SUMMARY OF THE VEGETATION MAP REVISION FOR WYONG LGA 2008

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BACKGROUND

Wyong Shire Council's existing vegetation map (Bell 2002) was produced using fine scale air photo interpretation (API) east of the F3 freeway but the vegetation west of the freeway was produced via a modelling approach (Bell 2002). Recent survey based approaches (Bell & Driscoll 2006) have demonstrated that important vegetation types exist in the west of the Shire that remain unmapped by Bell (2002). These exist to the extent that any shire-wide conservation assessment will be fundamentally biased if these vegetation types remain unrecognised. Secondly, the existing map in the east of the shire is based on air photos that are more than a decade old. A revision of the Bell 2002 map has therefore been undertaken to improve the overall accuracy of the existing map.

OBJECTIVES

The objectives of the project are:

1. Map the area west of the F3 freeway in Wyong LGA using fine scale API

2. Update and improve the accuracy of the existing map line work in the eastern portion of the Wyong LGA.

3. Assess the likelihood that unmapped vegetation units exist in the west Wyong LGA area and preliminarily map any mappable new units.

4. Recommend further directions and approaches for map improvement.

METHODOLOGY

The revision of the map has been undertaken by (1) including and extending the mapping approach of Bell and Driscoll (2006) to all lands west of the F3 within the Wyong LGA; (2) updating the existing line work for mapped polygons east of the freeway; and (3) analysing potential vegetation types identified by Bell and Driscoll (2006) and map any new vegetation types (within the limits of existing data).

1. Extending the mapping of Bell and Driscoll (2006)

East Coast Flora Surveys were engaged to map the western portion of Wyong LGA using the approach of Bell and Driscoll (2006). The methodology and results of this mapping are reported in Appendix 1. Briefly this mapping produced a fine scale mapping of the vegetation across the study area. However, because vegetation types exist in the study area that are not mapped for the LGA by Bell (2002), the vegetation was reported as variants of regional map units (NPWS 2000). The report does not determine if these variants constitute legitimate vegetation types (see 3. below).

2. Updating the existing line work

The existing line work (polygon edges) east of the F3 freeway was undated by Council GIS staff in consultation with East Coast Flora Surveys. This was done using 2006 aerial photography flown December 2006 (scale 1:8000; resolution 0.1 m - Copyright 2009 SKM Ausimage). This was undertaken to update the areal extent of the vegetation in this area (which was previously mapped using 1994 aerial photography – see Bell 2002) and hence capture changes in vegetation extent and to provide a similar level of line work accuracy to that of the new polygons delineated west of the F3 freeway.

3. Vegetation classification

Bell (2006) indicates that vegetation types previously unmapped in the LGA by Bell (2002) occur in the western portion of the LGA. Therefore a revision of the vegetation classification was required. This revision was undertaken as follows:

(1) Data set. Vegetation plot data for the study area and adjacent LGAs was complied for use in this study (see Table 1). The data was compiled with the aim being to include all systematic vegetation survey data that was publically available to early 2008. This data was referenced against other data sets recently (e.g. HCCREMS 2008) to ensure that no major emission in survey data sets were evident.

(2) Data filtering / selection.

Data filtering. The acquired data was filtered via GIS to exclude plot data outside of the Wyong LGA.

Data selection. The vegetation analyses required that the data set meets minimum standards of consistency for plot size and plot type, species recording and scoring (e.g. density or cover abundance) and the data recorded (e.g. number of species; generally consistency with records from the region and LGA). Thus, the filtered data set was reviewed and plot data was selected that –

A. Consisted of full floristic data

B. Consisted of a plot size of 0.04 ha

C. Consisted of cover abundance data (or had been converted to cover abundance data)

D. Had been assesses as "high quality data" by Bell (2002) or assessed by HCCREMS (2008a) and subsequently judged as data to be used by HCCREMS (2008b) or data that had been recently collected (Tierney unpublished data) to be consistent with criteria A,B,C.

The plot data selected from the above procedure included some plots from sites which were known to be from areas of disturbed vegetation and these plots were also excluded from the analyses. This assessment and data sets used are thus displayed in Table 1.

Table 1. The assessment of the data set available for this study.

Abbreviation as per HCCREMS (2008)	**Area (0.04)**	**full floristics**	**Braun Blanquet** (or can convert to 1-6 scale)	**Use or disregard**
ALLEN	Yes	Yes	Yes (1-7?)	Use
ALLGOSFORD	Yes	Yes	Yes (1-7)	Use
ALLRAINTOT	?	Yes	Yes (1-7)	Disregard
AMYCLOSE	0.01	Yes	Yes (1-6?)	Disregard
ANDREWS	Yes	Yes	Yes (1-7 but different scale)	Use
ASKANIA	Yes	Yes	Yes (1-7)	Use
CCCEN	Yes	Yes	Yes (1-7)	Use
COLON	Yes	Yes	? (1-9?)	?
CRAHUN	Yes	Yes	Yes (1-6)	Use
DAVIDTIERN	Yes	Yes	Yes (1-6)	Use
MUNMORAH	Yes	Yes	Yes (1-6)	Use
HAMTERR	Yes	Yes	Yes (1-6)	Use
HUNCO2	Yes	Yes	Yes (1-7)	Use
INOPINA	Yes	Yes	Yes (1-6)	Use
LAKEMSRA	Yes	Yes	Yes (1-6?)	Use
LESRYK	Yes	Yes	Yes	Disregard (disturbed)

MARKROB	Yes	Yes	Yes (1-7 but different scale)	Yes
MUNMORAH	Yes	Yes	Yes (1-6)	Use
PACPOWER	Yes	Yes	yes (1-6?)	Use
PIONDQUAD	Yes	Yes	YES (1-6)	Use
POLLOCKAVE	Yes	Yes	y (1-6)	Use
PORTERSMON	Yes	Yes	y (1-6)	Use
R PAYNE	Yes	Yes	1-7?	Yes
RAIN1	No	Yes	No (presence/absence)	Disregard
RBCS3	Yes	Yes	1-7 (and other?)	Check

(3) Taxonomic revisions.

The YETI database (DECC) includes tables for standardising the taxonomy of species (taxon and cap tables). These were current to early 2008 and were used for updating the data for analyses.

(4) Analyses.

The analyses of the data was carried out as follows –

A. *Cover–abundance standardisation*. All selected data sets were converted to a standard 1-6 cover abundance (Braun-Blanquet) scale.

B. *Preliminary analyses*. Preliminary analyses were undertaken in PRIMER (Clarke and Gorley 2001) to determine the general relationship of the available data to the existing Wyong vegetation classification scheme (Bell 2002). The plot data was imported into PRIMER and a similarity matrix created (using Bray-Curtis similarity with the data untransformed). Cluster analyses (using the group average cluster mode) was undertaken and the resultant dendogram examined. Diagnostic species for the map units described by Bell (2002) were consulted as well as the map location of plots within mapped vegetation polygons on the Bell map to determine the approximate number of plots available for each of the vegetation types of Bell (2002).

C. *Development of a reference data set.* The available plot data set was interrogated to (optimally) extract five plots representative of each of the Bell (2002) units to form a reference data set against which potential new vegetation types could be analysed. Where five plots for each unit were unavailable, plot data that had been judged to be suitable for use (Table 1) but which was in an adjacent LGA was used. This data was analysed (as in the preliminary analyses) to determine if plots generally clustered into discrete groupings that included similar vegetation types (e.g. wetlands; rainforests; woodlands). Plots that appeared to have been assigned to the wrong vegetation type were removed from the data set.

D. *Survey.* Field surveys were undertaken in the western Wyong area to sample some new potential vegetation units (reported by Bell and Driscoll 2006). The surveys targeted potential vegetation types that were likely to be most widespread (under represented). These include identified variants of REMS units 9 and 21 - see Table 2.

Table 2. Plot data for the potential vegetation types reported by Bell (2006) which are recorded as local variants of NPWS (2000).

NPWS unit (Bell assigned subunit)	No. surveyed
9(g)	2
9(a)	5
9(i)	1
9(j)	3
21(f)	4

E. *Analyses of the relationship of the surveyed vegetation to the reference data set.* The new plot data was appended to the reference data set of Bell (2002) units and analyses by PRIMER again undertaken. The new survey plots were designated as a factor for comparison against each Bell unit (as distinct factors). The ANOSIM routine (a multivariate equivalent of ANOVA) was used to determine if these factors were significantly different (p = 0.05). Secondly, the new vegetation plots were analysed as representative of potential new vegetation types. These potential types were *a priori* recognised (by inspection of notes from Bell and Driscoll 2006 and the recognition of broad differences in floristic differences among the subunit types) as possibly clustering into three broad vegetation units (here tagged by the dominant tree species as a blackbutt forest type, a blue leaved stringybark / mahogany dominated forest and a mahogany / ironbark forest). These were compared against the plot data available as representative of the Bell map units present in the west Wyong area (map units 28,30 and units 34-43). These patterns were displayed via the cluster analysis routine (dendogram) in PRIMER. The SIMPER routine in PRIMER was used to determine the species which contributed the most (to the 90% level) to the similarity among the potential units. These species are equivalent to the positive diagnostic species determined by *Fidel* (see Keith & Bedward 1999).

RESULT

The reference data set did not provide the considered optimum five plots for each of the Bell units (2002). This is consistent with Bell (2002) which reports that some (few) units were defined in the absence of adequate survey data. Frequently, vegetation types that are naturally rare or over cleared are poorly surveyed and professional judgement or more surveys are required to address assessments of their status.

Table 3. Number of plots included in the analyses of the relationship of new survey plots (in Bell 2006 subunits) to existing Bell units.

Unit	No. of plots
1	4
2	3
3	5
4	4
5	4
6	4
7	5
8	2
9	2
10	5
11	5
12	1
13	5
14	3
15	1
16	1
17	3
18	5
19	1
20	5
21	1
22	3
23	5
24	5
25	5
26	3
27	1
28	5
29	4
30	2
31	5
32	4
33	5
34	5
35	5
36	1
37	4
38	4
39	0
40	4
41	4
42	4
43	2
New subunits	18
Total plots	167

The analyses of overall difference among the Bell (2002) map units and the new survey plots had a Global R value of 0.675 (Global R represents the degree to which the analysed plots fit the classification - measured on a scale form 0.0 to 1.0). Thus there was a good relationship among the plots and classification scheme. Excluding tests against map units which had only one sample, the new plots were collectively distinct from all other Bell units except Bell units 30 and units 41 (p values of < 0. 0.5).

The test for difference among the potential new map units and those currently mapped for the west Wyong area also had a strong overall pattern (Global R = 0.726; overall $p < 0.001$). Where sufficient permutation could be undertaken (generally a minimum of 30-50 is required), the identified potential new vegetation units were distinct (Table 4). The cluster analyses also showed these potential units to be generally distinct (note that the stringybark units actually consists of two plots in a moist and two plots in a dry variant of this community). The SIMPER routine determined that a mix of tree, shrub and ground cover species contributed towards the major differences among the potential new map units. Thus, for example, the potential unit Coastal Ranges Mahogany Ironbark Forest had a variable tree layer so that most of the species that drive the similarity among sites were those of the shrub and ground layers (Table 5).

Table 4. Results of the ANOSIM test for differences among the forest types of the west Wyong area including the existing map units (numbered) and the potential new units (named).

Pairwise Tests

Groups	R Statistic	Significance Level %	Possible Permutations	Actual Permutations	Number >= Observed
28, 30	0.891	4.8	21	21	1
28, 34	0.784	0.8	126	126	1
28, 35	0.672	0.6	462	462	3
28, 36	1.	16.7	6	6	1
28, 37	0.644	0.8	126	126	1
28, 38	0.906	0.8	126	126	1
28, 40	1.	0.8	126	126	1
28, 41	1.	0.8	126	126	1
28, 42	0.956	0.8	126	126	1
28, 43	1.	4.8	21	21	1
28, Blackbutt	0.996	0.8	126	126	1
28, Stringy	0.975	0.8	126	126	1
28, Mahogany	1.	0.8	126	126	1
30, 34	0.836	4.8	21	21	1
30, 35	0.469	14.3	28	28	4
30, 36	1.	33.3	3	3	1
30, 37	0.857	6.7	15	15	1
30, 38	1.	6.7	15	15	1
30, 40	1.	6.7	15	15	1
30, 41	0.964	6.7	15	15	1
30, 42	0.821	6.7	15	15	1
30, 43	1.	33.3	3	3	1
30, Blackbutt	0.982	4.8	21	21	1
30, Stringy	1.	6.7	15	15	1
30, Mahogany	1.	6.7	15	15	1
34, 35	0.537	1.1	462	462	5
34, 36	0.72	16.7	6	6	1
34, 37	0.15	17.5	126	126	22
34, 38	0.059	23.8	126	126	30
34, 40	0.963	0.8	126	126	1
34, 41	0.738	1.6	126	126	2
34, 42	0.8	1.6	126	126	2
34, 43	0.855	4.8	21	21	1
34, Blackbutt	0.856	0.8	126	126	1
34, Stringy	0.656	2.4	126	126	3
34, Mahogany	0.844	1.6	126	126	2
35, 36	0.689	14.3	7	7	1
35, 37	0.573	1.4	210	210	3
35, 38	0.683	1.4	210	210	3
35, 40	0.377	2.4	210	210	5
35, 41	-0.026	53.3	210	210	112
35, 42	0.063	31.9	210	210	67
35, 43	0.193	32.1	28	28	9
35, Blackbutt	0.541	0.2	462	462	1
35, Stringy	0.552	1.	210	210	2
35, Mahogany	0.55	0.5	210	210	1
36, 37	0.167	40.	5	5	2
36, 38	1.	20.	5	5	1
36, 40	1.	20.	5	5	1
36, 41	1.	20.	5	5	1
36, 42	1.	20.	5	5	1
36, 43	1.	33.3	3	3	1
36, Blackbutt	1.	16.7	6	6	1
36, Stringy	1.	20.	5	5	1
36, Mahogany	1.	20.	5	5	1
37, 38	0.177	11.4	35	35	4
37, 40	0.969	2.9	35	35	1
37, 41	0.896	2.9	35	35	1
37, 42	0.927	2.9	35	35	1
37, 43	0.893	6.7	15	15	1
37, Blackbutt	0.956	0.8	126	126	1
37, Stringy	0.865	2.9	35	35	1
37, Mahogany	0.938	2.9	35	35	1
38, 40	1.	2.9	35	35	1
38, 41	1.	2.9	35	35	1
38, 42	0.969	2.9	35	35	1
38, 43	1.	6.7	15	15	1
38, Blackbutt	1.	0.8	126	126	1
38, Stringy	0.979	2.9	35	35	1
38, Mahogany	1.	2.9	35	35	1
40, 41	0.708	2.9	35	35	1
40, 42	0.313	5.7	35	35	2
40, 43	0.893	6.7	15	15	1
40, Blackbutt	1.	0.8	126	126	1
40, Stringy	1.	2.9	35	35	1
40, Mahogany	1.	2.9	35	35	1
41, 42	-0.052	57.1	35	35	20
41, 43	0.768	6.7	15	15	1

41, Blackbutt	0.9	0.8	126	126	1
41, Stringy	0.958	2.9	35	35	1
41, Mahogany	0.917	2.9	35	35	1
42, 43	0.429	13.3	15	15	2
42, Blackbutt	0.744	0.8	126	126	1
42, Stringy	0.771	2.9	35	35	1
42, Mahogany	0.76	2.9	35	35	1
43, Blackbutt	0.964	4.8	21	21	1
43, Stringy	1.	6.7	15	15	1
43, Mahogany	1.	6.7	15	15	1
Blackbutt, Stringy	0.888	0.8	126	126	1
Blackbutt, Mahogany	0.938	0.8	126	126	1
Stringy, Mahogany	0.396	2.9	35	35	1

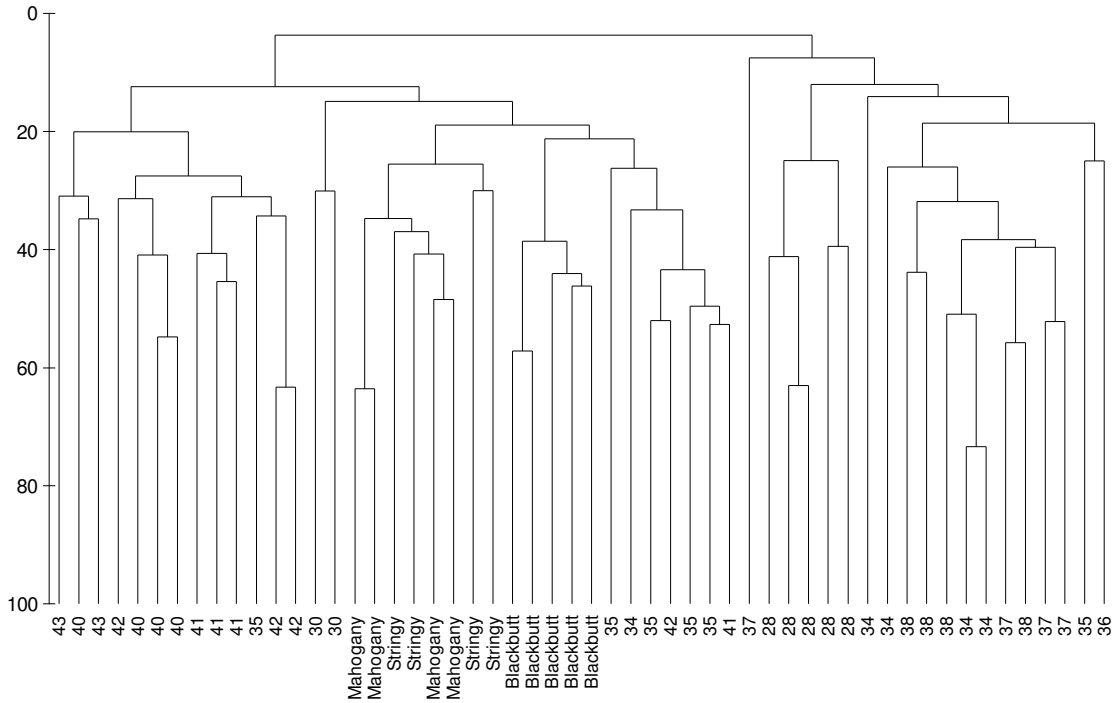

Figure 1. The dendogram (cluster analyses) of the forest types of the west Wyong area including the existing map units (numbered) and the potential new units (named).

Table 5. SIMPER results for the three potential new units. These show the contribution that individual species make to the difference among the identified potential new unit and all other vegetation types to which they were compared as a percentage of the total difference (shown to the ~ 90% level of difference).

A. Coastal Ranges Blackbutt Forest (coded as Blackbutt on Figure 1 and Table 1).

Species	**% contribution**	**% cumulative difference**
Allocasuarina torulosa	12.21	12.21
Eucalyptus pilularis	10.62	22.83
Persoonia linearis	6.75	29.59
Entolasia marginata	6.75	36.34
Dianella caerulea	6.75	43.09
Angophora floribunda	5.97	49.06
Lomandra longifolia	5.12	54.18
Eucalyptus propinqua	3.58	57.76
Themeda australis	3.41	61.17
Synoum glandulosum	3.41	64.30
Breynia oblongifolia	3.14	67.44
Imperata cylindrica	2.89	70.32
Corymbia maculata	2.24	72.57
Eucalyptus microcorys	2.23	74.80
Adiantum aethiopicum	2.13	76.92
Calochlaena dubia	2.08	79.00
Smilax australis	1.98	81.08
Cissus hypoglauca	1.98	83.06
Desmodium brachypodum	1.79	84.85
Maytenus silvestris	1.71	86.56

B. Coastal Ranges Stringybark / Mahogany Forest (Stringybark on Figure 1 and Table 1).

Species	**% contribution**	**% cumulative difference**
Allocasuarina torulosa	13.06	13.06
Entolasia marginata	8.64	21.70
Dianella caerulea var *producta*	7.83	29.52
Pomax umbellata	7.83	37.35
Persoonia linearis	6.16	43.51
Eucalyptus agglomerata	5.50	49.01
Platysace lanceolata	5.50	54.51
Lomandra longifolia	5.19	59.70
Panicum simile	5.19	64.89
Pteridium esculentum	5.05	69.93
Brunoniella australis	3.34	73.27
Billardiera scandens	2.59	75.87
Lepidosperma laterale	1.86	77.73
Hybanthus monopetalus	1.86	79.59
Acacia floribunda	1.86	81.44
Angophora costata	1.78	83.23
Acacia ulicifolia	1.78	85.01
Cheilanthes sieberi	1.70	86.71
Entolasia marginata	1.70	88.40
Choriocarpia leptopetala	1.63	90.03

C. Coastal Ranges Mahogany / Ironbark Forest (Blackbutt on Figure 1 and Table 1).

Species	% contribution	% cumulative difference
Lomandra longifolia	7.85	7.85
Cheilanthes sieberi	7.22	15.06
Billardiera scandens	7.22	22.28
Pratia purpuascenns	7.22	29.49
Allocasuarina torulosa	5.95	35.45
Daviesia ulicifolia	5.41	40.86
Persoonia linearis	5.35	46.21
Melichrus procumbens	4.21	50.41
Brunoniella australis	4.21	54.62
Daviesia squarrosa	3.61	58.23
Imperata cylindrica	3.49	61.72
Centella asiatica	3.49	65.21
Jacksonia scoparia	2.49	67.70
Entolasia marginata	2.41	70.11
Oxalis chnoodes	2.40	72.52
Smilax australis	2.39	74.90
Podolobium ilicifolium	2.37	77.28
Oplismenus imbecillis	2.32	79.60
Pomax umbellata	1.80	81.40
Acacia floribunda	1.25	82.65
Dianella caerulea var *producta*	1.21	83.86
Geitonoplesium cymosum	1.21	85.07
Astrotricha latifolia	1.21	86.27
Poranthera microphylla	1.20	87.47
Themeda australis	1.20	88.66
Gonocarpus teucriodes	1.20	89.86
Jacksonia scoparia	1.20	91.06

CONCLUSION

Bell and Driscoll (2008) recorded a large number of vegetation variants which cannot be clearly assigned to either existing regional mapping (REMS 2000) or current local mapping (Bell 2002). Preliminary analyses indicate that at least some of these variants are likely to warrant map unit status. This analyses identified three vegetation types that can now be recognised as discrete vegetation types (Table 5). These are described in Appendix 5 (vegetation map units 44, 45 and 46) and are now appended to the units of Bell (2002) and together these form a revised map layer.

Bell and Driscoll (2008) identify a need for further survey in the west Wyong study area to develop a rigorous assessment of vegetation patterns and for further updating of the vegetation assessment. The current project has, however, made significant changes to the mapping of the Wyong LGA. These are:

1. Three new map units are now recognised in the western portion of the LGA. These units occupy considerable area and demonstrate that complex vegetation patterns exist across the largely intact landscape of the Wyong valleys.

2. Map unit 35 (Bell 2002) has been found to be more restricted than shown in previous mapping. This unit is concentrated east of the F3 freeway in the Ourimbah – Glenning Valley area. Appropriate environmental zoning / protection of this vegetation is required to protect this vegetation type is this portion of the LGA.

3. There are significant improvements in line work accuracy across the LGA that better accord with the current vegetation extent.

FURTHER WORK

The following work is required as a follow on from this mapping project:

1. An explicit program of vegetation map updating at appropriate intervals needs to be established. Given ongoing vegetation loss, the probability of ongoing state-wide listings of EECs and new vegetation / biodiversity management programs there is a need to review the vegetation map over time.

2. Further plot data is required to meet the recommendations of Bell & Driscoll (2008). At least five plots need to be available for each of the vegetation sub-units recognised by Bell & Driscoll (2008) to properly assess the status of these vegetation types.

3. An updated LGA wide assessment of the status of threatened fauna and flora that have previously been mapped / modelled by their association with vegetation types is required.

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APPENDIX

1. Metadata
2. New map unit descriptions
3. PDF of new map

APPENDIX 1 VEGETATION METADATA

CATEGORY	ELEMENT	DESCRIPTION
DATASET	**Title:**	Vegetation
	Custodian:	Wyong Shire Council
	Originator:	Wyong Shire Council, East Coast Flora Surveys
	Publication Date (yyyymmdd):	20090200
CONTACT DETAILS	**Contact Organisation:**	Wyong Shire Council
	Contact Name & Position:	David Tierney Ecologist Phone: 02 4350 5156
	Contact Address	PO Box 20 WYONG NSW 2259 Phone: 02 4350 5555
DESCRIPTION	**Abstract:**	Maps the natural vegetation of Wyong Local Government Area
	Purpose:	Update an earlier version created in 2002
	Keyword Theme:	vegetation
	Keyword Place:	Wyong Shire - whole
	Keyword Stratum:	above ground
	Keyword Temporal	2008
	Feature Type:	polygon
CURRENCY	**Beginning:**	2002 (Bell) and updated using shire-wide aerial photography Dec 2006 / Jan 2007
	End:	
STATUS	**Progress:**	In work
	Maintenance & Update Frequency:	Continual
ACCESS, USE, CREDITS	**Access Constraints:**	Dataset access is granted solely by Wyong Shire Council as determined by the terms and conditions specified in any associated data sharing agreement(s). Any person whose legal rights may be affected or who intends to act on any information contained in the dataset should verify such information with Wyong Shire Council.

CATEGORY	ELEMENT	DESCRIPTION
	Use Constraints:	Use of the dataset is determined by any associated data sharing agreement(s). Wyong Shire Council accepts no responsibility for errors or omissions.
	Dataset Credit:	Maps and reports made using any data must acknowledge Wyong Shire Council copyright and the date of the dataset release.
ATTRIBUTES	**Name:** **Description:** **Values:**	SUBGROUP Represents variants of the vegetation map unit of Bell (2002).
	Name: **Description:** **Values:**	CLASS Combines vegetation type of (Bell 2002) with SUBGROUP and CONDITION attributes.
	Name: **Description:** **Values:**	STATE State of vegetation (Bell 2002). XR = Disturbed – Canopy only XS = Disturbed – Regrowth
	Name: **Description:** **Values:**	VEGENAME Names from Bell (2002).
	Name: **Description:** **Values:**	Keith_No Classifies vegetation according to the Formations of Keith (2004). 1, 2, 4 – 6, 8 – 10 (within Wyong Shire)
	Name: **Description:** **Values:**	Keith_Type Name of the Keith Formations (Keith 2004).
	Name: **Description:** **Values:**	UNIT Mapping by Bell & Driscoll (2008) using REMS (2000) units and subunits.
	Name: **Description:** **Values:**	COMM Assignment of Bell & Driscoll (2008) subunits to Bell (2002) units by name.
	Name: **Description:** **Values:**	LABEL Major species identified by Bell & Driscoll (2008).

CATEGORY	ELEMENT	DESCRIPTION
	Name: **Description:** **Values:**	WYONG_UNIT Assignment of Bell & Driscoll (2008) subunits to Bell (2002) unit numbers with addition of three new units (44, 45 & 46) in 2009. 1 – 46
	Name: **Description:** **Values:**	WYONG_COMM
	Name: **Description:** **Values:**	REMS_UNIT REMS (2000) unit.
	Name: **Description:** **Values:**	REMS_COMM REMS units assigned to broad vegetation types.
	Name: **Description:** **Values:**	JSCA_UNIT Bell & Driscoll (2008) subunit numbers.
	Name: **Description:** **Values:**	JSCA_COMM Bell & Driscoll (2008) subunit names.
	Name: **Description:** **Values:**	SOURCE Defines if the Bell & Driscoll subunits were assigned by Jilliby Mapping (for DECC) or by Bell as part of the Bell & Driscoll (2008) project or the Wyong Coal Project investigations.
	Name: **Description:** **Values:**	EEC Estimate of the EEC status of the vegetation.

APPENDIX 2 NEW MAP UNIT DESCRIPTIONS

Map unit 44 Coastal Ranges Blackbutt Forest

General description

Coastal Ranges Blackbutt forest occurs as an open forest on ranges above the spotted gum and rainforests of the Wyong valleys. A number of tree species typically present generally are not found on the clay soils of these lower slopes and soil type is likely to have a strong influence on its distribution. In moist variants a high diversity can be supported in the ground layer.

Known floristic / structural variations

Floristically this vegetation varies from having a mesic understorey of ferns and an open mid layer in protected sites to supporting a thick mid mid layer of shrubs in drier sites. It is likely that further survey will resolve these variations into discrete units.

Distribution

Occurs along mid to upper slopes in the ranges west of the F3 freeway from south of Wyong river to north of Buttonderry in the Kiah Ridge area.

Extent

This vegetation is mapped as occupying 1,961 ha (total mapped vegetation for the LGA of 53,978).

Relationship to other communities

The presence of *Eucalyptus pilularis* and a diversity of other tree species and either a moist ground layer or thick mid layer distinguish this vegetation type from adjacent Narrabeen Dooralong Spotted Gum and other adjacent vegetation with which it intergrades.

Equivalent vegetation types

add in

Significant species

* Undescribed species - none recorded

* Threatened species – non recorded

* Rare (ROTAP) – non recorded

Community conservation status

This vegetation type is generally included in National Parks, State Forest or in areas zoned for environmental protection.

Mapping reliability and included units

The community has been mapped using aerial photography and some ground truthing. Further survey work is required to address the issues of the vegetation representing more than one vegetation type.

Vegetation structure (approx.)

Emergents 35

Tallest 25

Mid 1 10

Mid 2 5

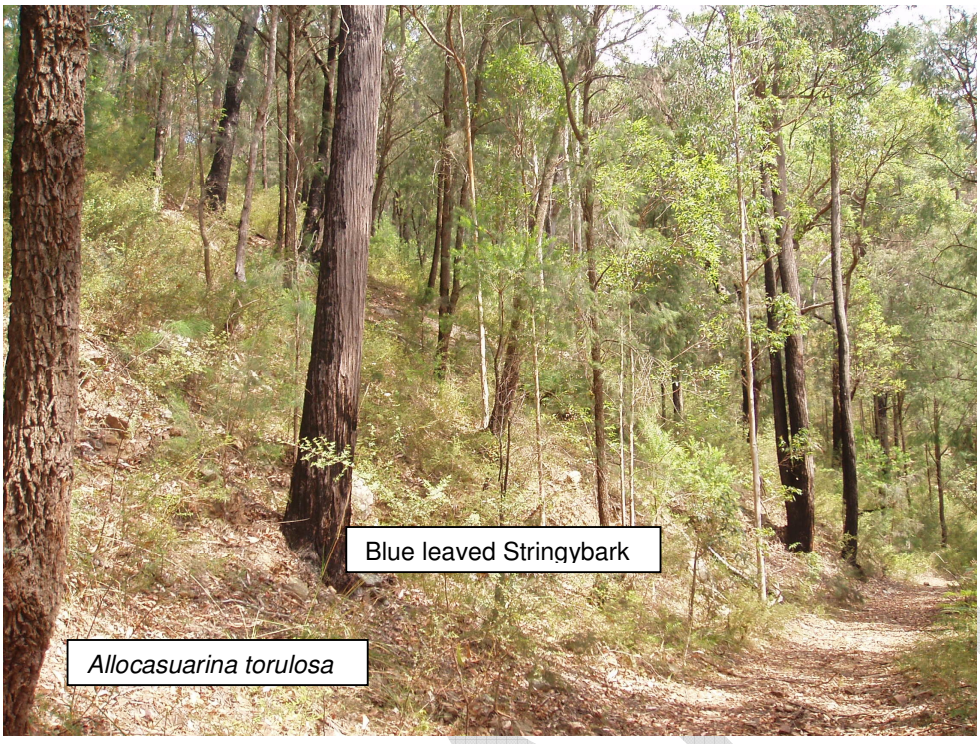
Low 1 1

Positive diagnostic species

Species	% contribution	% cumulative difference
Allocasuarina torulosa	12.21	12.21
Eucalyptus pilularis	10.62	22.83
Persoonia linearis	6.75	29.59
Entolasia marginata	6.75	36.34
Dianella caerulea	6.75	43.09
Angophora floribunda	5.97	49.06
Lomandra longifolia	5.12	54.18
Eucalyptus propinqua	3.58	57.76
Themeda australis	3.41	61.17
Synoum glandulosum	3.41	64.30
Breynia oblongifolia	3.14	67.44
Imperata cylindrica	2.89	70.32
Corymbia maculata	2.24	72.57
Eucalyptus microcorys	2.23	74.80

Adiantum aethiopicum	2.13	76.92
Calochlaena dubia	2.08	79.00
Smilax australis	1.98	81.08
Cissus hypoglauca	1.98	83.06
Desmodium brachypodum	1.79	84.85
Maytenus silvestris	1.71	86.56

Map unit 45 Coastal Ranges Stringybark Mahogany Forest



General description

Coastal Ranges Stringybark Mahogany Forest occurs on upper to mid slopes on sandy to loam soils predominately south and west of Wyong River. The forest canopy is generally very open and thus a well developed mid and ground layer frequently occurs. The presence of fire scars and pyrogenic species in the shrub layer indicate that fires are an important driver of the vegetation floristics.

Known floristic / structural variations

There is frequently a gradation that runs down slope where the dry shrub layer is replaced by more mesic shrubs with higher fire sensitivity.

Distribution

Occurs along mid slopes south and west of Wyong River.

Extent

This vegetation is mapped as occupying 4,835 ha (total mapped vegetation for the LGA of 53,978).

Relationship to other communities

The shrub layer shares a number of species with adjacent vegetations such as Hunter Ranges Dry Sheltered Forest. Canopy species generally distinguish these communities (*E. agglomerata*; *Eucalyptus propinqua*).

Equivalent vegetation types

add in

Significant species

* Undescribed species - none recorded

* Threatened species – non recorded

* Rare (ROTAP) – non recorded

Community conservation status

This vegetation type is generally included in National Parks, State Forest or in areas zoned for environmental protection.

Mapping reliability and included units

The community has been mapped using aerial photography and some ground truthing. Further survey work is required to address the issues of the vegetation representing more than one vegetation type.

Vegetation structure

Tallest 25

Mid 1 15

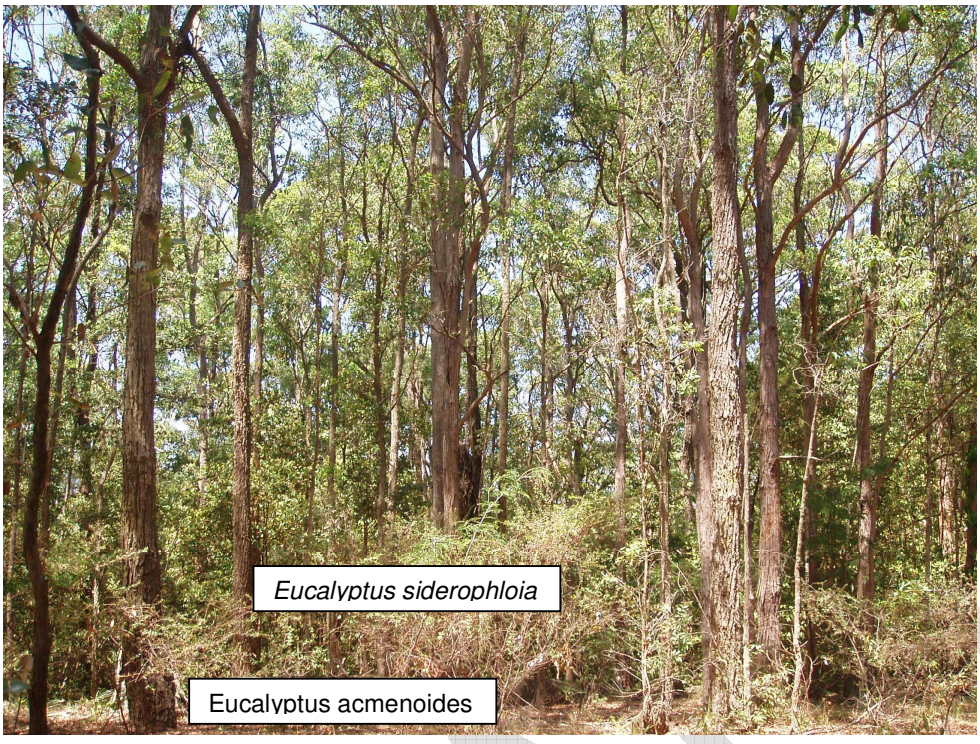
Mid 2 3

Low 1 1

Positive diagnostic species

Species	% contribution	% cumulative difference
Allocasuarina torulosa	13.06	13.06
Entolasia marginata	8.64	21.70
Dianella caerulea var *producta*	7.83	29.52
Pomax umbellata	7.83	37.35
Persoonia linearis	6.16	43.51
Eucalyptus agglomerata	5.50	49.01
Platysace lanceolata	5.50	54.51
Lomandra longifolia	5.19	59.70
Panicum simile	5.19	64.89
Pteridium esculentum	5.05	69.93
Brunoniella australis	3.34	73.27
Billardiera scandens	2.59	75.87
Lepidosperma laterale	1.86	77.73
Hybanthus monopetalus	1.86	79.59
Acacia floribunda	1.86	81.44
Angophora costata	1.78	83.23
Acacia ulicifolia	1.78	85.01
Cheilanthes sieberi	1.70	86.71
Entolasia marginata	1.70	88.40
Choriocarpia leptopetala	1.63	90.03

Map unit 46. Coastal Ranges Mahogany / Ironbark Forest



General description

Coastal Ranges Mahogany Forest occurs on upper slopes of the ranges around the Jilliby Creek to Wyong River area. The forest has a diverse canopy layer which typically includes *Eucalyptus acmenoides*, ironbark species and *Syncarpia glomulifera*. This forest type is typically above Narrabeen Dooralong Spotted Gum Ironbark Forest and it shares a range of shrub and ground layer species with that forest type (e.g. *Allocasuarina torulosa*; *Daviesia ulicifolia*; *Melichrus procumbens*).

Known floristic / structural variations

There is considerable variability in both the canopy and mid layers. Further survey is required to assess if this variability resolves into distinct vegetation types.

Distribution

Distributed on the upper slopes and ridges of the Jilliby / Dooralong area.

Extent

This vegetation is mapped as occupying 1,547 ha (total mapped vegetation for the LGA of 53,978).

Relationship to other communities

This community is most closely related to map unit 35 however it differs in that it that map unit now mapped more to the east of the freeway contains more *Eucalyptus saligna*, *Eucalyptus deanei* and a more developed mesic shrub layer.

Equivalent vegetation types

add in

Significant species

* Undescribed species - none recorded

* Threatened species – non recorded

* Rare (ROTAP) – non recorded

Community conservation status

This vegetation type is generally included in National Parks, State Forest or in areas zoned for environmental protection.

Mapping reliability and included units

The community has been mapped using aerial photography and some ground truthing. Further survey work is required to address the issues of the vegetation representing more than one vegetation type.

Vegetation structure (approx.)

Emergents

Tallest 20

Mid 1 5

Low 1 1

Positive diagnostic species

Species	% contribution	% cumulative difference
Lomandra longifolia	7.85	7.85
Cheilanthes sieberi	7.22	15.06
Billardiera scandens	7.22	22.28
Pratia purpuascenns	7.22	29.49
Allocasuarina torulosa	5.95	35.45
Daviesia ulicifolia	5.41	40.86
Persoonia linearis	5.35	46.21
Melichrus procumbens	4.21	50.41
Brunoniella australis	4.21	54.62
Daviesia squarrosa	3.61	58.23
Imperata cylindrica	3.49	61.72
Centella asiatica	3.49	65.21
Jacksonia scoparia	2.49	67.70
Entolasia marginata	2.41	70.11
Oxalis chnoodes	2.40	72.52
Smilax australis	2.39	74.90
Podolobium ilicifolium	2.37	77.28
Oplismenus imbecillis	2.32	79.60

Pomax umbellata	1.80	81.40
Acacia floribunda	1.25	82.65
Dianella caerulea var *producta*	1.21	83.86
Geitonoplesium cymosum	1.21	85.07
Astrotricha latifolia	1.21	86.27
Poranthera microphylla	1.20	87.47
Themeda australis	1.20	88.66
Gonocarpus teucriodes	1.20	89.86
Jacksonia scoparia	1.20	91.06

APPENDIX 3 THE NEW MAP