 hectares of land in the Shellharbour LGA is covered by natural vegetation; note that Macquarie Pass National Park was not mapped and is not included in these figures. The other 10,820 hectares (74%) is covered by shrublands and grasslands dominated by introduced species, cropland, quarries and urban land.

The vegetation communities in the Shellharbour LGA are described below, in Table 1. Each community profile provides:

- i. a brief summary of the structure and floristic composition of the community;
- ii. notes on the distribution of each community in the Shellharbour LGA;
- iii. the total area (hectares) of the community in the Shellharbour LGA;
- iv. the proportion of the Shellharbour LGA covered by the community and the proportion of all mapped vegetation that the community represents; this has no bearing on the original area covered by the community. Note: the area of Shellharbour LGA used is 14,712 ha less the 1,064 ha of Macquarie Pass National Park, which was not mapped in this project.
- v. a conservation priority rating, based on its ecological value, to indicate what priority should be given to conserving the community wherever it occurs in the Shellharbour LGA;
- vi. information on which reserve(s) contain the vegetation community. It should be noted that "reservation" does not always imply "conservation". While some reserves have a nature conservation focus, others were established to provide areas for recreation, as well; they are not necessarily managed to conserve flora and fauna. Five reserves in the Shellharbour LGA have strong nature conservation objectives; they are:
Macquarie Pass National Park, managed by the National Parks and Wildlife Service;
Killalea State Park, managed by the Department of Land and Water Conservation;
Bass Point Reserve, managed by Shellharbour City Council;
Blackbutt Forest Reserve, managed by Shellharbour City Council; and
Croome Road Reserve, managed by Shellharbour City Council.

Table 1
Vegetation Communities in the City of Shellharbour

Vegetation Community	Code	Key Species
Group 1. Rainforests		
1.1 Complex Subtropical Rainforest	COM-SRF	<i>Ficus</i> spp., <i>Toona ciliata</i>
1.2 Complex Littoral Rainforest	COM-LRF	<i>Podocarpus elatus</i> , <i>Cassine australis</i>
1.3 Moist Subtropical Rainforest	MST-SRF	<i>Pennantia cunninghamii</i> , <i>Ficus</i> spp.
1.4 Coachwood Warm Temperate Rainforest	CER-WRF	<i>Ceratopetalum apetalum</i> , <i>Doryphora sassafras</i>
1.5 Ironwood Warm Temperate Rainforest	BAC-WRF	<i>Backhousia myrtifolia</i>
Group 2. Eucalypt Forests		
2.1 White Box - Brown Barrel Tall Forest	QUD-FAS	<i>E. quadrangulata</i> , <i>E. fastigata</i> , <i>E. smithii</i>
2.2 White Box - Yellow Stringybark Tall Forest	QUD-MUL	<i>E. quadrangulata</i> , <i>E. muelleriana</i>
2.3 Blackbutt Tall Forest	PIL-SYN	<i>Eucalyptus pilularis</i> , <i>Syncarpia glomulifera</i>
2.4 Silvertop Ash - Forest Oak Forest	SIE-CAS	<i>Eucalyptus sieberi</i> , <i>Allocasuarina torulosa</i>
2.5 Red Gum - White Box Forest	TER-QUD	<i>Eucalyptus tereticornis</i> , <i>E. quadrangulata</i>
2.6 Red Gum Forest - Rainforest	TER-WRF	<i>Eucalyptus tereticornis</i> , <i>Backhousia myrtifolia</i>
2.7 Red Gum - Blue Gum Forest	TER-SAL	<i>Eucalyptus tereticornis</i> , <i>E. saligna</i> / <i>E. botryoides</i>
2.8 Red Gum - Stringybark Forest	TER-EUG	<i>Eucalyptus tereticornis</i> , <i>E. eugenioides</i> , <i>Angophora floribunda</i> , <i>Eucalyptus bosistoana</i>
2.9 Red Gum - Paperbark Forest	TER-MEL	<i>Eucalyptus tereticornis</i> , <i>Melaleuca decora</i> <i>E. longifolia</i>
2.10 Bangalay - Banksia Forest	BOT-BAN	<i>Eucalyptus botryoides</i> , <i>Banksia integrifolia</i>
Group 3. Miscellaneous Forests		
3.1 Coast Banksia Forest	BAN-FOR	<i>Banksia integrifolia</i>
3.2 Wattle Forest	ACA-FOR	<i>Acacia mearnsii</i>
3.3 Mixed/Miscellaneous Forest	MIS-FOR	Native and introduced trees

Table 1 (continued)
Vegetation Communities in the City of Shellharbour

Vegetation Community	Code	Key Species
Group 4. Floodplain Forests		
4.1 River Oak Tall Forest	CAS-CUN	<i>Casuarina cunninghamiana</i>
4.2 Swamp Oak Forest	CAS-GLA	<i>Casuarina glauca</i>
Group 5. Shrublands		
5.1 Paperbark Tall Shrubland	MEL-ARM	<i>Melaleuca armillaris</i>
5.2 Coast Teatree Shrubland	LEP-LAV	<i>Leptospermum laevigatum</i> , <i>Banksia integrifolia</i>
5.3 Paperbark Shrubland	MEL-ERI	<i>Melaleuca ericifolia</i>
5.4 Coast Wattle Shrubland	ACA-SPH	<i>Acacia sophorae</i>
5.5 Coast Rosemary Shrubland	WES-SHR	<i>Westringia fruticosa</i> , <i>Banksia integrifolia</i>
5.6 Lantana Shrubland	LAN-SHR	<i>Lantana camara</i> *
Group 6. Fresh Wetlands		
6.1 Cumbungi Reedland	TYP-RDL	<i>Typha orientalis</i>
6.2 Fresh Juncus Rushland	JUN-FRH	<i>Juncus usitatus</i>
6.3 Spike-rush Sedgeland	ELE-SDG	<i>Eleocharis sphacelata</i>
6.4 Sandstone Sedgeland	SST-SDG	Sedges and rushes, <i>Viminaria juncea</i>
6.5 Triglochin Aquatic Herbland	TRI-HBL	<i>Triglochin procerum</i>
Group 7. Saline Wetlands		
7.1 Mangrove Forest	AVI-FOR	<i>Avicennia marina</i>
7.2 Mangrove Shrubland	AVI-SHR	<i>Avicennia marina</i> , <i>Aegiceras corniculatum</i>
7.3 Phragmites Reedland	PHR-RDL	<i>Phragmites australis</i>
7.4 Saltmarsh	SAR-SUA	<i>Sarcocornia quinqueflora</i> , <i>Suaeda australis</i>
7.5 Saltwater Juncus Rushland	JUN-SAL	<i>Juncus kraussii</i>
7.6 Seagrass	ZOS-RUP	<i>Zostera</i> sp., <i>Ruppia</i> sp., <i>Halophila</i> sp.
Group 8. Grasslands		
8.1 Spinifex Grassland	SPN-GRL	<i>Spinifex sericeus</i> , <i>Carex pumila</i>
8.2 Kangaroo Grass Grassland	THM-GRL	<i>Themeda australis</i>
8.3 Non-native Grassland	INT-GRL	<i>P. clandestinum</i> *, <i>S. secundatum</i> *

* Introduced plant species

3. VEGETATION COMMUNITY DESCRIPTIONS

GROUP 1: RAINFORESTS

1.1 COMPLEX SUBTROPICAL RAINFOREST

Toona ciliata - *Ficus* spp. - *Dendrocnide excelsa* - *Planchonella australis*
COM-SRF

Description: Complex Subtropical Rainforest is the most diverse rainforest type in the region and in southern New South Wales. It occurs on Permian volcanic soils in areas with a relatively low to moderate rainfall. The rainforest is characterised by a diversity of tree species, multiple canopy layers and an abundance of vines. The ground cover is usually quite sparse and the ground is often very rocky. Emergent trees are common, including large old figs *Ficus* spp. The characteristic tree species include Red Cedar *Toona ciliata*, Giant Stinging Tree *Dendrocnide excelsa*, Brush Bloodwood *Baloghia inophylla*, Black Apple *Planchonella australis*, Whalebone Tree *Streblus brunonianus* and Illawarra Flame Tree *Brachychiton acerifolius*. A dry variation of this community occurs on some of the driest, north-facing slopes; species such as White Cedar *Melia azedarach*, Illawarra Flame Tree *Brachychiton acerifolius* and Koda *Ehretia acuminatum* are common in such locations.

Distribution in Shellharbour LGA: This community once covered a fairly large area between Bass Point and the lower slopes of the escarpment (Mills & Jakeman 1995). Large patches now exist only in the steep rocky gullies to the west of Dunmore and to the south of Albion Park, around Stockyard Mountain. There are small remnants throughout the Shellharbour district, particularly in the area from Oak Flats, to the hills at Dunmore, to Albion Park and south into Jamberoo Valley.

Area in Shellharbour LGA: 750.6 hectares

Proportion (%) of the Shellharbour LGA: 5.5%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 18.03%

Conservation Priority: VERY HIGH

Complex Subtropical Rainforest is a regionally significant ecological community that should have a very high conservation priority. The community has been severely depleted in the Illawarra Region since European settlement (Mills 1988). It provides habitat for many threatened and regionally significant flora and fauna species, including several fauna species that are almost totally restricted to lowland rainforest.

Reserved Areas in Shellharbour LGA: There are several small patches in Killalea State Park.

1.2 COMPLEX LITTORAL RAINFOREST

***Podocarpus elatus* - *Endiandra sieberi* - *Cassine australis*
COM-LRF**

Description: Complex Littoral Rainforest is similar to Complex Subtropical Rainforest; the two communities contain many of the same species. Tree and vine species diversity is fairly high, and there are few ferns because of the dry conditions and well drained sandy soils. The main tree species include Plum Pine *Podocarpus elatus*, Red-fruited Olive-plum *Cassine australis*, Corkwood *Endiandra sieberi*, Native Olive *Notelaea longifolia*, Hairy Wilkiea *Wilkiea huegeliana* and various Figs *Ficus* spp. Burny Vine *Malaisia scandens* and Water Vine *Cissus antarctica* are common.

Distribution in Shellharbour LGA: Complex Littoral Rainforest mainly occurs on sand dunes near the sea. It occurs at Bass Point and on the Minnamurra Sand Spit. Rainforest species are also found at Lake Illawarra, for example on Picnic Island, suggesting that littoral rainforest may once have occurred there.

Area in Shellharbour LGA: 5.68 hectares

Proportion (%) of the Shellharbour LGA: 0.04%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 0.14%

Conservation Priority: VERY HIGH

Complex Littoral Rainforest is a regionally significant ecological community. It should have a very high conservation priority. The littoral rainforest at Bass Point is one of the best examples in southern New South Wales; few other sites exhibit such diversity. The Bass Point rainforest is used by several threatened bird species, such as the Powerful Owl and the Rose-crowned Fruit-Dove. Although the rainforest on the Minnamurra Sand Spit is not so well developed, it is an important area of habitat and is of ecological interest. Littoral rainforest contains several regionally significant plant species, such as Native Celtis *Celtis paniculata*, which reaches its southern limit on the Minnamurra Sand Spit.

Reserved Areas in Shellharbour LGA: This community occurs in Bass Point Reserve, and on the Minnamurra Sand Spit in Killalea State Park. Most of the rainforest at Bass Point is protected by SEPP No.26 - Littoral Rainforests (stand no.173A).

1.3 MOIST SUBTROPICAL RAINFOREST

***Pennantia cunninghamii* - *Livistona australis* - *Doryphora sassafras*
MST-SRF**

Description: Moist Subtropical Rainforest is also similar to Complex Subtropical Rainforest, but it contains species that prefer the moister conditions and it lacks several "dry rainforest" species. The characteristic species include Brown Beech *Pennantia cunninghamii*, Red Cedar *Toona ciliata*, Figs *Ficus* spp., Cabbage Palm *Livistona australis*, Pigeonberry Ash *Elaeocarpus kirtonii*, Sassafras *Doryphora sassafras* and Lilly Pilly *Acmena smithii*. The community has an abundance of ferns, such as Fragrant Fern *Microsorium scandens*, Jungle Brake *Pteris umbrosa* and tree ferns *Cyathea* spp.

Distribution in Shellharbour LGA: Moist Subtropical Rainforest occurs from the base of the escarpment to the upper benches, at about 400 metres in altitude. The underlying geology is usually the Permian Coal Measures, rather than the volcanic soils associated with Complex Subtropical Rainforest, although there is never a distinct boundary between the two rainforest communities.

Area in Shellharbour LGA: 249.66 hectares

Proportion (%) of the Shellharbour LGA: 1.8%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 6.00%

Conservation Priority: VERY HIGH

Moist Subtropical Rainforest is a regionally significant ecological community that should have a very high conservation priority. It is ecologically diverse and it contains several regionally significant plant species. It also provides habitat for several threatened fauna species.

Reserved Areas in Shellharbour LGA: This community occurs in the lower sections of Macquarie Pass National Park.

1.4 COACHWOOD WARM TEMPERATE RAINFOREST

Ceratopetalum apetalum* - *Doryphora sassafras* - *Acmena smithii
CER-WRF

Description: Coachwood Warm Temperate Rainforest is much simpler in structure and floristic composition than the subtropical rainforest types described above. The dominant tree species is usually Coachwood *Ceratopetalum apetalum*, which commonly occurs with Sassafras *Doryphora sassafras*, Lilly Pilly *Acmena smithii*, Featherwood *Polysma cunninghamii* and Native Laurel *Cryptocarya glaucescens*. Pepper Bush *Tasmannia insipida*, a shrub species, is usually present. Ferns are common, including tree ferns.

Distribution in Shellharbour LGA: This community occurs on the upper slopes of the escarpment, usually above about 300 metres in altitude. The topography is usually very steep. The community is replaced by moist subtropical rainforest on the adjacent topographic benches. The underlying geology is usually the Narrabeen Group or talus material.

Area in Shellharbour LGA: 48.71 hectares

Proportion (%) of the Shellharbour LGA: 0.36%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 1.17%

Conservation Priority: HIGH

Coachwood Warm Temperate Rainforest is a regionally significant ecological community that should have a high conservation priority. Although it was not cleared to the same extent as lowland subtropical rainforest, it is naturally rare and it supports regionally significant flora and fauna species, and possibly some threatened species.

Reserved Areas in Shellharbour LGA: Macquarie Pass National Park contains a large area of Coachwood Warm Temperate Rainforest.

1.5 IRONWOOD WARM TEMPERATE RAINFOREST

Backhousia myrtifolia

BAC-WRF

Description: Ironwood Warm Temperate Rainforest contains mainly hardy species, rainforest plants able to grow in very dry conditions. The dominant tree species is always Ironwood *Backhousia myrtifolia*. Other characteristic species include Native Olive *Notelaea venosa*, Sweet Pittosporum *Pittosporum undulatum*, Gristle Water Fern *Blechnum cartilagineum* and various vines such as Bearded Tylophora *Tylophora barbata* and Traveller's Joy *Clematis aristata*. There are often emergent eucalypts, the species varying from one location to another.

Distribution in Shellharbour LGA: This community forms dense thickets on the edge of other rainforest, or it occurs along creeks at lower altitudes, for example at Yellow Rock.

Area in Shellharbour LGA: 11.80 hectares

Proportion (%) of the Shellharbour LGA: 0.08%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 0.28%

Conservation Priority: MODERATELY HIGH

The conservation of Ironwood Warm Temperate Rainforest should have a moderately high priority. It is common in southern New South Wales. The patches in the Illawarra Region are small to moderately large, but the community is uncommon in the Shellharbour LGA. Most of the patches were too small to map at a scale of 1:8000, and so went undetected.

Reserved Areas in Shellharbour LGA: Macquarie Pass National Park contains stands of Ironwood Warm Temperate Rainforest.

GROUP 2: EUCALYPT FORESTS

2.1 WHITE BOX - BROWN BARREL TALL FOREST

Eucalyptus quadrangulata* - *Eucalyptus fastigata* - *Eucalyptus smithii

QUD-FAS

Description: This tall forest community is dominated by Coast White Box *Eucalyptus quadrangulata*, Brown Barrel *Eucalyptus fastigata* and Gully Gum *Eucalyptus smithii*. It is well developed and is usually associated with rainforest. The middle canopy often contains rainforest species. The understorey is often a dense tangle of shrubs. Ferns and vines are common.

Distribution in Shellharbour LGA: This community usually occurs on the upper slopes of the escarpment, above about 300 metres, where the rainfall is high and conditions are fairly moist. White Box - Yellow Stringybark Tall Forest fairly consistently gives way to White Box - Brown Barrel Tall Forest at around 300 metres above sea level along this part of the escarpment.

Area in Shellharbour LGA: 431.64 hectares

Proportion (%) of the Shellharbour LGA: 3.16%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 10.37%

Conservation Priority: HIGH

White Box - Brown Barrel Tall Forest is a regionally significant community, with a high priority for conservation. It is one of the best developed and least disturbed forest types in the region. It is contiguous with similar forest extending along the escarpment towards Wollongong and Kiama, and it provides habitat for a diverse range of forest fauna, including threatened owls.

Reserved Areas in Shellharbour LGA: A large area of this tall forest community has been reserved in Macquarie Pass National Park.

2.2 WHITE BOX - YELLOW STRINGYBARK TALL FOREST

Eucalyptus quadrangulata* - *Eucalyptus muelleriana
QUD-MUL

Description: This tall forest community is dominated by Coast White Box *Eucalyptus quadrangulata* and Yellow Stringybark *Eucalyptus muelleriana*. Trees from the adjoining communities are often present as well, such as Forest Red Gum *Eucalyptus tereticornis*. There is usually a strong rainforest component in the understorey, although it is usually grassy on dry slopes.

Distribution in Shellharbour LGA: This type of forest occurs on the escarpment slopes at the western extremity of the Shellharbour LGA, at altitudes of about 200-300 metres. It occurs downslope from White Box - Brown Barrel Tall Forest and upslope from Red Gum - White Box Forest.

Area in Shellharbour LGA: 503.86 hectares

Proportion (%) of the Shellharbour LGA: 3.69%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 12.10%

Conservation Priority: HIGH

The conservation of White Box - Yellow Stringybark Tall Forest should have a high priority, for this is a regionally significant ecological community. Its conservation values are similar to those of White Box - Brown Barrel Tall Forest.

Reserved Areas in Shellharbour LGA: Macquarie Pass National Park contains areas of White Box - Yellow Stringybark Tall Forest.

2.3 BLACKBUTT TALL FOREST

Eucalyptus pilularis* - *Syncarpia glomulifera

PIL- SYN

Description: This tall forest community is dominated by Blackbutt *Eucalyptus pilularis*; the most common associate is Turpentine *Syncarpia glomulifera*. The understorey is drier than in the forests higher on the escarpment. Common understorey species include Brush Daisy-bush *Olearia viscidula*, Two-veined Hickory *Acacia binervata* and Spiny-headed Mat-rush *Lomandra longifolia*.

Distribution in Shellharbour LGA: Blackbutt Tall Forest occurs on the escarpment at Yellow Rock. It is usually on Budgong Sandstone, below an altitude of about 200 metres. There are also small remnants on the hills on the coastal plain; the best example is in Blackbutt Forest Reserve.

Area in Shellharbour LGA: 156.8 hectares

Proportion (%) of the Shellharbour LGA: 1.14%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 3.77%

Conservation Priority: MODERATELY HIGH

The conservation of Blackbutt Tall Forest should have a moderately high priority. Although it is quite common throughout the Illawarra Region, at Shellharbour it is mainly confined to one large stand at Yellow Rock. Like the other tall forest communities, it probably provides habitat for several threatened and regionally significant fauna species.

Reserved Areas in Shellharbour LGA: Blackbutt Forest Reserve contains a relatively large stand of Blackbutt Tall Forest.

2.4 SILVERTOP ASH - FOREST OAK FOREST

Eucalyptus sieberi* - *Allocasuarina torulosa

SIE-CAS

Description: This forest community is dominated by Silvertop Ash *Eucalyptus sieberi*, a tree species that usually occurs on the sandstone plateau. Rarely does it occur on the slopes of the escarpment. Forest Oak *Allocasuarina torulosa* is a common associate. The understorey is composed of species from the surrounding moist forest types; it contains few "sandstone species".

Distribution in Shellharbour LGA: This community occurs in only a few locations, on talus material on the escarpment.

Area in Shellharbour LGA: 8.08 hectares

Proportion (%) of the Shellharbour LGA: 0.06%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 0.19%

Conservation Priority: MODERATELY HIGH

Silvertop Ash - Forest Oak Forest should have a moderately high priority for conservation. Although a common tree species in the Illawarra Region, tall stands of *Eucalyptus sieberi* are uncommon along the escarpment. The stands growing along the escarpment are of interest because they are in an atypical situation.

Reserved Areas in Shellharbour LGA: Some Silvertop Ash - Forest Oak Forest has been reserved in Macquarie Pass National Park.

2.5 RED GUM - WHITE BOX FOREST

Eucalyptus tereticornis* - *Eucalyptus quadrangulata

TER-QUD

Description: This forest community is usually dominated by Forest Red Gum *Eucalyptus tereticornis* and Coast White Box *Eucalyptus quadrangulata*. Tree species from the adjacent dry community are often present, namely Thin-leaved Stringybark *Eucalyptus eugenioides* and Rough-barked Apple *Angophora floribunda*. The understorey usually contains scattered shrubs, such as Brush Daisy-bush *Olearia viscidula* and Tree Violet *Hymenanthera dentata*. The ground cover, which is grassy on dry sites, contains species such as Cockspur Flower *Plectranthus parvifolius*, Lobelia *Pratia purpurascens*, Tussock *Poa labillardieri*, Forest Starwort *Stellaria flaccida*, Australian Basket-grass *Oplismenus aemulus* and Austral Crane's-bill *Geranium solanderi*. Where rainforest is prominent in the understorey, the forest has been mapped as Red Gum Forest - Rainforest (TER-WRF).

Distribution in Shellharbour LGA: This community occurs along the escarpment in the western part of the Shellharbour LGA, at about 100 - 200 metres above sea level.

Area in Shellharbour LGA: 279.66 hectares

Proportion (%) of the Shellharbour LGA: 2.04%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 6.72%

Conservation Priority: MODERATELY HIGH

As part of the Red Gum group of communities, Red Gum - White Box Forest is a regionally significant ecological community. It should have a moderately high priority for conservation. It is at the moist end of the spectrum of communities in this complex, and at the dry end of the spectrum of escarpment forest communities. This community probably contains habitat for threatened and regionally significant fauna species.

Reserved Areas in Shellharbour LGA: A small amount of this community has been reserved in Macquarie Pass National Park.

2.6 RED GUM FOREST - RAINFOREST

***Eucalyptus tereticornis* - *Eucalyptus quadrangulata* - Rainforest Species TER-WRF**

Description: This forest type is usually associated with Red Gum - White Box Forest. The forest consists of large old Red Gums *Eucalyptus tereticornis* and/or Coast White Box *Eucalyptus quadrangulata*, and an understorey of rainforest plants. The rainforest plants are usually the hardy species, such as Ironwood *Backhousia myrtifolia*, Sweet Pittosporum *Pittosporum undulatum* and Red Ash *Alphitonia excelsa*.

Distribution in Shellharbour LGA: This community occurs on sheltered slopes, from about 50 - 200 metres above sea level.

Area in Shellharbour LGA: 163.33 hectares

Proportion (%) of the Shellharbour LGA: 1.19%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 3.92%

Conservation Priority: HIGH

Red Gum Forest - Rainforest is a regionally significant ecological community. It should have a high priority for conservation, like all of the Red Gum communities. In a regional context, the community is an unusual combination of dry Red Gum forest and rainforest. The community probably provides habitat for threatened and regionally significant fauna species.

Reserved Areas in Shellharbour LGA: No areas of Red Gum Forest - Rainforest have been reserved in the Shellharbour LGA.

2.7 RED GUM - BLUE GUM FOREST

***Eucalyptus tereticornis* - *Eucalyptus saligna*/E. *botryoides*
TER-SAL**

Description: Most of the Red Gum - Blue Gum Forest in the Shellharbour LGA has been removed, and the remainder has been heavily disturbed. The main tree species are Forest Red Gum *Eucalyptus tereticornis*, Blue Gum *Eucalyptus saligna*/E. *botryoides*, Hickory *Acacia implexa*, Red Ash *Alphitonia excelsa* and Black She-oak *Allocasuarina littoralis*. Thin-leaved Stringybark *Eucalyptus eugenioides* and Rough-barked Apple *Angophora floribunda* are also present. Part of the area mapped has a rainforest understorey.

Distribution in Shellharbour LGA: This community occurs at only one location in the Shellharbour LGA, near Tongarra Creek. It is more common to the north and south of Shellharbour, in the Wollongong and Kiama LGAs.

Area in Shellharbour LGA: 11.7 hectares

Proportion (%) of the Shellharbour LGA: 0.09%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 0.28%

Conservation Priority: MODERATELY HIGH

Like the other Red Gum communities, Red Gum - Blue Gum Forest should have a moderately high priority for conservation.

Reserved Areas in Shellharbour LGA: Red Gum - Blue Gum Forest does not occur in any reserves in the Shellharbour LGA.

2.8 RED GUM - STRINGYBARK FOREST

Eucalyptus tereticornis* - *Eucalyptus eugenioides* - *Eucalyptus bosistoana
TER-EUG

Description: This community, which varies from forest to woodland, contains Forest Red Gum *Eucalyptus tereticornis*, Thin-leaved Stringybark *Eucalyptus eugenioides* and Coast Grey Box *Eucalyptus bosistoana*. The understorey is rather open; it contains few shrubs. The ground cover is grassy; the characteristic species include Kangaroo Grass *Themeda australis*, Small-leaved Bramble *Rubus parvifolius*, Mulga Fern *Cheilanthes sieberi*, Barbwire Grass *Cymbopogon refractus*, Dwarf Blue Trumpet *Brunoniella pumilio* and Tick-trefoil *Desmodium rhytidophyllum*.

Distribution in Shellharbour LGA: Red Gum - Stringybark Forest occurs on low hills and slopes in the eastern and central parts of the Shellharbour LGA, mostly on Budgong Sandstone. It occurs where rainfall is relatively low. The community extends inland to the foot of Macquarie Pass, but only because of a rain shadow effect in that area. It is replaced on moister sites and at higher altitude by Red Gum - White Box Forest (TER-QUD) and on the floodplains by the Red Gum - Paperbark Forest (TER-MEL).

Area in Shellharbour LGA: 519.65 hectares

Proportion (%) of the Shellharbour LGA: 3.80%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 12.48%

Conservation Priority: VERY HIGH

Red Gum - Stringybark Forest is a regionally significant ecological community that should have a very high conservation priority. Referred to as Illawarra Lowlands Grassy Woodland by the NSW Scientific Committee in its Final Determination, the community has been listed as an endangered ecological community under the *Threatened Species Conservation Act 1995*. Because large areas of Red Gum forest and woodland have been cleared throughout New South Wales, Red Gum has a high conservation value wherever it occurs. Red Gum forest probably provides habitat for a unique fauna assemblage, although no systematic surveys have been undertaken.

Reserved Areas in Shellharbour LGA: Red Gum - Stringybark Forest does not occur in any reserves in the Shellharbour LGA.

2.9 RED GUM - PAPERBARK FOREST

Eucalyptus tereticornis* - *Melaleuca decora* - *Eucalyptus longifolia

TER-MEL

Description: This community, which varies from forest to woodland, is usually dominated by Forest Red Gum *Eucalyptus tereticornis* and Paperbark *Melaleuca decora*; Woollybutt *Eucalyptus longifolia* and Prickly-leaved Paperbark *Melaleuca styphelioides* are common associates. The understorey is grassy and has few shrubs. The characteristic understorey species include Sickie Wattle *Acacia falcata*, Spreading Flax-lily *Dianella revoluta*, Variable Sword-sedge *Lepidosperma laterale* and Wiry Panic *Entolasia stricta*.

Distribution in Shellharbour LGA: This community occurs throughout the Shellharbour LGA, on broad floodplains and on the adjoining lower slopes. There are good examples at the southern end of the aerodrome and in Croome Road Reserve.

Area in Shellharbour LGA: 64.16 hectares

Proportion (%) of the Shellharbour LGA: 0.47%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 1.54%

Conservation Priority: VERY HIGH

Red Gum - Paperbark Forest should have a very high conservation priority; it is a regionally significant ecological community. Referred to as Illawarra Lowlands Grassy Woodland by the NSW Scientific Committee in its Final Determination, the community has been listed as an endangered ecological community under the *Threatened Species Conservation Act 1995*. Because large areas of Red Gum forest and woodland have been cleared throughout New South Wales, Red Gum has a high conservation value wherever it occurs. Red Gum forest probably provides habitat for a unique fauna assemblage, although no systematic surveys have been undertaken.

Reserved Areas in Shellharbour LGA: Red Gum - Paperbark Forest occurs in Croome Road Reserve, Blackbutt Forest Reserve and on public land at the aerodrome.

2.10 BANGALAY - BANKSIA FOREST

Eucalyptus botryoides* - *Banksia integrifolia

BOT-BAN

Description: The forest is dominated by Bangalay *Eucalyptus botryoides*. The understorey, which is shrubby, contains coastal species such as Tree Broom-heath *Monotoca elliptica* and Coast Banksia *Banksia integrifolia*, as well as Golden Wattle *Acacia longifolia*, Cheesetree *Glochidion ferdinandi*, Maiden's Wattle *Acacia maidenii* and Corkwood *Duboisia myoporoides*.

Distribution in Shellharbour LGA: This community occurs on and near the coast, mainly on sand deposits. There are examples near the Minnamurra River estuary, south of the waste disposal depot and near Swamp Road.

Area in Shellharbour LGA: 60.02 hectares

Proportion (%) of the Shellharbour LGA: 0.43%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 1.44%

Conservation Priority: MODERATELY HIGH

Bangalay Forest was once common along the coast at Shellharbour, but most of it has been cleared. The community should have a high conservation priority, because it is now rare in the Shellharbour area. Although the area covered is not large, the Bangalay Forest in the Minnamurra-Dunmore area, provides relatively good quality habitat.

Reserved Areas in Shellharbour LGA: Bangalay Forest occurs on the Minnamurra Sand Spit, in Killalea State Park.

GROUP 3: MISCELLANEOUS FOREST COMMUNITIES

3.1 COAST BANKSIA FOREST

Banksia integrifolia

BOT-BAN

Description: This community, which ranges from forest to woodland, occurs mainly as regrowth in the Shellharbour LGA. The most characteristic species is Coast Banksia *Banksia integrifolia*, although many others are also present, such as Coast Teatree *Leptospermum laevigatum* and Lilly Pilly *Acmena smithii*. The species composition varies with the substrate on which the vegetation is growing, whether sand or volcanic rock.

Distribution in Shellharbour LGA: This community occurs along the coast in a few places, but most has been cleared. It occurs on Bevans Island at Bass Point and in Killalea State Park, above the Minnamurra Sand Spit.

Area in Shellharbour LGA: 10.53 hectares

Proportion (%) of the Shellharbour LGA: 0.08%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 0.25%

Conservation Priority: MODERATELY HIGH

Coast Banksia Forest should have a moderately high priority for conservation. Banksias provide an important source of nectar for birds when flowering. Most of this community has been cleared between Stanwell Park and Gerroa.

Reserved Areas in Shellharbour LGA: Coast Banksia Forest occurs in Killalea State Park, as well as at Bass Point and on the islands near the entrance of Lake Illawarra.

3.2 WATTLE FOREST

Acacia mearnsii* - *Acacia maidenii

ACA-FOR

Description: This community occurs as a forest or woodland of rather small wattle trees, mostly Black Wattle *Acacia mearnsii* and Maiden's Wattle *Acacia maidenii*. It is not a natural community, but grows on land that was previously cleared. It is often infested with thickets of Lantana.

Distribution in Shellharbour LGA: This community occurs throughout the Shellharbour LGA.

Area in Shellharbour LGA: 62.35 hectares

Proportion (%) of the Shellharbour LGA: 0.45%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 1.50%

Conservation Priority: LOW

Most regrowth wattle has a low conservation priority. However, in some cases the regrowth is a precursor to a more stable and long lived forest community. Wattle Forest occurring in corridors of bushland can improve the effectiveness of the corridor and assist in the regeneration of rainforest and eucalypt forest.

Reserved Areas in Shellharbour LGA: Wattle Forest does not occur in any of the reserves. The community is not natural, so it is not important to conserve it.

3.3 MIXED/MISCELLANEOUS FOREST

***Erythrina x sykesii** - *Pinus* spp.* - *Acacia* spp.**

MIS-FOR

Description: This community is composed of stands of trees in plantations, windbreaks and thickets. The trees are native, introduced or a mixture of both.

Distribution in Shellharbour LGA: Mixed/Miscellaneous Forest occurs throughout the area, mainly on the lowlands, surrounded by cleared land.

Area in Shellharbour LGA: 40.45 hectares

Proportion (%) of the Shellharbour LGA: 0.29%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 0.97%

Conservation Priority: LOW

It is not usually important to conserve this community for its ecological values, which are mostly negligible. Farm plantings and miscellaneous stands of introduced trees have a low priority for nature conservation. However, individual fig trees occurring in the stands are important for some native fauna species, such as the Grey-headed Flying-Fox and the rainforest pigeons.

Reserved Areas in Shellharbour LGA: Some reserves contain Mixed/Miscellaneous Forest; for example, Killalea State Park. The community is not natural, so it is usually not important to conserve it.

GROUP 4: FLOODPLAIN FORESTS

4.1 RIVER OAK TALL FOREST

Casuarina cunninghamiana

CAS-CUN

Description: This community usually contains large River Oaks *Casuarina cunninghamiana* and other native plants such as Spiny-headed Mat-rush *Lomandra longifolia*. Rainforest plants and Coral Trees *Erythrina x sykesii* are sometimes present too. Weeds are often prolific, forming a tangled mass along the banks of the streams.

Distribution in Shellharbour LGA: Remnants of River Oak Forest occur along Macquarie Rivulet and its main tributaries. It has been cleared in most places, the remaining stands forming a discontinuous band along the edge of the streams.

Area in Shellharbour LGA: 113.45 hectares

Proportion (%) of the Shellharbour LGA: 0.83%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 2.72%

Conservation Priority: HIGH

River Oak Tall Forest should have a high priority for conservation, because so much has been cleared. This community plays an important role in stabilising stream banks. It also facilitates the movement of fauna throughout the district.

Reserved Areas in Shellharbour LGA: A small stand of River Oak Tall Forest has been reserved in Macquarie Pass National Park.

4.2 SWAMP OAK FOREST

Casuarina glauca

CAS-GLA

Description: This community usually occurs as a dense stand of Swamp Oak *Casuarina glauca*, with few other trees. It occurs upslope from mangroves and saltmarsh, but downslope from Bangalay - Banksia Forest and Red Gum - Paperbark Forest (TER-MEL).

Distribution in Shellharbour LGA: Swamp Oak Forest occurs on low-lying land near brackish lagoons and estuaries, mainly around Lake Illawarra and along the Minnamurra River estuary. The largest stands are in the vicinity of the Minnamurra River. In some places, for example at Dunmore, the community extends onto the floodplains.

Area in Shellharbour LGA: 86.73 hectares

Proportion (%) of the Shellharbour LGA: 0.63%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 2.08%

Conservation Priority: MODERATELY HIGH

Swamp Oak Forest should have a moderately high priority for conservation. It is an integral part of the estuarine vegetation complex, together with saltmarsh and, in some places, mangrove communities. The estuarine complex is particularly important, because it is naturally uncommon north of the Shoalhaven River and it has been seriously depleted in the Shellharbour area. Where Swamp Oak Forest grows along streams and estuaries, it helps to stabilise the banks.

Reserved Areas in Shellharbour LGA: There are small areas of Swamp Oak Forest on Council land around Lake Illawarra.

GROUP 5: SHRUBLANDS

5.1 PAPERBARK TALL SHRUBLAND

Melaleuca armillaris

MEL-ARM

Description: This community is a dense, tall and dry shrubland dominated by the large shrub species, Bracelet Honey-myrtle *Melaleuca armillaris*. Other species in the shrubland include Giant Hop-bush *Dodonaea viscosa*, Mulga Fern *Cheilanthes sieberi* and Cockspur Flower *Plectranthus graveolens*.

Distribution in Shellharbour LGA: The shrubland occurs on very dry rocky ridges at Dunmore, on volcanic soil. There are also small patches near Killalea. Because the soils on which it grows are shallow and do not retain enough moisture, the shrubs die back during drought.

Area in Shellharbour LGA: 225.5 hectares

Proportion (%) of the Shellharbour LGA: 1.65%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 5.42%

Conservation Priority: VERY HIGH

Paperbark Tall Shrubland is a regionally significant ecological community. It should have a very high conservation priority, because it does not appear to occur elsewhere in southern New South Wales. The community grows on volcanic rock outcrops on dry rocky ridges, but such conditions are uncommon. Paperbark Tall Shrubland occurs on similar topography at Kiama, but this is the only other place it occurs in the Illawarra Region. The threatened species *Zieria granulata* is closely associated with this community.

Reserved Areas in Shellharbour LGA: Small stands of Paperbark Tall Shrubland occur in Killalea State Park.

5.2 COAST TEATREE SHRUBLAND

Leptospermum laevigatum* - *Banksia integrifolia

LEP-LAV

Description: The shrubland is dominated by Coast Teatree *Leptospermum laevigatum*. It contains other coastal species such as Tree Broom-heath *Monotoca elliptica*, Coast Banksia *Banksia integrifolia* and Coast Beard-heath *Leucopogon parvifolius*. Other common species include Spiny-headed Mat-rush *Lomandra longifolia*, Saloop *Einadia hastata* and Native Stork's-bill *Pelargonium australe*.

Distribution in Shellharbour LGA: This community occurs on sand dunes along the coast. The best examples are at Bass Point and on the Minnamurra Sand Spit.

Area in Shellharbour LGA: 53.18 hectares

Proportion (%) of the Shellharbour LGA: 0.39%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 1.28%

Conservation Priority: MODERATELY HIGH

Coast Teatree Shrubland should have a moderately high conservation priority, mainly because it is now so uncommon in the Shellharbour area. The shrubland is important for dune stabilisation.

Reserved Areas in Shellharbour LGA: Most of the Coast Teatree Shrubland in the Shellharbour LGA occurs in Bass Point Reserve and on the Minnamurra Sand Spit in Killalea State Park.

5.3 PAPERBARK SHRUBLAND

Melaleuca ericifolia

MEL-ERI

Description: This community is a dense shrubland dominated by Swamp Paperbark *Melaleuca ericifolia*. Other wetland species also occur in the community, such as Swamp Oak *Casuarina glauca*, Common Reed *Phragmites australis*, Tall Sedge *Carex appressa* and Narrow-leaved Paperbark *Melaleuca linariifolia*. Depending on salinity levels, some saltmarsh species may also be present.

Distribution in Shellharbour LGA: This community occurs in freshwater swamps near the coast. Only one small patch remains in the Shellharbour LGA, at Dunmore Wetland. All other areas have been cleared.

Area in Shellharbour LGA: 2.63 hectares

Proportion (%) of the Shellharbour LGA: 0.02%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 0.06%

Conservation Priority: HIGH

Paperbark Shrubland is a regionally significant ecological community. It should have a high priority for conservation, mainly because it is now rare in the Shellharbour area.

Reserved Areas in Shellharbour LGA: This community has been reserved at Dunmore Swamp Wetland. It has been zoned Environmental Protection (Wetlands) and is being purchased by Council for reservation.

5.4 COAST WATTLE SHRUBLAND

Acacia sophorae

ACA-SPH

Description: This shrubland community is usually dominated by Coast Wattle *Acacia sophorae*. It contains various other coastal dune species, such as Knobby Club-rush *Isolepis nodosa*, Coast Beard-heath *Leucopogon parvifolius*, Sea Bindweed *Calystegia soldanella*, Coast Teatree *Leptospermum laevigatum* and Coast Banksia *Banksia integrifolia*. Hairy Spinifex *Spinifex sericeus* occurs on the seaward side.

Distribution in Shellharbour LGA: This community occurs on coastal sand dunes, between the Coast Teatree Shrubland (LEP-LAV) and the beach. There are examples at Killalea Lagoon and on the Minnamurra Sand Spit.

Area in Shellharbour LGA: 14.88 hectares

Proportion (%) of the Shellharbour LGA: 0.11%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 0.36%

Conservation Priority: HIGH

Coast Wattle Shrubland is not a regionally significant ecological community, but it should have a high conservation priority because it helps to stabilise sand dunes.

Reserved Areas in Shellharbour LGA: Coast Wattle Shrubland occurs in Killalea State Park.

5.5 COAST ROSEMARY SHRUBLAND

Westringia fruticosa

WES-SHR

Description: The shrubland is low-growing; it is less than about a metre in height. The main species is Coast Rosemary *Westringia fruticosa*; a few other species are sometimes present, such as Coast Banksia *Banksia integrifolia* and Spiny-headed Mat-rush *Lomandra longifolia*.

Distribution in Shellharbour LGA: The shrubland occurs on exposed coastal cliff tops on the southern side of Killalea State Park.

Area in Shellharbour LGA: 1.36 hectares

Proportion (%) of the Shellharbour LGA: 0.01%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 0.03%

Conservation Priority: MODERATELY HIGH

The community is very restricted in its occurrence, being found only in small, scattered stands.

Reserved Areas in Shellharbour LGA: There are small patches in Killalea State Park.

5.6 LANTANA SHRUBLAND

***Lantana camara** - *Acacia* spp.**

LAN-SHR

Description: Lantana *Lantana camara*, which a rampant introduced shrub, forms dense thickets in areas that have been disturbed or previously cleared. There are large stands at Dunmore, where rainforest once occurred, and along the base of the escarpment. It also occurs on abandoned farmland along the escarpment and has invaded some areas of dry eucalypt forest. Black Wattle *Acacia mearnsii* is common in and around Lantana thickets. Rainforest plants often occur among the Lantana.

Distribution in Shellharbour LGA: This community occurs throughout the Shellharbour LGA but is most common on dry sites at low altitude, on high nutrient volcanic soils.

Area in Shellharbour LGA: 164.73 hectares

Proportion (%) of the Shellharbour LGA: 1.20%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 3.96%

Conservation Priority: LOW

The conservation priority for Lantana Shrubland is generally low, because it is not a natural community. However, older stands of Lantana sometimes contain significant plant species, including threatened species such as *Zieria granulata* and *Cynanchum elegans*. The thickets sometimes act as buffer vegetation for adjoining rainforest.

Reserved Areas in Shellharbour LGA: Lantana Shrubland occurs in several reserves. It is usually not important to conserve it.

GROUP 6: FRESH WETLANDS

6.1 CUMBUNGI REEDLAND

***Typha orientalis* - *Persicaria* spp.**

TYP-RDL

Description: Originally, Cumbungi Reedland probably occurred only as small isolated patches on freshwater wetlands. As it occurs in most places today, however, it is usually not a natural community. A dense growth of Cumbungi *Typha orientalis* is now typical, sometimes mixed with Common Reed *Phragmites australis* and other wetland plants, both native and introduced. The community often occurs in association with Phragmites Reedland (PHR-RDL).

Distribution in Shellharbour LGA: Cumbungi Reedland is common in drains and on low lying flats beside developed land, where increased runoff and nutrients provide unnatural, but excellent, conditions for the growth of dense stands of Cumbungi *Typha orientalis*. There are large stands at "Shadforth" near Barrack Swamp, at Albion Park and along the railway line near the Princes Highway at Dunmore.

Area in Shellharbour LGA: 6.71 hectares

Proportion (%) of the Shellharbour LGA: 0.05%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 0.16%

Conservation Priority: LOW TO HIGH

Some patches of Cumbungi Reedland in the Shellharbour LGA are regionally significant, but the priority for conserving the community is variable. In most places, it has a low priority for conservation. However, at least two threatened species inhabit Cumbungi Reedland, the Australasian Bittern and the Green and Golden Bell Frog. The larger stands therefore have a potentially high conservation value.

Reserved Areas in Shellharbour LGA: Cumbungi Reedland does not occur in any reserves. The community is not natural, so it is not important to conserve it.

6.2 FRESH JUNCUS RUSHLAND

***Juncus* spp. - *Carex appressa* - *Persicaria* spp.**

JUN-FRH

Description: The floristic composition of Juncus Rushland is a variable. Many wetland species are associated with this community, the most common being Common Rush *Juncus usitatus* and Tall Sedge *Carex appressa*. Water Primrose *Ludwigia peploides*, Knotweeds *Persicaria* spp. and Cumbungi *Typha orientalis* are also common. The community expands during wet periods and contracts during the dry.

Distribution in Shellharbour LGA: Juncus Rushland occurs in dams, along drainage channels and in broad wetlands on some floodplains, for example at Dunmore.

Area in Shellharbour LGA: 18.87 hectares

Proportion (%) of the Shellharbour LGA: 0.14%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 0.45%

Conservation Priority: MODERATELY HIGH

The priority for conserving Juncus Rushland is variable, ranging from low to moderately high. The larger areas are more important.

Reserved Areas in Shellharbour LGA: Juncus Rushland is not reserved in the Shellharbour LGA. One wetland, to the north of Albion Park, is protected under SEPP No.14 - Coastal Wetlands (wetland no.382).

6.3 SPIKE-RUSH SEDGELAND

Eleocharis sphacelata* - *Schoenoplectus validus

ELE-SDG

Description: Tall Spike-rush *Eleocharis sphacelata* is the most common reed species in this community, but other species are also usually present, particularly in shallow water and on the edge of the water. Other sedge species occasionally dominate.

Distribution in Shellharbour LGA: Spike-rush Sedgeland mainly occurs in small patches of water up to one or two metres deep, in freshwater dams, around lakes and on the edge of streams. Examples include Killalea Lagoon and the billabong at Albion Park Showground. There are also stands of this wetland community in many farm dams throughout the district.

Area in Shellharbour LGA: 1.58 hectares

Proportion (%) of the Shellharbour LGA: 0.01%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 0.04%

Conservation Priority: LOW TO HIGH

Some patches of Spike-rush Sedgeland in the Shellharbour LGA are regionally significant, but the priority for conserving the community is variable. In most places, it has a low priority for conservation. However, Spike-rush Sedgeland provides habitat for several waterbird species and other wetland fauna. The Green and Golden Bell Frog, a threatened species, occurs in this community at Killalea Lagoon.

Reserved Areas in Shellharbour LGA: Spike-rush Sedgeland occurs in Killalea State Park.

6.4 SANDSTONE SEDGELAND

**Sedges and rushes - *Viminaria juncea* - *Melaleuca thymifolia*
SST-SDG**

Description: Sandstone Sedgeland is a broad term used to describe the swamps occurring on a substrate of sandstone. The species composition varies considerably, but "swamp species" dominate, including several distinctive shrubs such as Golden Spray *Viminaria juncea* and Thyme Honey-myrtle *Melaleuca thymifolia*.

Distribution in Shellharbour LGA: There are extensive areas of Sandstone Sedgeland just outside the Shellharbour LGA, at Barren Grounds and in the water catchment areas to the northwest. There are small patches in the far northwestern corner of the LGA, on the plateau above the escarpment.

Area in Shellharbour LGA: not mapped

Proportion (%) of the Shellharbour LGA: -

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: -

Conservation Priority: MODERATELY HIGH

Sandstone Sedgeland is a regionally significant community that should have a moderately high conservation priority wherever it occurs. The community has several values; these include its floristic diversity, its role in protecting water quality, and its value as habitat for fauna.

Reserved Areas in Shellharbour LGA: Most areas of Sandstone Sedgeland in this district are in the water catchment areas, in Barren Grounds Nature Reserve and in Budderoo National Park, where they are totally protected.

6.5 TRIGLOCHIN AQUATIC HERBLAND
Triglochin procerum* - *Ludwigia peploides
TRI-HBL

Description: Triglochin Aquatic Herbland is a variable community that occurs along freshwater drainage lines and swamps, large and small, across the entire region. It is most common on broad floodplains. The community often develops in artificial wetlands, such as farm dams. Many wetland species are associated with the community, but Water Ribbons *Triglochin procerum* is the most characteristic. Permanent standing water is essential for the development of this community.

Distribution in Shellharbour LGA: This wetland community occurs in farm dams and drainage channels. It also occurs in large pools in rivers and in other freshwater wetlands. All of the patches in the Shellharbour LGA are small.

Area in Shellharbour LGA: not mapped

Proportion (%) of the Shellharbour LGA: -

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: -

Conservation Priority: LOW

This community has a low priority for conservation because it is widespread, common and ephemeral, expanding and contracting as water levels rise and fall. Although the community has a low conservation priority as a whole, natural occurrences along the Minnamurra River are part of the estuarine system and are worth preserving. Aquatic vegetation assists with channel stability, provides habitat for aquatic species, such as native fish, and forms an important part of the ecosystem of some streams. Most occurrences, however, are on farm dams and along drains; these are of little conservation significance.

Reserved Areas in Shellharbour LGA: Triglochin Aquatic Herbland occurs in most freshwater wetlands, so it is probably reserved in the reserves, for example at Killalea Lagoon.

GROUP 7: SALINE WETLANDS

7.1 MANGROVE FOREST

Avicennia marina

AVI-FOR

Description: This community is usually a mono-specific stand of the tree, Grey Mangrove *Avicennia marina*. Other species are occasionally present, mainly saltmarsh species and River Mangrove *Aegiceras corniculatum*. Usually, however, no other plants grow on the tidally inundated river flats on which this community occurs.

Distribution in Shellharbour LGA: This community occurs on the tidal parts of the Minnamurra River.

Area in Shellharbour LGA: 25.39 hectares

Proportion (%) of the Shellharbour LGA: 0.19%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 0.61%

Conservation Priority: HIGH

Mangrove Forest should have a high conservation priority. It is a regionally significant ecological community. Mangroves are an important part of estuarine ecosystems. They provide breeding grounds for fish and habitat for several rare bird species. The Black Bittern, a threatened species, inhabits mangroves. Mangroves also help to stabilise the channel.

Reserved Areas in Shellharbour LGA: The complex of communities in the Minnamurra wetlands is not reserved; most of the land is privately owned. However, the estuarine wetlands along the Minnamurra River are protected under SEPP No.14 - Coastal Wetlands (wetland no.372).

7.2 MANGROVE SHRUBLAND

Avicennia marina* - *Aegiceras corniculatum* - *Sarcocornia quinqueflora

AVI-SHR

Description: Mangrove Shrubland is dominated by the shrub River Mangrove *Aegiceras corniculatum* and the herb Beaded Glasswort *Sarcocornia quinqueflora*. Other species include Sea Rush *Juncus kraussii* and Salt Couch *Sporobolus virginicus*.

Distribution in Shellharbour LGA: Mangrove Shrubland usually occurs inland and/or upstream from Mangrove Forest, where tidal inundation is less frequent, allowing other species to grow. Mangrove Shrubland usually occurs with Saltmarsh (SAR-SUA).

Area in Shellharbour LGA: 18.66 hectares

Proportion (%) of the Shellharbour LGA: 0.14%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 0.45%

Conservation Priority: HIGH

Mangrove Shrubland is a regionally significant ecological community. It should have a priority for conservation, because it is an important part of the estuarine ecosystem. It provides breeding areas for fish, stabilises the channel and provides habitat for several rare bird species. The Black Bittern, a threatened species, inhabits mangroves.

Reserved Areas in Shellharbour LGA: The complex of communities in the Minnamurra wetlands is not reserved; most of the land is privately owned. However, the estuarine wetlands along the Minnamurra River are protected under SEPP No. 14 - Coastal Wetlands (wetland no.372).

7.3 PHRAGMITES REEDLAND

Phragmites australis

PHR-RDL

Description: Phragmites Reedland usually occurs in a mosaic with associated communities such as Swamp Oak Forest (CAS-GLA), Saltwater Juncus Rushland (JUN-SAL) and/or Paperbark Shrubland (MEL-ERI). The dominant species is Common Reed *Phragmites australis*, but many other wetland species are also present.

Distribution in Shellharbour LGA: Phragmites Reedland usually occurs in the upper reaches of estuaries, where there is a freshwater influence. It also occurs in freshwater wetlands, for example at Albion Park and Dunmore. The community sometimes grows in freshwater with Cumbungi Reedland (TYP-RDL).

Area in Shellharbour LGA: 9.27 hectares

Proportion (%) of the Shellharbour LGA: 0.07%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 0.22%

Conservation Priority: LOW TO MODERATELY HIGH

Some patches of Phragmites Reedland in the Shellharbour LGA are regionally significant, but the priority for conserving the community is variable; in most places, it has a low priority. However, Phragmites Reedland provides habitat for at least one threatened species, the Australasian Bittern, so the larger stands, in particular, are potentially significant.

Reserved Areas in Shellharbour LGA: This community is not reserved in the Shellharbour LGA.

7.4 SALTMARSH

***Sarcocornia quinqueflora* - *Suaeda australis* - *Sporobolus virginicus* - *Juncus kraussii*
SAR-SUA**

Description: The Saltmarsh in the Shellharbour LGA is very variable. It is a complex of communities encompassing low growing shrubland, herbland and grassland vegetation growing on tidally inundated flats. The most common species is Beaded Glasswort *Sarcocornia quinqueflora*, which often dominates broad areas of the lower saltmarsh. The upper saltmarsh is usually dominated by *Juncus kraussii* (Saltwater Juncus Rushland JUN-SAL). The saltmarsh species in the community include Austral Seablite *Suaeda australis*, Salt Couch *Sporobolus virginicus* and Streaked Arrowgrass *Triglochin striatum*.

Distribution in Shellharbour LGA: Broad areas of this community occur along the Minnamurra River estuary, in the far southeastern corner of the Shellharbour LGA. There is also some saltmarsh on the foreshores of Lake Illawarra.

Area in Shellharbour LGA: 25.23 hectares

Proportion (%) of the Shellharbour LGA: 0.19%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 0.61%

Conservation Priority: HIGH

Saltmarsh is a regionally significant ecological community. It should have a high priority for conservation, because it is an important part of the estuarine ecosystem. It provides areas for fish to breed, stabilises the channel and provides habitat for several rare bird species. Several threatened wading bird species occur in saltmarsh.

Reserved Areas in Shellharbour LGA: The complex of communities in the Minnamurra wetlands is not reserved; most of the land is privately owned. However, the estuarine wetlands along the Minnamurra River are protected under SEPP No.14 - Coastal Wetlands (wetland no.372). Small areas of saltmarsh occur on Council land along the foreshore of Lake Illawarra, and on Bevans Island.

7.5 SALTWATER JUNCUS RUSHLAND

Juncus kraussii* - *Suaeda australis* - *Samolus repens

JUN-SAL

Description: Saltwater Juncus Rushland occurs along the edge of tidally inundated estuaries and lakes, as well as around lakes and lagoons that are seldom open to the sea. It sometimes extends across floodplains. The community is characterised by dense stands of Sea Rush *Juncus kraussii* and a few other saltmarsh species. This community usually occurs above Saltmarsh (SAR-SUA) and below Swamp Oak Forest (CAS-GLA).

Distribution in Shellharbour LGA: Shellharbour Swamp is covered by Saltwater Juncus Rushland. There are large areas of this community along the estuary of the Minnamurra River, in the far southeastern corner of the Shellharbour LGA. It also occurs along the foreshores of Lake Illawarra.

Area in Shellharbour LGA: 14.07 hectares

Proportion (%) of the Shellharbour LGA: 0.10%

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 0.34%

Conservation Priority: LOW TO MODERATELY HIGH

The priority for conserving Saltwater Juncus Rushland varies from low to moderately high. The community is usually not well utilised by vertebrate fauna; it is so dense that animals find it difficult to penetrate. However, like saltmarsh, it is an integral part of the estuarine ecosystem.

Reserved Areas in Shellharbour LGA: The complex of communities in the Minnamurra wetlands is not reserved; most of the land is privately owned. However, the estuarine wetlands along the Minnamurra River are protected under SEPP No.14 - Coastal Wetlands (wetland no.372). Small areas of rushland occur on Council land along the foreshore of Lake Illawarra, and on Bevans Island.

7.6 SEAGRASS

***Zostera* sp. - *Ruppia* sp.**

ZOS-RUP

Description: This community is an aquatic community growing in saltwater to brackish water. The species present vary depending upon the estuary in question, water salinity and other factors. The main species locally are Eelgrass *Zostera* sp. and Sea Tassel *Ruppia* sp.

Distribution in Shellharbour LGA: Seagrass occurs mainly in Lake Illawarra. There are small areas in the other local estuaries, such as the Minnamurra River and Little Lake.

Area in Shellharbour LGA: not mapped

Proportion (%) of the Shellharbour LGA: -

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: -

Conservation Priority: VERY HIGH

The seagrass is important for the good health of estuarine systems, particularly for fish and some invertebrate communities.

Reserved Areas in Shellharbour LGA: This community is not reserved, because conservation reserves are seldom made below high water mark. The Lake Illawarra Authority is managing the seagrass in the lake for its conservation.

GROUP 8: GRASSLANDS

8.1 SPINIFEX GRASSLAND

Spinifex sericeus* - *Carex pumila* - *Isolepis nodosa

SPN-GRL

Description: Spinifex Grassland is always the closest vegetation to the ocean and is often destroyed during heavy seas. The associated species, most of which are restricted to this community, include Dune Thistle *Actites megalocarpa*, Strand Sedge *Carex pumila* and Knobby Club-rush *Isolepis nodosa*. The introduced Sea Rockets *Cakile* spp. and Pennywort *Hydrocotyle bonariensis* are also common in the community.

Distribution in Shellharbour LGA: Spinifex Grassland occurs behind most of the local beaches. Most areas are on "rehabilitated dunes" so are semi-natural communities. The most extensive examples are at the Minnamurra Sand Spit and in Killalea State Park.

Area in Shellharbour LGA: not mapped

Proportion (%) of the Shellharbour LGA: -

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: -

Conservation Priority: MODERATE

The community has little habitat value, but is important in stabilising frontal dune systems.

Reserved Areas in Shellharbour LGA: This community is reserved in Killalea State Park.

8.2 KANGAROO GRASS GRASSLAND

Themeda australis

THM-GRL

Description: This native grassland is dominated by Kangaroo Grass *Themeda australis*, with various other grassland speices. These species include Tall Bluebell *Wahlenbergia stricta*, Wandering Sailor *Commelina cyanea*, Kidney-weed *Dichondra repens*, Native Sarsaparilla *Hardenbergia violacea* and Spiny-headed Mat-rush *Lomandra longifolia*.

Distribution in Shellharbour LGA: Kangaroo Grass Grassland occurs on exposed coastal headlands in unimproved rough grazing paddocks in inland locations. Examples can be seen on Windang Island, in Blackbutt Forest Reserve and on the plateau at Regal Heights, Albion Park.

Area in Shellharbour LGA: 1.88 hectares

Proportion (%) of the Shellharbour LGA: 0.01 %

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: 0.05 %

Conservation Priority: HIGH

The occurrence of this community are rather rare in the region so all areas are of botanical interest. The threatened species Spike Rice-flower *Pimelea spicata* occurs in this community in some locations.

Reserved Areas in Shellharbour LGA: This community occurs on the top of Windang Island, which is managed by Council as a conservation area, and in Council's Blackbutt Forest Reserve.

8.3 NON-NATIVE GRASSLAND

***Pennisetum clandestinum* - *Stenotaphrum secundatum* - *Axonopus affinis*
INT-GRL**

Description: This community is dominated by introduced grasses and other herbs; many of the species were introduced as pasture species. Many species are present, but the most common grasses are Kikuyu Grass *Pennisetum clandestinum*, Buffalo Grass *Stenotaphrum secundatum* and Carpet Grass *Axonopus affinis*.

Distribution in Shellharbour LGA: Non-native Grassland occurs where the natural vegetation has been removed, and where grazing or other agricultural activities have prevented the native vegetation from regenerating.

Area in Shellharbour LGA: not mapped

Proportion (%) of the Shellharbour LGA: -

Proportion (%) of the Mapped Vegetation in the Shellharbour LGA: -

Conservation Priority: Not relevant.

Reserved Areas in Shellharbour LGA: Not relevant.

4. CONSERVATION IMPORTANCE OF THE VEGETATION

The natural vegetation in the City of Shellharbour is composed of a unique range of communities that do not occur elsewhere. The uniqueness of the vegetation is a result of several important environmental parameters, such as a relatively high rainfall in the western part of the LGA, a distinct rain shadow to the east, the presence of volcanic soils and a broad altitudinal range. In order to maintain biological diversity in the Shellharbour LGA, it is important to conserve representative samples of all vegetation communities, as well as the pattern of their distribution and inter-relationships.

The natural vegetation in the City of Shellharbour is composed of forty (40) vegetation communities. The total area of natural vegetation is ? hectares, or ?% of the LGA. The remaining vegetation is biased towards the escarpment; much more vegetation has been cleared from the lowlands, to the east.

Conservation Reserves

Several reserves in the Shellharbour LGA have strong nature conservation objectives. These reserves are either managed by Shellharbour City Council, the Department of Land and Water Conservation or the National Parks and Wildlife Service:

Reserves Managed by the National Parks and Wildlife Service
Macquarie Pass National Park

Reserves Managed by the Department of Land and Water Conservation
Killalea State Park

Reserves Managed by Shellharbour City Council
Bass Point Reserve
Blackbutt Forest Reserve
Croome Road Reserve
Windang Island Reserve
Dunmore Wetland
Lake Illawarra Entrance Islands
Lake Illawarra foreshores (partly managed by the Lake Illawarra Authority)

Endangered Ecological Communities

Endangered ecological communities in New South Wales are listed in Part 3 of Schedule 1 of the *Threatened Species Conservation Act 1995*. The placement of these communities on Schedule 1 is determined by the NSW Scientific Committee, as established by the Act.

The only endangered ecological community found in the Shellharbour LGA is the community described as the Illawarra Lowlands Grassy Woodland. The NSW Scientific Committee's Final Determination to list this community is provided in Appendix 1. The vegetation communities described in this report that are encompassed by the Illawarra Lowlands Grassy Woodland are:

- Red Gum – White Box Forest
- Red Gum – Blue Gum Forest
- Red Gum – Stringybark Forest
- Red Gum – Paperbark Forest

Although not yet listed in the Act, the following communities are under investigation for possible future listing (NPWS, Hurstville, pers. comm., March, 2000):

- Complex Subtropical Rainforest
- Paperbark Tall Shrubland (*Melaleuca armillaris*)

State Environmental Planning Policy No.26 – Littoral Rainforests

State Environmental Planning Policy No. 26 – Littoral Rainforests identifies and makes provision for the protection of littoral (coastal) rainforest in New South Wales. A copy of SEPP No. 26 is provided in Appendix 2.

One patch of littoral rainforest is identified in the Shellharbour LGA. This is at Bass Point and is identified as stand number 173A. This area is totally within the Bass Point Reserve. The stand on the Minnamurra Sand Spit is not identified under the Policy. In this study, this rainforest type is identified as the Complex Littoral Rainforest (COM-LRF) community.

State Environmental Planning Policy No.14 – Coastal Wetlands

State Environmental Planning Policy No.14 – Coastal Wetlands identifies and makes provision for the protection of coastal wetlands in New South Wales. A copy of SEPP No.14 is provided in Appendix 3.

Wetlands on Lake Illawarra, the Minnamurra River and elsewhere are identified in the Policy. All wetlands in the Policy in Shellharbour are listed in Table 2. More detail on the wetlands in the City are provided in the reports by KMA (1996) and Chaffer (1997).

Table 2
SEPP No. 14 Wetlands in the City of Shellharbour

No.	Name	Approx. Area	Type	Owner(s)
372	Minnamurra	162 ha	Estuarine	Shellharbour Council/ Kiama Council/Freehold
374a	Minnamurra River	48.5 ha	Estuarine	State Land
374b	Dunmore Swamp	8 ha	Freshwater (ephemeral)	Shellharbour Council
375	Killalea Lagoon	19 ha	Freshwater (permanent)	Killalea State Park
376	Shellharbour Swamp	4.3 ha	Estuarine	Shellharbour Council
377	Lake Illawarra Entrance	3 ha	Estuarine	Shellharbour Council
378	Werrang Island/ Berageree Island	2 ha	Estuarine	State Land
379	Picnic Island	3 ha	Estuarine	State Land
380	Bevans Island	30.8 ha	Estuarine	State Land
381a	Koona Bay	50.8 ha	Estuarine	Shellharbour Council/ Wollongong Council/Private
382	Albion Park Showground	3.5 ha	Freshwater (permanent)	Shellharbour Council

Fisheries Management Act 1994

Under the *Fisheries Management Act 1994*, a permit is required to cut, remove, damage or destroy mangroves, seagrasses and other prescribed marine vegetation. This applies to the saline wetland communities described in this report.

5. REFERENCES

Chafer, C. J. (1997). Biodiversity of Wetlands in the Illawarra Catchments: an Inventory. Illawarra Catchment Management Committee, Wollongong, November.

Kevin Mills & Associates Pty Limited (1996). Wetlands in the City of Shellharbour, New South Wales. Prepared for Shellharbour City Council, January.

Kevin Mills & Associates Pty Limited (1997). Lake Illawarra Foreshore Habitats. Assessment and Enhancement Opportunities. Prepared for the Lake Illawarra Authority, Wollongong, February.

Kevin Mills & Associates Pty Limited (1997). Plan of Management. Dunmore Wetland Catchment. City of Shellharbour. Prepared for Shellharbour City Council, August.

Kevin Mills & Associates Pty Limited (1998). Ecological Study, Shell Cove Structure Plan, City of Shellharbour. Prepared for Walker Corporation, October.

Kevin Mills & Associates (2000). Nature Conservation Study, Rural Lands Study Area, City of Shellharbour. Prepared for Shellharbour City Council, Shellharbour, January.

Mills, K. (1988). The Clearing of the Illawarra Rainforests: Problems in Reconstructing Pre-European Vegetation Patterns. *Aust. Geog.* 19(2): 230-240.

Mills, K. (1988). Conservation of Rare Rainforest Plant Species in the Illawarra Region of New South Wales. Inventory, Assessment and Recommendations for Management. A report to the National Parks and Wildlife Service of New South Wales.

Mills, K. (1998). Vegetation Survey Methods and Natural Vegetation Types in the Coastal Parts of the Shoalhaven Region of New South Wales. *Illawarra Vegetation Studies* (7), Coachwood Publishing, Jamberoo, NSW, revised 1998.

Mills, K. & Jakeman, J. (1995). *Rainforests of the Illawarra District*. Coachwood Publishing, 143p.

New South Wales (1985). *State Environmental Planning Policy No.14. - Coastal Wetlands*. Government Printer, Sydney.

New South Wales (1995). *Threatened Species Conservation Act 1995*. NSW Government Printer, Sydney.

New South Wales (198). *State Environmental Planning Policy No.26 - Littoral Rainforests*. Government Printer, Sydney.

APPENDIX 1

FINAL DETERMINATION: ILLAWARRA LOWLANDS GRASSY WOODLAND

NSW SCIENTIFIC COMMITTEE

Final Determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list the Illawarra Lowlands Grassy Woodland 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. The Illawarra Lowlands Grassy Woodland is the name given to the plant community from the local government areas of Wollongong City, Shellharbour City, and Kiama Municipality (within the Sydney Basin Bioregion) that is characterised by the following assemblage of species:

<i>Acacia falcata</i>	<i>Dianella revoluta</i>	<i>Hypoxis hygrometrica</i>
<i>Acacia implexa</i>	<i>Dichondra repens</i>	<i>Jacksonia scoparia</i>
<i>Acacia maidenii</i>	<i>Dodonaea viscosa</i> var	<i>Kennedia rubicunda</i>
<i>Acacia mearnsii</i>	<i>angustifolia</i>	<i>Lepidosperma laterale</i>
<i>Acacia stricta</i>	<i>Echinopogon caespitosus</i>	<i>Leucopogon juniperinum</i>
<i>Allocasuarina littoralis</i>	<i>Echinopogon ovatus</i>	<i>Lomandra filiformis</i>
<i>Angophora floribunda</i>	<i>Entolasia stricta</i>	<i>Lomandra multiflora</i>
<i>Aristida ramosa</i>	<i>Eragrostis</i> sp.	<i>Melaleuca decora</i>
<i>Aristida vagans</i>	<i>Eucalyptus amplifolia</i>	<i>Melaleuca styphelioides</i>
<i>Athropodium milleflorum</i>	<i>Eucalyptus bosistoana</i>	<i>Microlaena stipoides</i>
<i>Boronia polygalifolia</i>	<i>Eucalyptus botryoides</i>	<i>Oplismenus aemulus</i>
<i>Bothriochloa macra</i>	<i>Eucalyptus botryoides/saligna</i>	<i>Oplismenus imbecillis</i>
<i>Brachychiton populneus</i>	<i>Eucalyptus eugenioides</i>	<i>Panicum</i> sp.
<i>Brunoniella pumilio</i>	<i>Eucalyptus longifolia</i>	<i>Parsonsia straminea</i>
<i>Bursaria spinosa</i>	<i>Eucalyptus pilularis</i>	<i>Plectranthus parviflorus</i>
<i>Callistemon salignus</i>	<i>Eucalyptus tereticornis</i>	<i>Poa labillardieri</i>
<i>Carex longebrachiata</i>	<i>Gahnia radula</i>	<i>Pratia purpurascens</i>
<i>Cheilanthes sieberi</i>	<i>Geitonoplesium cymosum</i>	<i>Pultenaea retusa</i>
<i>Citriobatus pauciflorus</i>	<i>Geranium solanderi</i>	<i>Pultenaea villosa</i>
<i>Commelina cyanea</i>	<i>Glycine</i> sp.	<i>Rubus parvifolius</i>
<i>Cymbopogon refractus</i>	<i>Goodenia hederacea</i>	<i>Stellaria flaccida</i>
<i>Daviesia genistifolia</i>	subsp. <i>hederacea</i>	<i>Themeda australis</i>
<i>Daviesia ulicifolia</i>	<i>Hardenbergia violacea</i>	<i>Tricoryne elatior</i>
<i>Desmodium rhytidophyllum</i>	<i>Hibbertia aspera</i>	<i>Veronica calycina</i>
<i>Desmodium varians</i>	<i>Hypericum gramineum</i>	<i>Wahlenbergia</i> sp.

2. The total species list of the community is considerably larger than that given in 1 (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 1 may be present. At any one time, 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 and by its recent disturbance history. The number of

species and the above-ground composition of species will change with time since fire, and may also change in response to changes in fire frequency.

3. Illawarra Lowlands Grassy Woodland has been recorded from the local government areas of Wollongong City, Shellharbour City and Kiama Municipality (within the Sydney Basin Bioregion).
4. Illawarra Lowlands Grassy Woodland includes the Yallah Woodland and Mills' (1997) communities of the Floodplains, communities of the Ridges and Slopes (Dry communities) and communities of the lower escarpment (Moist communities), but does not include Floodplain Communities dominated by *Casuarina* species or rainforest on latite soils.
5. Characteristic tree species in the Illawarra Lowlands Grassy Woodland are *Eucalyptus tereticornis*, *Eucalyptus eugenioides*, *Eucalyptus longifolia*, *Eucalyptus bosistoana* and *Melaleuca decora*.
6. Illawarra Lowlands Grassy Woodland occurs on relatively gently sloping to undulating lands less than about 200m elevation on Berry Siltstone, Budgong Sandstone and Quaternary alluvium.
7. Illawarra Lowlands Grassy Woodland provides habitat for the endangered orchid *Pterostylis gibbosa*.
8. No areas of Illawarra Lowlands Grassy Woodland are presently included in formal conservation reserves though some occur in small council reserves including Blackbutt Reserve and Croome Road Reserve in Shellharbour.
9. Large areas of Illawarra Lowlands Grassy Woodland have been cleared. Most remnants are small and fragmented and their long term viability is threatened. Some remnants consist of regrowth after clearing or other disturbances. Identified threats include further clearing, grazing, weed invasion, selective logging, rubbish dumping, housing and hobby farm developments and physical damage from recreational activities.
10. In view of the small size of existing remnants, the threat of further clearing and other threatening processes, the Scientific Committee is of the opinion that Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion is likely to become extinct in nature unless factors threatening its survival or evolutionary development cease to operate and that listing as an endangered ecological community is warranted.

Dr Chris Dickman
Chairperson
Scientific Committee

Gazetted: 24/12/99
Exhibition period: 24/12/99 – 4/2/00

Reference: Kevin Mills & Associates (1997) *Ecological Study Figtree Estate and Forest Red Gum Communities of the Illawarra Coastal Plain*. (prepared for Stockland Trust Group Ltd Sydney).

APPENDIX 2

SEPP NO.26 – LITTORAL RAINFORESTS

Citation

1. This State Environmental Planning Policy may be cited as "State Environmental Planning Policy No. 26 – Littoral Rainforests".

Aims, objectives, etc.

2. The aim of this Policy is to provide a mechanism for the consideration of applications for development that is likely to damage or destroy littoral rainforest areas with a view to the preservation of those areas in their natural state.

Interpretation

3. (1) In this Policy –

"damage", in relation to flora, includes lopping, topping and felling;

"flora" includes trees, shrubs and vegetation;

"residential land" means land which is within a zone designated "Residential", "Village" or "Township" on the day on which this Policy takes effect in any environmental planning instrument;

"the Act" means the Environmental Planning and Assessment Act 1979.

(2) Rocks, rock formations and earth are elements of the landscape for the purposes of this Policy.

Application of Policy

4. (1) This Policy applies to-

(a) land enclosed by the outer edge of the heavy black line on the series of maps held in the Department and marked "State Environmental Planning Policy No. 26 – Littoral Rainforests"; and

(b) land not so enclosed but within a distance of 100 metres from the outer edge of that heavy black line except residential land and land to which State Environmental Planning Policy No. 14 – Coastal Wetlands applies.

(2) This Policy does not apply to land dedicated or reserved under the National Parks and Wildlife Act 1974 as an Aboriginal area, historic site, national park, nature reserve, state game reserve or state recreation area or land dedicated or set apart under section 25A of the Forestry Act 1916 as a flora reserve.

Relationship between instruments

5. In the event of an inconsistency between this Policy and a regional environmental plan or a local environmental plan whether made before, on or after the day on which this Policy takes effect, this Policy shall prevail to the extent of the inconsistency.

Designated development

6. An act which requires the consent of the Council by virtue of clause 7(1) is designated development for the purposes of the Act.

Development – consent and concurrence

- 7.(1) A person shall not, without the consent of the Council, on land described in clause 4(1)(a), erect a building, carry out work, use land for any purpose, or subdivide it, disturb, change or alter any landform or disturb, remove, damage or destroy and native flora or other element of the landscape or dispose of or dump any liquid, gaseous or solid matter.

(2) A person shall not, without the consent of the Council, on land described in clause 4(1)(b), erect a building, disturb or change or alter any landform or disturb, remove, damage or destroy and native flora, or dispose of or dump any liquid, gaseous or solid matter.

(3) Subject to subclause (4), the Council shall not determine an application under subclause (1) or (2) by granting consent under the Act except with the concurrence of the Director.

(4) The Council shall not determine an application described in section 91A of the Act by granting consent under the Act except with the concurrence of the Minister.

(5) Nothing in subclause (1) or (2) requires the consent of the Council to be obtained for –
(a) any act which is carried out in the ordinary course of residential occupation of the land concerned;

(b) eradication of native flora declared noxious by proclamation under section 467 of the Local Government Act 1919, by means not significantly detrimental to the native ecosystem;

(c) unavoidable destruction or removal during eradication of native flora adjacent to any flora declared noxious by such a proclamation; or

(d) removal of leaf litter, shed bark or cured grasses for the purpose of reducing the risk of bushfire.

(6) The Council shall not consent to an application made under subclause (1) or (2) unless it is satisfied, if the application is to erect a building, carry out a work, use land for any purpose or dispose of or dump any liquid, gaseous or solid matter, that there is no place outside the area to which this Policy applies on which the development might suitably be located or occur.

Matters for consideration – concurrence

7. (1) The Minister and Director shall, for the purpose of deciding whether concurrence should be granted, consider-

(a) any representation made by or on behalf of the Director of National Parks and Wildlife about the likely impact of the proposal on the environment;

(b) the objectives and major goals of A National Conservation Strategy for Australia published by the Australian Government Publishing Service, Canberra. In 1984; and

(c) if the carrying out of the proposal and the use (if any) thereafter of the land concerned for the purpose for which it will be used may cause destruction or disturbance of the natural environment, the public interest (if any) in the carrying out of the proposal in relation to the public interest in the preservation of littoral rainforest in its natural state.

(2) A proposal may be in the public interest for the purposes of subclause (1) notwithstanding that it benefits persons (by means including financial or other advantage) who are not public authorities or benefits those persons exclusively.

Forwarding of copies of applications to Director of National Parks and Wildlife

8. If a Council receives an application under clause 7(1) or (2) of this Policy the Council shall within 7 days of its receipt of the application forward a copy of it to the Director of National Parks and Wildlife.

Amendment of other State Environmental Planning Policies

9. (1) State Environmental Planning Policy No. 4 – Development Without Consent, is amended by inserting in clause 4(1) after the word “State” the words “but does not apply to land to which State Environmental Planning Policy No. 26 – Littoral Rainforests applies”.

(2) State Environmental Planning Policy No. 8 – Surplus Public Land is amended by inserting at the end of Schedule 1 the following words:

6. Land to which State Environmental Planning Policy No. 26 – Littoral Rainforests applies.

(3) State Environmental Planning Policy No. 9 – Group Homes is amended by inserting in clause 4 after the word “State” the words “but does not apply to land to which State Environmental Planning Policy No. 26 – Littoral Rainforests applies”.

(4) State Environmental Planning Policy No. 14 – Coastal Wetlands, is amended by inserting after clause 4(3) the following subclause:

(4) This Policy does not apply to land to which State Environmental Planning Policy No. 26 – Littoral Rainforests applies.

(5) State Environmental Planning Policy No. 21 – Movable Dwellings is amended by inserting after clause 7(4) the following clause:

(5) Subclause (1) does not apply to land to which State Environmental Planning Policy No. 26 – Littoral Rainforests applies.

APPENDIX 3

SEPP NO.14 – COASTAL WETLANDS

Citation

1. This State Environmental Planning Policy may be cited as "State Environmental Planning Policy No. 14 – Coastal Wetlands".

Aims, objectives etc.

2. The aim of this policy is to ensure that the coastal wetlands are preserved and protected in the environmental and economic interests of the State.

Interpretation

3. In this policy, except in so far as the context or subject-matter otherwise indicates or requires-

"the Act" means the Environmental Planning and Assessment Act 1979;

"the map" means the series of maps marked "State Environmental Planning Policy No. 14 – Coastal Wetlands" deposited in the office of the Department.

Application of policy

4. (1) Subject to subclause (2), this policy applies to the land outlined by heavy black edging on the map.

(2) This policy does not apply to land dedicated or reserved under the National Parks and Wildlife Act 1974 as an Aboriginal area, historic site, national park, nature reserve, state game reserve or state recreation area.

Inconsistency between instruments

5. Subject to section 74(1) of the Act, in the event of an inconsistency between this policy and another environmental planning instrument, whether made before, on, or after the date on which this policy is made, this policy shall prevail to the extent of the inconsistency.

Consent Authority

6. The council of the local government area in which development described in clause 7(1)(a), (b), (c) or (d) is proposed to be carried out shall be the consent authority having the function to determine a development application relating to that development.

Restriction on development of certain land

7. (1) In respect of land to which this policy applies, a person shall not –

- (a) clear that land;
- (b) construct a levee on that land;
- (c) drain that land; or
- (d) fill that land,

except with the consent of the council and the concurrence of the Director.

(2) In considering whether to grant concurrence under subclause (1), the Director shall take into consideration –

(a) the environmental effects of the proposed development, including the effect of the proposed development on –

- (i) the growth of native plant communities;
- (ii) the survival of native wildlife populations;
- (iii) the provision and quality of habitats for both indigenous and migratory species;
- (iv) the surface and groundwater characteristics of the site on which the development is proposed to be carried out and of the surrounding area, including salinity and water quality;

- (b) whether adequate safeguards and rehabilitation measures have been, or will be, made to protect the environment;
- (c) whether carrying out the development would be consistent with the aim of this policy;
- (d) the objectives and major goals of the "National Conservation Strategy for Australia" (as set forth in the second edition of a paper prepared by the Commonwealth Department of Home Affairs and Environment for comment at the National Conference on Conservation held in June, 1983, and published in 1984 by the Australian Government Publishing Service) in so far as they relate to wetlands and the conservation of "living resources" generally, copies of which are deposited in the office of the Department;
- (e) whether consideration has been given to establish whether any feasible alternatives exist to the carrying out of the proposed development (either on other land or by other methods) and if so, the reasons given for choosing the proposed development; and
- (f) any representations made by the Director of National Parks and Wildlife in relation to the development application.

(3) Pursuant to section 29 of the Act, development for which consent is required by subclause (1) is declared to be designated development for the purposes of the Act.

Copy of application to be sent to Director of National Parks and Wildlife

8. Where a council receives an application for consent to carry out development referred to in clause 7(1), the council shall, within 7 days of its receipt of that application, forward a copy of the application to the Director of National Parks and Wildlife.

Amendment of State Environmental Planning Policy No. 4 – Development Without Consent

9. State Environmental Planning Policy No. 4 – Development Without Consent is amended by inserting in clause 10(1) after the matter "clause 9" the words "or to land to which State Environmental Planning Policy No. 14 – Coastal Wetlands applies".