Assessment of Rainforest TECs on NSW Crown Forest Estate

Survey, classification and Mapping Completed for the NSW Environment Protection Authority

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1 Overview

This report interprets the final determinations of four rainforest threatened ecological communities (TECs) listed under the NSW *Threatened Species Conservation Act, 1995* (TSC Act). These TECs are found in particular areas of the NSW east coast and hinterlands; Lowland Rainforest on Floodplains (LRFP), Lowland Rainforest (LORF), Littoral Rainforest (LTRF) and Milton-Ulladulla Subtropical Rainforest (MURF). The primary purpose of our interpretations has been to assess whether any of these rainforest TECs occur within 1.4 million hectares of state forest in eastern NSW. Where we consider them likely to occur, our goal has been to map the extent at a scale suitable for the regulation of forestry operations.

The compositional and distributional attributes of these rainforest TECs rely almost exclusively on the rainforest classifications of Floyd (1990), with each final determination assigning selected rainforest suballiances to circumscribe the assemblage. This presented challenges for our project as Floyds classifications are largely subjective, making assignment of rainforest vegetation to a particular suballiance difficult. This is compounded because suballiances cited in a determination are often similar to other; non-TEC suballiances and the distinction cannot be consistently made based on Floyd descriptions. Data on which the descriptions of suballiances are based are not compatible with quantitative analysis and this precludes direct comparison between different sites using these data. For these reasons the interpretation of rainforest TECs necessitates a conservative approach to interpretation and mapping if there is to be confidence that all potential areas are identified and included.

To overcome some of these problems we revisited a set of reference sites assigned by Floyd to suballiances cited by the final determinations, and collected new floristic data using standard flora survey methods. We also targeted a range of localities on state forest that we considered likely to include TECs using the suballiance descriptions, cited localities in Floyd (1990), and preliminary distribution models. Over 300 new rainforest plots were combined with a large pool of existing data covering eastern NSW to construct a provisional revised rainforest classification. We used the groups derived from this analysis to compare the species composition of Floyd suballiances, final determination assemblage lists and recent rainforest classifications included in regional classifications. Groups, (and the plots that defined them), were assigned to the Floyd suballiance with the highest degree of floristic similarity. We conferred with the TEC Project Reference Panel (the Panel) to resolve inconsistencies between the results of our analyses and statements relating to the distribution and composition of individual suballiances in Floyd (1990), and the final determinations.

We used plot data and a selection of environmental and remote-sensing variables to develop Random Forest (RF) models of the probability of occurrence of each of the TECs except Lowland Rainforest on Floodplains. For this TEC we were unable to assign any of our rainforest groups to the final determination assemblage list or the primary suballiances cited. We also could not discriminate which elements of other suballiances could be confidently assigned because statements in the determination are unclear. The TEC Panel overcame the problem by assigning any mapped rainforest assemblage on our alluvial and floodplain map as LRFP TEC. A total of 680 hectares of LRFP has been mapped on state forest in the Study Area. For LORF and LTRF we assessed the location of plots assigned to them and the distribution of the model on and adjoining state forests. We completed detailed aerial photograph interpretation using a prescribed set of mapping classes to discriminate rainforest and eucalypt and *Lophostemon confertus* for a range of canopy cover thresholds. We assigned polygons as candidate TEC using our interpretation of the modelled probabilities, plot data and our field knowledge.

Our interpretation and assessment of the LORF has identified 14,036 hectares present on state forest with only a small proportion (827 hectares) present on the South Coast. The largest areas of LORF are found in Ewingar and Unumgar State Forests in the north, Yadboro and Currowan State Forests in the south. For a small number of state forests we had insufficient evidence to assess the presence or absence of LORF and these have been excluded from our assessment. We found no evidence of the related Milton-Ulladulla Subtropical Rainforest TEC in any state forest largely as it is associated with igneous subtrates not found within state forests.

We found limited evidence of littoral rainforest TEC located on any state forest based on the locations of our plot data, Floyd reference sites or the assessment of our predictive models. We resolved a small potential area in Nambucca State Forest by including it within our map of LRFP TEC.

Our interpretation and mapping of the rainforest TECs has reduced some of the uncertainties associated with these final determinations arising from definitions that encompass wide ranging and complex floristic assemblages. The application of modern mapping technologies has also improved the identification and mapping of rainforest assemblages present on state forest. We consider that our maps encompass all our available evidence of Lowland Rainforest TEC and Lowland Rainforest of Floodplain present on state forest using the interpretations agreed upon for this project. To achieve this, our maps invariably include rainforest that is unlikely to meet our agreed interpretation.

2 Introduction

2.1 Project Rationale

This project was initiated by the NSW Environment Protection Authority (EPA) and Forest

Corporation NSW (FCNSW) as a coordinated approach to resolve long standing issues surrounding the identification, extent and location of priority NSW Threatened Ecological Communities (TECs) that occur on the NSW state forest estate included within the coastal Integrated Forestry Operation Approval (IFOA) areas.

2.2 Final Determinations

This report covers four Threatened Ecological Communities (TECs) describing rainforest assemblages in eastern NSW: Littoral Rainforest (LTRF), Lowland Rainforest (LORF), Lowland Rainforest on Floodplains (LRFP) and Milton-Ulladulla Subtropical Rainforest (MURF) (NSW Scientific Committee 2011, 2011a-c). The TECs were first gazetted as an Endangered Ecological Communities on various dates, LRFP on 13 August 1999, MURF on 2 November 2002, LTRF on 4 June 2004 and LORF on 22 December 2006. Minor amendments were subsequently made to all of the final determinations, which in all four cases were gazetted on 2 December 2011.

These four rainforest TECs are described in the final determinations by reference to Suballiances previously described by Floyd (1990). There are 57 suballiances described in this study but only a subset of these are assigned to each of the TECs. These suballiances and the amalgamations of them used in the determinations were subjectively defined and are often difficult to diagnose in a consistent manner. However, there are no other cited primary sources of information for any of the assessed TECs. Suballiances cited for each TEC are listed in Table 1. In the case of LORF and LRFP, the determinations list related suballiances other than those which principally define the TEC. In each case, the relationship of these other suballiances to the TEC is vague and difficult to interpret in a practical sense. For LORF, parts of the other suballiances are included if they occur '...in conjunction with...' a principal suballiance. In the case of LRFP, the TEC may include '...elements of...' the related suballiances.

Table 1. Floyd (1990) suballiances cited in each final determination.

TEC	Principal suballiances	Other related suballiances
LORF (para 4,5)	1 *Argyrodendron trifoliolatum* suballiance 5 *Castanospermum australe - Dysoxylum muelleri* suballiance 6 *Archontophoenix - Livistona* suballiance 14 *Doryphora sassafras - Daphnandra micranthus - Dendrocnide excelsa Ficus*-spp. - *Toona* suballiance 15 *Ficus* spp. - *Dysoxylum fraserianum - Toona - Dendrocnide* suballiance 21 *Araucaria cunninghamii* suballiance 22 *Flindersia* spp. - *Araucaria* suballiance	7, 8, 9, 10, 23, 27, 28, 29, 30, 33, 34, 35
MURF	*14 Doryphora sassafras - Daphnandra micranthus - Dendrocnide excelsa Ficus*-spp. - *Toona* suballiance 23 Ficus spp-Streblus-Dendrocnide-Cassine suballiance	
LRFP	3 *Cryptocarya obovata - Dendrocnide excelsa - Ficus* spp - *Araucaria*	1, 2, 4, 5, 6, 23, 24, 25, 26, 33

LTRF	16 *Syzygium leuhmannii – Acmena hemilampra* 17 *Cupaniopsis anacardioides* 18 *Lophostemon confertus* 19 *Drypetes – Sarcomelicope – Cassine – Podocarpus* 20 *Acmena smithii – Ficus - Livistona – Podocarpus*	none

2.3 Initial TEC Panel Interpretation

Under the *TSC Act*, TECs are defined by two characteristics: an assemblage of species and a particular location. The TEC Panel agreed that the occurrence of the three TECs is constrained to the IBRA Bioregions stated in the final determination, but for regulatory purposes, this requirement could be relaxed for areas close to bioregional boundaries. The TEC Panel agreed that LTRF, LORF, MURF and LRFP are TECs which have been defined primarily based on Floyds floristic data, although this has been used subjectively and was not based on quantitative floristic analyses.

From the final determination for each TEC, Table 2 summarises the key determining features of LTRF, LORF, LRFP and how they have been used in the assessment reported here, based on the interpretation of the features by the TEC Panel. Features of potential diagnostic value, common to all determinations except where indicated otherwise, are listed in Table 2.

<u>Table 2:</u> Key features of rainforest TECs of potential diagnostic value. Most of these features are common to all three TECs but may appear in different paragraphs in each final determination.

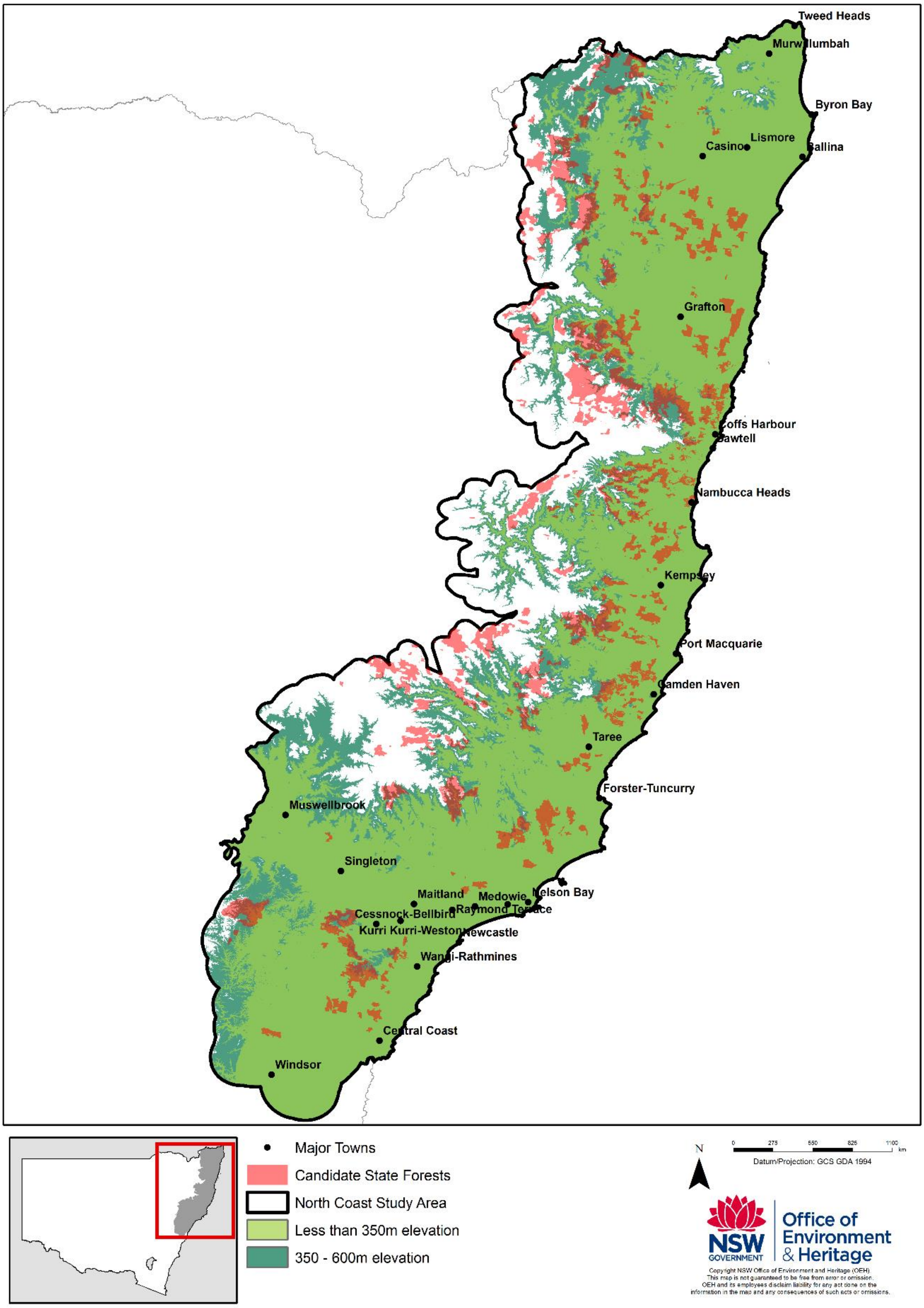
Feature	Diagnostic value and use for this assessment
NSW occurrences fall within specified IBRA bioregions.	Explicitly diagnostic in most cases, but for our purpose used with some allowance for occurrence outside but close to bioregional boundaries.
Associated with specified soil types and other environmental attributes.	Indicative, not used for LORF, LTRF, LRFP MURF occurs on basaltic soils (on Milton Monzonite), deep alluvium and soils of the Conjola Formation enriched by monzonite in the Milton Ulladulla area. Potentially diagnostic
Up to 600 m above sea level in the North Coast Bioregion but below 350 m in the Sydney Basin Bioregion (LORF only).	Diagnostic, except that we include areas above these elevations if they are part of a patch which occurs across an elevation threshold with no change likely in floristic composition.
Structural and growth form characteristics.	Indicative, not used.
'Scattered eucalypt emergents (e.g. *Eucalyptus grandis, E. saligna*) may occasionally be present.' (LORF only)	Potentially diagnostic, subject to interpretation of the phrase 'scattered eucalypt emergents'. We have used 30% crown cover of eucalypts as a maximum threshold for LORF.
Characterised by the plant species listed in paragraphs 1 (MURF) 2 (LORF), 3 (LTRF) or 8 (LRFP).	Potentially diagnostic, but used subject to consistency with Floyd suballiances cited in each final determination.
Known from specified LGAs but may occur elsewhere.	Indicative, not used.
Specified most frequent, common, dominant or locally abundant tree species.	Indicative, not used except to separate closely similar communities which could otherwise be considered to belong to more than one TEC.
General description of understorey	Indicative, not used
Explicit citation of Floyd suballiances.	We have used Floyd suballiances as the main comparative diagnostic features, subject to interpretation of vague qualifying phrases.

2.4 Assessment Area

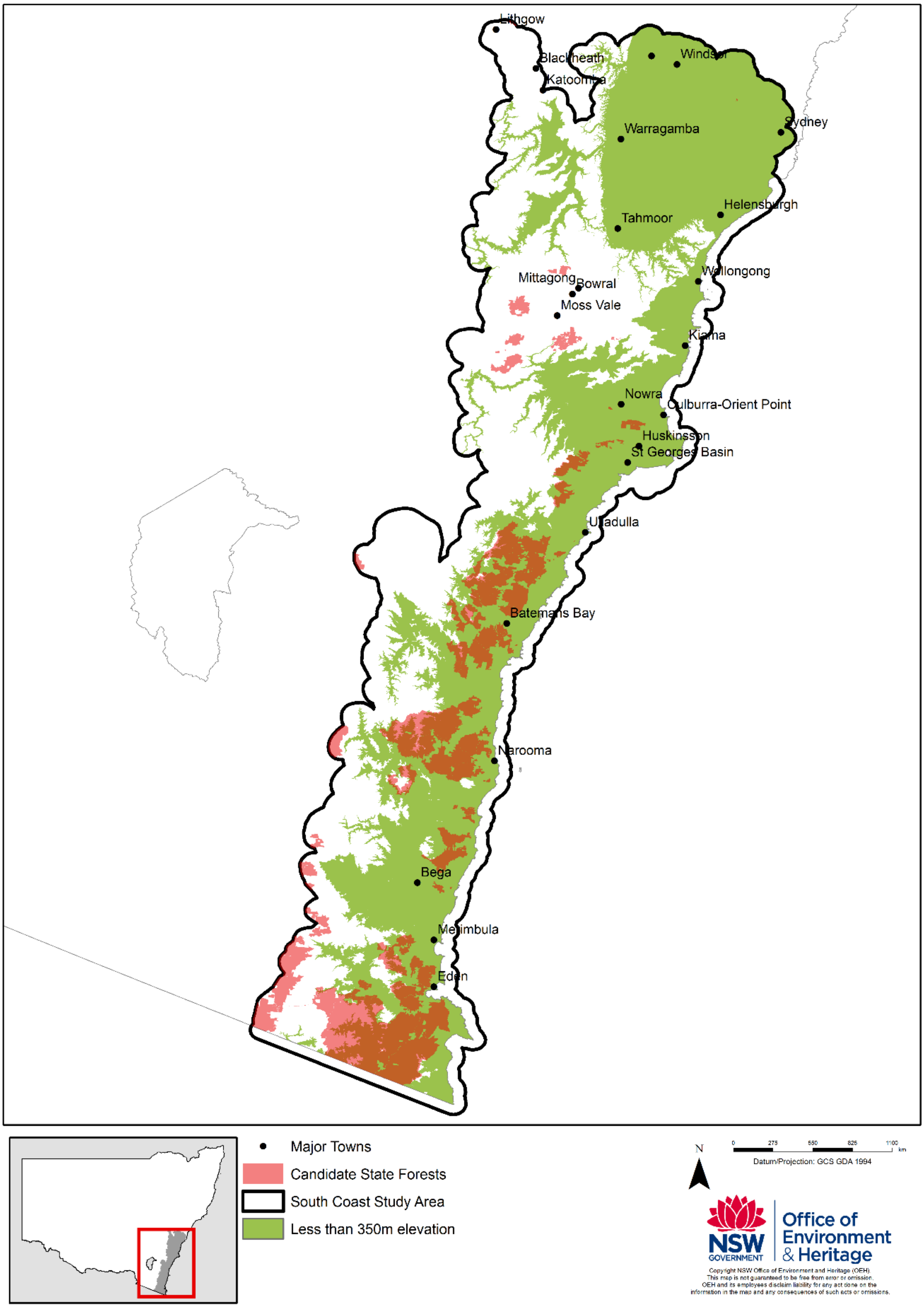
2.4.1 Location and study area boundaries

We defined two study areas for TEC assessment, one for the north coast (Map 1) and one for the south coast (Map 2). In both cases we defined the study areas to encompass all State forests within Upper and Lower North East RFA regions, Eden RFA region and the Southern RFA region. We included relevant data from outside these study areas for floristic analysis, but did not include the sampled areas as part of either study area.

<u>Map 1:</u> Candidate state forests in the North Coast Assessment Area.



Map 2: **Candidate state forests assessed in the South Coast assessment area.**



2.4.2 State forests subject to assessment

Tables 3 and 4 list the candidate state forest to be assessed for the North and South Coast assessment areas.

Table 3: List of North Coast candidate state forests to be assessed.

Candidate State Forest	Area (Ha)	Candidate State Forest	Area (Ha) within project Study area
Aberdare	6	Lansdowne	4,118
Avon River	5,061	Little Newry	189
Awaba	1,784	London Bridge	118
Bachelor	2,642	Lorne	3,257
Bagawa	5,384	Lower Bucca	2,621
Bald Knob	1,695	Lower Creek	1,270
Ballengarra	6,106	Malara	3,352
Banyabba	2,674	Marara	5,351
Barcoongere	320	Marengo	10,128
Barrington Tops	12,588	Maria River	1,815
Beaury	4,568	Masseys Creek	3,127
Bellangry	6,411	Mcpherson	6,488
Ben Halls Gap	351	Medowie	50
Billilimbra	3,853	Mernot	4,338
Boambee	821	Middle Brother	2,131
Bom Bom	872	Mistake	5,638
Bonalbo	1,456	Moogem	1,135
Bookookoorara	915	Moonpar	1,821
Boonanghi	3,817	Mororo	379
Boonoo	3,968	Mount Belmore	9,181
Boorabee	914	Mount Boss	17,165
Boorook	2,990	Mount Lindesay	3,046
Boundary Creek	2,539	Mount Marsh	3,636
Bowman	3,187	Mount Mitchell	2,323
Braemar	2,002	Mount Pikapene	553
Brassey	745	Mount Seaview	1
Bril Bril	2,333	Muldiva	687
Broken Bago	3,543	Myall River	13,611
Brother	6,179	Myrtle	4,303
Buckra Bendinni	1,766	Nambucca	1,510
Bulahdelah	7,799	Nana Creek	1,793
Bulga	14,254	Nerong	2,173
Bulls Ground	2,010	Never Never	3
Bungabbee	1,097	Newfoundland	5,939

Candidate State Forest	Area (Ha)	Candidate State Forest	Area (Ha) within project Study area
Bungawalbin	1,204	Newry	2,841
Burrawan	2,040	North Branch	796
Cairncross	4,487	Nowendoc	3,765
Camira	4,009	Nulla-five Day	3,370
Candole	6,574	Nundle	3,279
Carrai	3,028	Nymboida	6,400
Carwong	603	Oakes	7,639
Chaelundi	18,238	Oakwood	2,135
Cherry Tree	1,636	Old Station	230
Cherry Tree West	321	Olney	17,795
Chichester	20,539	Orara East	3,983
Clouds Creek	10,241	Orara West	4,459
Cochrane	231	Ourimbah	3,571
Collombatti	4,126	Paddys Land	907
Comboyne	2,576	Pappinbarra	1,181
Comleroy	2,904	Pee Dee	62
Coneac	777	Pine Brush	3,966
Conglomerate	5,162	Pine Creek	1,219
Coopernook	871	Pokolbin	14,030
Corrabare	5,197	Putty	22,252
Cowarra	1,687	Queens Lake	576
Curramore	84	Ramornie	6,175
Dalmorton	27,937	Ravensworth	901
Devils Pulpit	1,484	Riamukka	10,029
Diehappy	1,275	Richmond Range	6,340
Dingo	3,555	Roses Creek	1,790
Divines	1,524	Royal Camp	2,203
Donaldson	2,331	Scotchman	4,158
Doubleduke	5,824	Sheas Nob	4,333
Doyles River	7,744	Skillion Flat	5
Dyke	6	South Toonumbar	410
Eden Creek	1,179	Southgate	628
Edinburgh Castle	949	Spirabo	4,138
Ellangowan	1,179	Stewarts Brook	2,417
Ellis	9,736	Strickland	485
Enfield	12,973	Styx River	17,148
Enmore	169	Sugarloaf	3,151
Ewingar	18,433	Tabbimoble	2,627

Candidate State Forest	Area (Ha)	Candidate State Forest	Area (Ha) within project Study area
Forest Land	6,372	Tamban	7,632
Fosterton	823	Tarkeeth	530
Fullers	1,053	Thumb Creek	3,944
Gibberagee	10,574	Tomalla	2,107
Gibraltar Range	3,113	Toonumbar	1,528
Gilgurry	9,531	Tuckers Nob	1,885
Girard	18,851	Tuggolo	14,004
Giro	9,933	Uffington	325
Gladstone	6,230	Unumgar	3,563
Glen Elgin	682	Upsalls Creek	923
Glenugie	4,952	Urbenville	3
Grange	7,802	Viewmont	702
Gundar	119	Wallaroo	3,487
Hanging Rock	38	Wallingat	1,240
Heaton	2,236	Wang Wauk	8,330
Hyland	4,577	Washpool	2,961
Ingalba	6,632	Watagan	3,502
Irishman	2,733	Way Way	1,268
Johns River	725	Wedding Bells	4,645
Kalateenee	1,344	Whiporie	1,109
Kangaroo River	11,399	Wild Cattle Creek	9,667
Kendall	354	Willsons Downfall	317
Kerewong	3,665	Woodenbong	306
Kew	897	Woodford North	219
Keybarbin	3,707	Wyong	726
Kippara	5,554	Yabbra	8,417
Kiwarrak	6,535	Yango	684
Knorrit	5,081	Yarratt	2,381
Koreelah	708	Yessabah	1,887
Grand Total			**828,639**

Table 4: List of candidate state forests in the South Coast assessment area.

State Forest	Area (Ha)	State Forest	Area (Ha) within project study area
Badja	4839	Moruya	4059
Bateman	1	Mumbulla	6137
Belanglo	3891	Murrah	4215
Benandarah	2761	Nadgee	20537

State Forest	Area (Ha)	State Forest	Area (Ha) within project study area
Bermagui	1861	Nalbaugh	4396
Bodalla	24079	Newnes	281
Bolaro	1779	North Brooman	3631
Bombala	620	Nowra	521
Bondi	12742	Nullica	18298
Boyne	6161	Nungatta	887
Broadwater	167	Penrose	1986
Bruces Creek	791	Shallow Crossing	3855
Buckenbowra	5193	Shoalhaven	104
Cathcart	1735	South Brooman	5587
Clyde	3587	Tallaganda	1363
Coolangubra	8489	Tanja	867
Corunna	183	Tantawangalo	2466
Currambene	1695	Termeil	698
Currowan	11977	Timbillica	9144
Dampier	33746	Tomerong	212
East Boyd	21010	Towamba	5471
Flat Rock	4896	Wandella	5492
Glenbog	4641	Wandera	5198
Gnupa	1318	Wingello	3975
Jellore	1411	Woodburn	10
Jerrawangala	268	Yadboro	10750
Kioloa	171	Yambulla	47108
Mcdonald	3684	Yarrawa	179
Meryla	4554	Yerriyong	6604
Mogo	15498	Yurammie	4050
		Total	352931

2.5 Project Team

This project was completed by the Ecology and Classification Team in the OEH Native Vegetation Information Science Branch. It was initiated and funded by the NSW Environment Protection Authority under the oversight of the Director, Forestry Branch.

The project was managed by Daniel Connolly. Doug Binns undertook the floristic analysis of survey plots, and has interpreted the relationships and relatedness between relevant vegetation communities. Allen McIlwee performed the spatial analysis including fine scale modelling of alluvial floodplain extent, and broad scale predictive distribution modelling. Owen Maguire, Craig Harré, Bob Wilson and Mark Fisher undertook API mapping using 3D stereo imagery and botanical survey was completed by Doug Binns, John Hunter, Stephanie Horton and David Thomas with assistance from Shawn Capararo, Katrina Ismay, Daniel Connolly and Ken Turner.

3 Methodology

3.1 Approach

Analysis and mapping was guided by the general principles and particular interpretation of the TECs adopted by the TEC Project Reference Panel, described in Section 1.2. For the purpose of this project, LTRF, LORF, MURF and LRFP are interpreted from Floyd suballiances using more recent classifications as a basis for comparison. A major part of our assessment was to allocate all relevant systematic plot data to quantitatively-defined floristic communities. We used the most recent regional classifications as a base, but we also conducted a separate rainforest analysis. For the north coast study area, substantially more rainforest plots are now available than were used for previous classifications and we considered that the likelihood of needing to define additional rainforest floristic communities is high.

In the case of Lowland rainforest on floodplain, the final determination does not cite a map resource that can be used as a primary layer to guide the location or interpretation of suitable landscape features used in the TEC definition. Without consideration of landform features, it is not possible to interpret the floristic component of the final determination (other than for suballiance 3), in any useful practical sense, because the vagueness of the qualifying language defies a consistent interpretation. Since the date of the determination, a set of maps of landform features has been developed which allows parts of the cited communities that are mapped on floodplains or mapped on alluvial soils to be distinguished to some extent, although the scale is not always suitable for our purpose and finer-scale alluvial features are omitted (Troedson & Hashimoto, 2008). There is no reference to these maps in the final determination. In addition to these maps, we have developed a fine scale alluvial model, described in Section 2.2.2, to map areas of potential alluvial features. We used these later maps as our primary source for the identification of alluvial landscapes.

For MURF the final determination relates the assemblage to several specific geological attributes; Milton monzonite, Conjola Formation enriched by Monzonite and deep alluvium. We assessed available geology mapping to identify these features but included any plots located in the locality as part of our assessment of LORF owing to shared relationships to suballiance 14 in Floyd (1990).

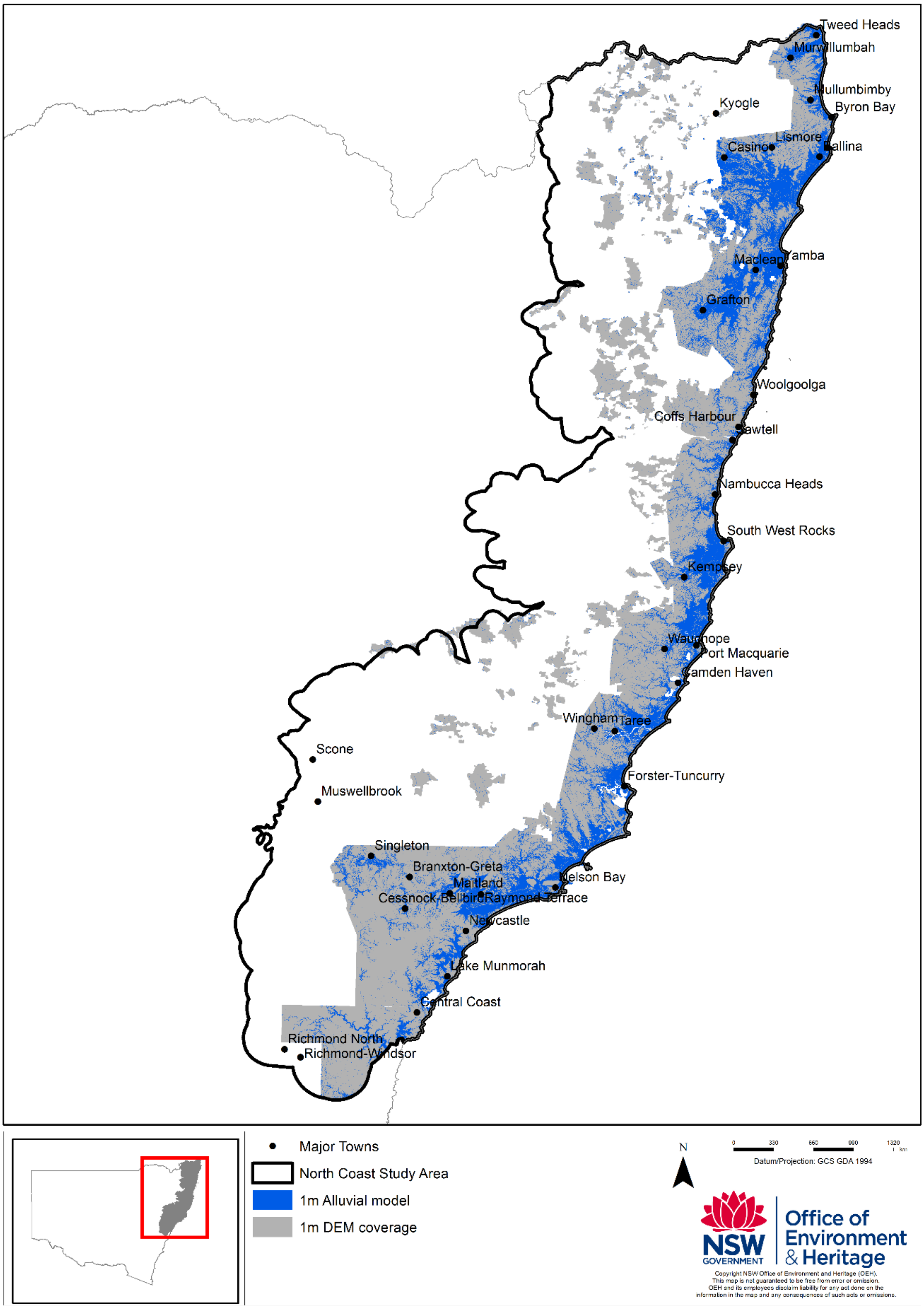
Because of the subjective nature of Floyd's classification, we were not able to consistently assign any systematic survey plots to a suballiance in a direct manner. Accordingly, we first defined vegetation groups quantitatively and then assigned those groups to the most similar suballiance based on extent of floristic similarity. As the basis for our quantitative analysis we used plots in which standard floristic data have been collected. This comprised data already held in the OEH VIS flora survey database (over all tenures), and data collected specifically for this project in state forests, (some of which we collected in Floyd's reference sites). We used a number of methods for analysis, including both hierarchical clustering and fuzzy clustering. We then compared the results of quantitative analyses with the classification described by Floyd (1990), to assess the extent to which vegetation groups defined from plot data relate to suballiances cited in the final determinations. There are no objective thresholds for assessing the degree of relationship and likelihood that a vegetation group belongs to a TEC, but our approach using plot-based floristic comparison provides a means of consistently allocating plots to being either TEC, or not, for a range of interpretation options.

3.2 Identifying Floodplains

3.2.1 Fine Scale Alluvial Model

We generated a fine scale digital representation of landscape elements in the study area that are likely to be associated with the range of floodplain and alluvial descriptors offered by the final determination for LRFP (Map 3). The concept for the model is that floodplain and alluvial environments relevant to LRFP occur in areas which are flat or have low slope and which receive either run-on flow, pooling or overbank flow at above particular thresholds, which vary with slope and catchment size. The model uses a 1 metre resolution, filled digital elevation model (DEM) derived from LiDAR data to calculate flow accumulation, elevation above stream channels along the lines of flow, and slope. Stream channels are defined at catchments >= 0.5 hectares. Thresholds are applied to combinations of the three variables to delineate areas of potential alluvium or floodplain. Our alluvial model represents our finest scale representation of alluvial landforms present on state forest across the study area.

<u>Map 3:</u> Distribution of modelled alluvium on the North Coast as derived from a 1 metre DEM



3.3 Existing Vegetation Data

3.3.1 Existing Vegetation Classifications

The primary classification cited in the final determinations for all four TECs is the classification into suballiances described by Floyd (1990). Suballiances have been subjectively defined, are based on variable search areas rather than plots, and most are not readily diagnosed in a consistent manner. Floyd describes common or frequent canopy species for some suballiances and these are potentially useful as diagnostic species in some cases. The most reliable source of primary floristic information on composition of suballiances is provided by the data recorded on microfiche enclosed in Floyd (1990). This data comprises lists of species at localities regarded by Floyd as representative of each suballiance. There are 238 sites overall and up to six such sites for each suballiance. There are additional data for a further 496 sites he collected which may be attributable to suballiances based on descriptions in Floyd (1990), but for these, we found there is some uncertainty regarding the extent to which the location for the site list matches the location which is described under a particular suballiance. Data for both sets of lists have been digitised and are available in the OEH VIS database. Due to the very variable search area and the scoring method applied, (which is not consistent with most plot-based data), we believe that combining data from these lists with plot data for a single quantitative analysis is unlikely to provide interpretable results.

Four recent regional classifications, based on plot-based floristic data, overlap our rainforest study area: Northern Rivers (OEH, 2012), Hunter-Central Rivers (Sivertsen et al 2011), Sydney Basin (OEH, in prep) and South Coast (Tozer et al 2010). These classifications post-date the original determinations, hence the described vegetation communities are not cited in any of the final determinations and cannot be used directly as reference points for TEC assessment. However, they provide an existing framework to allow us to put the results of our separate rainforest analysis into context.

3.3.2 Existing Vegetation Data

A recent review of OEH systematic flora survey data holdings in eastern NSW (OEH in prep) was available for the project. The review identified a subset of data suitable for use in quantitative vegetation classification on the basis that it met a set of predefined criteria, namely that plots:

- provided location co-ordinates with a stated precision of less than 100 metres in accuracy
- covered a fixed survey search area of approximately 0.04 hectares
- supported an inventory of all vascular plants
- provided a documented method that assigns a quantitative and/or semi quantitative measure of the cover and abundance of each species recorded

We used a subset of full floristic data in fixed area plots (0.04 to 0.1 hectares in size) in the OEH VIS database. We also collected additional field data for our project in 0.04 ha plots. These included some plots which we located in patches of rainforest vegetation described by Floyd as belonging to a particular suballiance, for some suballiances cited in the Lowland Rainforest or Lowland Rainforest on floodplains final determinations.

From the full set of floristic plots, we defined a core group of 1864 rainforest plots for eastern NSW, comprising those which had a cover-abundance score of 3 or more (representing at least 5% projective foliage cover) for any rainforest tree species (being species included as rainforest trees in Floyd 1989), and a cover-abundance score of < 3 for all eucalypts (including species of *Angophora, Syncarpia* and *Corymbia*). We used a total of 6845 plots for analysis, including both rainforest and potentially related eucalypt-dominated vegetation with mesophyll shrub understorey (wet sclerophyll forest in the broad sense, as defined by plots assigned to this class in existing regional classifications).

3.3.3 Data Preparation and Taxonomic Review

All species in the pooled dataset was standardised for analysis using a review completed for all flora survey data compiled for the Eastern NSW Classification (OEH in prep). Nomenclature was standardised to follow Harden (1990-93; 2000-2002) and updated to reflect currently accepted revisions using the PlantNETWebsite (Royal Botanic Gardens, 2002). The data was amended to:

- exclude exotic species
- exclude species identified to genus level only
- improve consistency in assignment of subspecies or varieties to species.

Cover and abundance score data extracted from the pooled data set was standardised to a six class modified braun-blanquet score. The transformation algorithm available within the OEH VIS Flora Survey data analysis module was applied to the analysis dataset.

3.4 New Survey Effort

3.4.1 Survey Stratification and Design

Our new survey had two purposes: (1) to obtain standard plot-based floristic data for cited suballiances at suballiance reference sites described by Floyd (1990); and (2) to sample previously unsampled rainforest and adjacent eucalypt forest in a range of low elevation sites which we considered likely to support rainforest TECs. In the first case, our objective was to make a direct comparison between the sampled suballiance and communities defined from quantitative analyses. We gave priority to primary suballiances cited in the final determinations. We selected plots using digital aerial imagery of the suballiance locations, aiming to sample areas which had a well-developed rainforest canopy and relatively little evidence of disturbance. We chose a minimum of two plots in each suballiance rainforest patch. For the second purpose, we used preliminary predictive models based on suballiance reference sites to extrapolate likely occurrences of rainforest TECs, particularly LORF, and selected plots from those in a similar manner as described above for Floyd suballiance sites.

3.4.2 Survey Method

Systematic flora survey were conducted in accordance with OEH standard methods (Sivertsen, 2009). Preselected sample points were located in the field using a global positioning system (GPS). In the field, plots were assessed for the presence of heavy disturbance (such as severe disturbance through clearing or weed infestation) and were either abandoned or moved to an adjoining location in matching vegetation.

Systematic floristic sample plots were fixed to 0.04 hectares in size. The area was marked out using a 20 by 20 metre tape, although in some communities (such as riparian vegetation) a rectangular configuration of the plot (e.g. 10 by 40 metres) was required. Within each sample plot all vascular plant species were recorded and assigned estimates for foliage cover and number of individuals. Raw scores were later converted to a modified 1-8 Braun-Blanquet scale (Poore, 1955) as shown in Table 5.

Table 5: Braun Blanquet-to-cover abundance conversion table.

Modified Braun Blanquet 6 point scale	Raw Cover Score	Raw Abundance Score
1 (<5% and few)	<5%	≤3
2(<5% and many)	<5%	≥3
3 (5-25%)	≥5 and <25%	any

4 (25%-50%)	≥25% and <50%	any
5 (50%-75%)	≥50% and <75%	any
6 (75%-100%)	≥75%	any

Species that could not be identified in the field were recorded to the nearest possible family or genus and collected for later identification. Species that could not be identified confidently were lodged with the NSW Herbarium for identification. At each plot estimates were made of the height range, projected foliage cover and dominant species of each vegetation stratum recognisable at the plot. Measurements were taken of slope and aspect. Notes on topographic position, geology, soil type and depth were also compiled. Evidence of recent fire, erosion, clearing, grazing, weed invasion or soil disturbance was recorded. The location of the plot was determined using a hand held GPS or a topographic map where a reliable reading could not be taken. Digital photographs were also taken at each plot.

3.5 Classification Analyses

3.5.1 Clustering

We used the following steps for analysis:

1. Hierarchical agglomerative classification of all eastern NSW core rainforest plots (as defined above under Section 2.3.2) to define initial groups. We used the ASO and FUSE modules in PATN (Belbin, 1988), using the Bray-Curtis association measure and beta value of -0.1. We chose a classification level which was consistent with groups defined by previous regional classifications (Tozer et al, 2010; OEH, 2012, Sivertsen et al 2011, OEH, in prep) but which allowed recognition of separate floristic groups related to other related Floyd suballiances.
2. Fuzzy clustering ('Noise Clustering', De Cáceres, Font, & Oliva, 2010; Wiser & De Cáceres, 2013) of all rainforest plots and potentially related vegetation (broadly, all wet sclerophyll forests), using initial groups from our rainforest classification plus previously defined wet sclerophyll communities (from existing regional classifications) as fixed groups. Noise Clustering requires specification of a fuzziness coefficient (where a coefficient of 1 is equivalent to hard clustering which allocates each plot to only one community) and a threshold distance for outliers. We chose a fuzziness coefficient of 1.1 and an outlier threshold of 0.8. These parameters resulted in results which were relatively robust to different sets of data and which had a high degree of consistency, where appropriate, with previous classifications. Analyses were completed using functions in the 'vegclust' package in R 3.1.1.

3.5.2 Multivariate regression

We used multivariate regression to make pair-wise comparisons of selected pairs of communities to test their degree of floristic similarity to other pairs, using the 'mvabund' package in R3.1.1 (Warton, Wright, & Wang, 2012). This method does not rely on calculation of dissimilarities so provides an independent comparison with distance-based methods. For each pair, the difference in summed AIC is calculated, summed across all species in both communities combined, between a null model and a model using community as the factor. The difference in summed AIC provides a relative measure of the extent to which recognising two separate communities provides a better model of species occurrence than does a single combined group. A higher difference indicates communities which are more clearly distinct. A difference close to zero, or negative, indicates no distinction between groups.

We also used the results of multivariate regression to identify species which are most strongly characteristic of difference between groups. Species with the highest difference between AIC for the group model and that for the null model are those with most diagnostic value.

3.5.3 Comparison with Floyd suballiances and final determination lists

Our objective for floristic analysis was to define rainforest groups using numerical classification which can be comparatively related to previously described rainforest suballiances (Floyd 1990). As noted in Section 2.3.1, suballiances have been subjectively defined and are based on variable search areas rather than plots. We used both the primary suballiance reference sites (238 sites for which floristic composition is recorded on microfiche enclosed in Floyd 1990) and the other secondary 496 sites for which data are available but not recorded on Microfiche and for which suballiance is not necessarily recorded.

For our analysis, we separated the primary Floyd suballiance reference sites from the secondary Floyd data, rather than aggregating to suballiance level. This is because the composition of sites may vary substantially within a suballiance. The number of species listed for the various suballiance sites varies greatly, with a range of 5-267, which makes absolute comparisons potentially misleading because the results are affected by the total number of species. In particular, suballiance sites 34-6, 028-2 and 021-3 have unusually high numbers of species and appear to be composites. To account for this variation, we used both absolute and relative comparisons and we relied more on relative comparisons in cases where the greatest absolute similarity was to one of the sites with very high number of species. In addition to considering floristic similarity, we also took into account the location and environment of the plots in a community, and the extent to which these were consistent with the most similar suballiance sites.

To compare our rainforest groups with suballiances and with the final determination species assemblage lists, we calculated the mean proportion of species per plot in each community, which are shared with the suballiance list or determination species lists. We did not use suballiance lists directly in clustering analyses because of their variable search area and numbers of species. We used mean proportion to rank communities by their likelihood of belonging to a suballiance and thereby a rainforest TEC. We made both absolute comparisons and relative comparisons. For relative comparisons across suballiances for a floristic group or community, we note that the mean proportion of species depends on the size of the assemblage list as well as the degree of floristic relationship. For these comparisons, we expressed the mean proportion as a percentage of the highest mean for each suballiance site and also as a proportion of the expected maximum for the number of species for each suballiance site. We estimated the expected maximum by fitting a smoothed curve to a plot of number of species against maximum proportion for all 734 suballiance sites. Some suballiance reference sites appear to be composites from several related sites. As such they have unusually high numbers of species and inflate the observed proportions, giving a misleading indication of relationships. For floristic groups which had high degree of similarity to these, we also checked for consistency with other similar suballiance sites.

3.5.4 Assessment of quantitative floristic groups as TEC

We assessed the likelihood of one of our rainforest floristic groups or existing vegetation communities belonging to a TEC based on several factors:

1. Identifying the suballiance to which it was most similar, whether this suballiance was a principle or related suballiance cited in a final determination. We also assessed the extent to the group was similar to any principle suballiance cited in the final determinations using comparisons described in 2.5.3. We used the median proportions (absolute and relative) for all rainforest and wet sclerophyll groups as a threshold. If a floristic group had both absolute and relative proportions below this threshold, we considered that it could not be assigned to any suballiance and its

likelihood of belonging to a rainforest TEC was based on other factors. Otherwise, we generally assigned it to the suballiance with the highest mean proportion for the group. If a group consistently had its highest mean to a suballiance site using either absolute or relative proportions, we were able to confidently assign it to that suballiance. In other cases, we could assign to one suballiance, or one of several possible suballiances, with varying degrees of confidence. We also considered whether there were other suballiance sites, which were below the maximum proportion but close to it, especially if they were TEC principal suballiance sites. We used a precautionary approach, so that where relationships were ambiguous, we gave precedence to TEC principal suballiances.

2. The extent to which it included plots with > 5% projective foliage cover of eucalypts and the extent to which a eucalypt species was among the most frequent species. We considered that our groups with over half their plots with eucalypt cover >5% were unlikely to belong to rainforest TECs, unless they had very strong floristic relationships with a TEC principle suballiance.
3. For Lowland rainforest TEC, the extent to which it occurred below 600 metre elevation (in North Coast Bioregion) or 350 metre elevation (in Sydney Basin Bioregion). We considered that our rainforest groups for which over 50% of plots occurred above these thesholds were unlikely to belong to LORF.
4. For Lowland Rainforest on Floodplain TEC, the extent to which plots occurred on or adjoining our mapped alluvial model;
5. For Littoral Rainforest, the extent to which plots occurred in proximity to the ocean or areas of maritime influence.
6. For Milton Ulladulla Subtropical Rainforest the extent to which plots occurred in proximity to Monzonite and related igneous substrates.

3.6 Indicative TEC Distribution Map

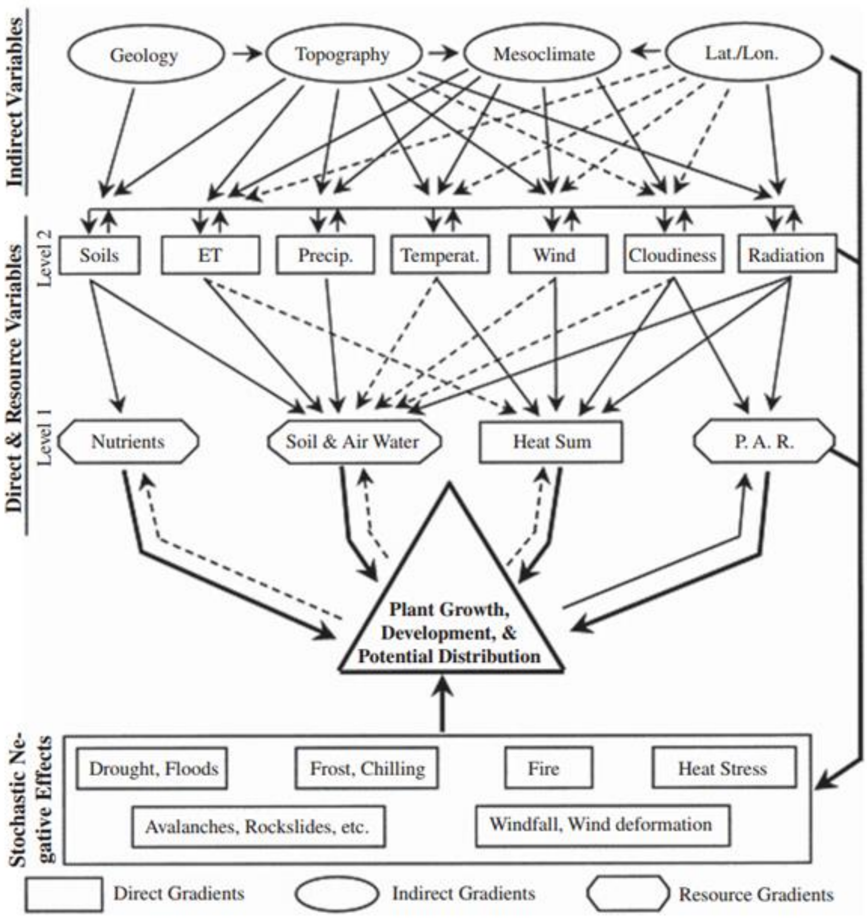
3.6.1 Background

A niche modelling approach (also known as species or habitat distribution modelling) was used to create indicative potential distribution map of each of the TEC communities. This approach attempts to extrapolate the fundamental niche of the TEC in question outside the locations where it is known to be present (its realized niche), by relating known occurrence and absence to environmental predictors.

Modelling the distribution of a TEC requires the characterisation of environmental conditions that are suitable for the community to exist. The inclusion of the absence data from the plot allocation allows us to constrain the potential distribution model to a narrow set of favourable environmental conditions that are not occupied by other vegetation communities.

Ecological niche modelling involves the use of environmental data describing factors that are known to have either a direct (proximal) or indirect (distal) impact on a species or ecological community. Proximal variables directly affect the distribution of the biotic entity, while distal variables are correlated to varying degrees with the causal ones (Austin, 2002). Austin & Smith (1990) differentiate between indirect gradients, which have no physiological effects on plants, and direct or resource gradients, which directly influence plant growth or distribution. Direct or resource gradients mainly concern light, temperature, water and nutrients, whereas the main indirect gradients are altitude, topography and geology (Austin & Van Niel 2011). An environmental variable may act both as a resource that provides building blocks for growth processes and as a condition that fulfils the requirements for physiological processes to function effectively.

Diagram 2 provides a basic conceptual framework for how plant communities are likely to respond to their environment. Arrows in the figure show how particular indirect variables interact to generate more direct environmental drivers through biophysical processes. Note plant distributions are also influenced by stochastic processes such as extreme heat or cold, landslip or erosion, high winds, drought, flood and fire. However, in niche modelling, we assume that the composition of vegetation is primarily determined by environment rather than successional status or by time since last disturbance (Franklin 1995). It is also assumed that vegetation is in equilibrium with the environment, or at least a quasi-equilibrium where change is slow relative to the life span of the biota.

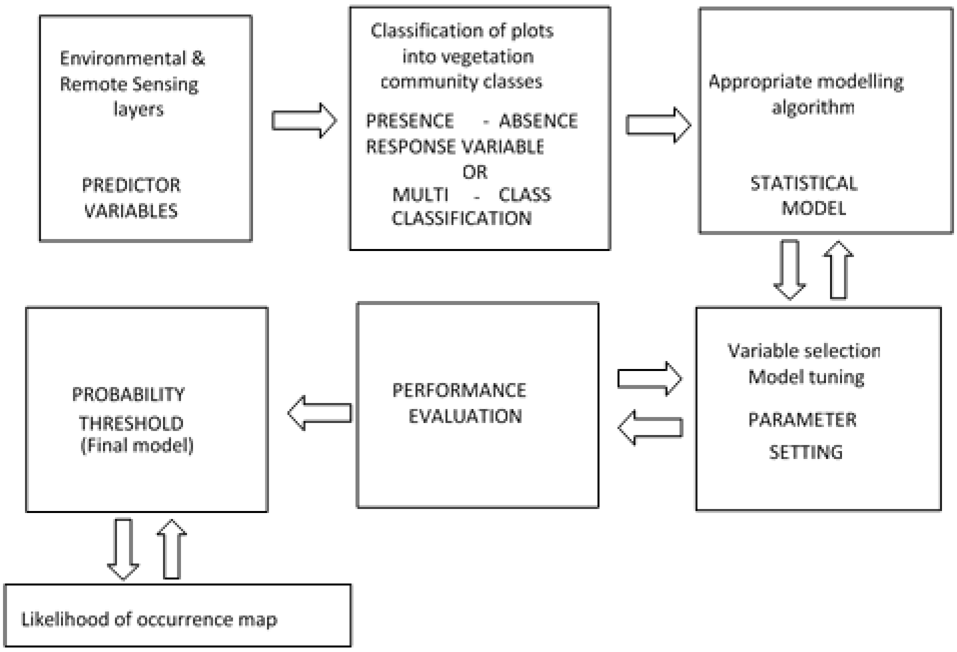


<u>Diagram 2</u>: Conceptual model of relationships between resources, direct and indirect environmental gradients and their influence on growth, performance and geographical distribution of plants and vegetation communities in general. Source: Guisan and Zimmermann (2000; Figure 3).

Diagram 3 provides an overview of the step by step modelling process, which involves a 'classification-then-modelling' approach (Ferrier et al. 2002) with two distinct stages. In the first stage the biological survey data are subjected to a vegetation classification and full-floristic vegetation plots are allocated to presence/absence category for each TEC. This classification is run without any reference to the environmental data. In the second stage the community-level TEC entities defined by the classification are modelled as a function of environmental predictors. Each of the TEC communities have been modelled separately by relating the observed presence or absence of the community to available environmental predictors. Alternatively, it is possible to fit a model to all communities simultaneously by treating community membership as a multinomial response (e.g. using multinomial boosted regression trees).

The statistical model refers to the choice of (i) a suitable machine learning algorithm for predicting a presence-absence response variable and its associated theoretical probability distribution, and (ii) choice of an appropriate variable selection procedure that either has the goal of optimising prediction accuracy or interpretability.

Diagram 3: Process for creating indicative TEC distribution maps



3.6.2 Modelling complex ecological systems

The niche modelling community has made considerable headway in developing machine learning alogrithms to predict the occurrence of species and communities using presence-absence data (Evans and Crushman 2009). The methods model vegetation patterns as continuous measures of site suitability or probability of occupancy. Non-parametric approaches such as Classification and Regression Trees (CART) have gained widespread use in ecological studies (De´ath and Fabricius 2000). However, CART suffers from problems such as over-fitting and difficulty in parameter selection. Solutions to deal with these issues have been proposed that incorporate iterative approaches (Breiman 1996). One approach, Random Forests (Brieman 2001) has risen to prominence due to its ability to handle large numbers of predictors and find signal in noisy data (Cutler et al. 2007). Another advantage of Random Forests is that, by permutation of independent variables, it provides local and global measures of variable importance.

Random Forests is an algorithm that developed out of CART and bagging approaches. By generating a set of weak-learners based on a bootstrap of the data, the algorithm converges on an optimal solution while avoiding issues related to CARTs and parametric statistics (Cutler et al. 2007). Ensemble-based weak learning hinges on diversity and minimal correlation between learners. Diversity in Random Forest is obtained through a Bootstrap of training, randomly drawing selection of M (independent variables) at each node (defined as m), and retaining the variable that provides the most information content. To calculate variable importance, improvement in the error is calculated at each node for each randomly selected variable and a ratio is calculated across all nodes in the forest.

The algorithm can be explained by:

1. Iteratively construct *N* Bootstraps (with replacement) of size *n* (36%) sampled from *Z*, where *N* is number of Bootstrap replicates (trees to grow) and *Z* is the population to draw a Bootstrap sample from.
2. Grow a random-forest tree T_b at each node randomly select *m* variables from *M* to permute through each node to find best split by using the Gini entropy index to assess information content and purity. Grow each tree to full extent with no pruning (e.g., no complexity parameter).
3. Using withheld data (OOB, out-of-bag) to validate each random tree T_b (for classification
OOB Error; for regression pseudo R^2 and mean squared error).
4. Output ensemble of random-forest trees

$$\{T_b\}\frac{B}{1}$$

To make a prediction for a new observation x_i:
Regression:

$$\hat{f}_{\mathrm{rf}}^{B}(x) = \frac{1}{B}\sum_{b=1}^{B} T_b(x)$$

Classification: Let $\hat{C}_b$ (*x*) be the class prediction of the *B*th random-forests tree then

$$\hat{C}_{rf}^{B}(x) = \text{majorityvote}\left\{\hat{C}_b(x)\right\}\frac{1}{B}$$

Commonly, the optimal *m* is defined for classification problems as sqrt (*M*); and for regression *M*/3, where *M* is a pool of independent variables. It is widely recognised that Random Forest is robust to noise even given a very large number of independent variables (Hastie et al. 2009).

All Random Forest modelling was performed in the statistical software package R version 3.3.0.

3.6.3 Spatial Data and the variable selection process

A set of 175 variables were available for modelling. These include a set of 1) 130 continuous environmental variables relating to climate, topography and Euclidean distance to features such as the coast, permanent water bodies and various stream orders, 2) 32 variables derived from Landsat and Spot 5 imagery, and 3) 13 categorical variables such as great soil group and single dominant lithology type, which were extracted from statewide corporate geographic information system (GIS) layers. All variables were in the form of gridded Erdas Imagine rasters (*.img), with exactly the same cell size (30 x 30 metre) and extent.

The raster layers were stacked in R using the Raster Package (Hijmans and van Etten 2014). The grid cell values for each of the 175 potential predictor variables were extracted for each site in the allocation file using a customised script in R, and the resulting csv file loaded into R. To improve model fit we tested for multicollinearity between the site values across the predictors using the “multicollinear” function in the rfUtilities library using a significance value of 0.001. To check whether the collinear variables were in fact redundant, we performed a "leave one out" test which identifies whether any variables are forcing other variables to appear multicollinear.

Random Forest models are a good starting point for making inferences about the factors driving the distribution of a plant species or ecological community. However, they are data driven models, whose purpose is to give the best possible predicted extent for the data available, and the complexity of spatial pattern. Variable selection is a crucial step in the modelling process. We used a variable selection procedure developed by Murphy et al. (2010) which standardizes the relative importance values of predictors to a ratio and iteratively subsets variables within a given ratio, running a new model for each subset of variables. Each resulting model is compared with the original model, which is held fixed. Model selection is achieved by optimizing model performance based on a minimization of both "out-of-bag" error and largest "within-class" error for classification. There is also a penalty for the number of variables selected in a model, resulting in a preference for the lowest number of predictors from closely competing models.

For each model generated, we also checked whether the shape of the fitted functions made sense based on our knowledge of the types of environments that the TECs occupy. When a TEC did not model well into the environments we expected it to occur, we went back and re-examined the site allocation, and made a decision on whether to split the TEC into different communities or sub-types, that each may respond to different environmental drivers.

We also ran Random Forest models using three types of predictor sets. The first used the full set of continuous environmental variables, with the aim of predicting the potential distribution (realised niche) of the TEC in its broadest sense. The second used a combination of continuous environmental and remote sensing variables. The inclusion of remote sensing variables added information about the spectral characteristics of vegetation itself, and its dynamics through time, giving a better reflection of the actual as opposed to potential distribution of the TEC. Categorical variables were not incorporated into the models directly, but the data was occasionally used to compare frequency histograms across presence and absence sites to see if a distinct preference for particular soil type or fertility class existed. However, since the number of absence sites greatly outnumbered the presences, there is generally insufficient data to draw conclusions about clear preferences for one group of soil classes over another.

Through a series of initial trials, we found a third hybrid approach produced the best set of predictors for modelling. Here we used the variable selection process described above to identify a subset of 30 environmental predictors out of the 130 available. We then added the 32 remote sensing variables and reran the same variable selection process, selecting out two subsets, one with 15 and the other with 30 predictors. These numbers were set *a priori* since previous modelling had suggested that a minimum of around 12 predictors (those with the highest relative influence values) was generally needed to get a levelling out of the performance curves (see below). Beyond this stabilisation point, one could double or triple the number of predictors in a model, but this would have little effect on overall performance since the new predictors tended to have a very small influence on the model.

3.6.4 Model performance and EEC-Habitat relationships across the various TECs

As a means to assess model performance, we plotted the predicted probability of occurrence (PO) values for all plots allocated to a TEC (in descending order) against the same number of highest ranked absence plots. We defined a good model as having high PO values across the majority of TEC presence sites, dropping sharply at the end for those plots that occupy marginal environmental space (these could potentially be misclassified false positives). If there is no overlap in PO values for the lowest ranked presence sites and the highest ranked absence sites, performing a classification using any number between these two values will result in the correct prediction of 100% of presence and absence sites. In such a case there was no need to present a confusion matrix describing the percentage of sites correctly classified.

In most cases, environmental variables strongly dominated the set of 15 predictors, although occasionally one or two remote sensing variables were chosen. However, in the set of 30 predictors, it was common for a number of the original environmental variables to reduce and be replaced with some remote sensing variables. We found that models with 15 predictors generally had very good performance with 100% of sites allocated to the TEC and 100% of absence sites correctly classified. However, we also found that doubling the number of predictors generally resulted in a better model in that it provided greater discrimination using local scale habitat predictors. Although a tighter fitting, finer threaded potential distribution map was produced, it was sometimes unclear as to whether the additional variables picked up important variation not captured in the main set of 15 predictors, or whether they simply account for noise in the dataset.

To understand and evaluate the habitat relationships for each TEC, we used a combination of the scaled variable importance values for predictors and shape of the response functions in partial plots as a measure of the strength and nature of interactions.

3.6.5 Spatial Interpolation

We used the Random Forest models with 15 and 30 variables to create multiple 30x30m probability of occurrence maps for each TEC (and there community components) covering the entire study area. Using the performance plots described above, we identified a range of thresholds below the maximum PO across all absence sites to represent the area which the TEC has the potential to occur, and below which, we assumed the TEC is absent. Setting the threshold at the high end of probability of occurrence values for absence sites resulted in a relatively narrow predicted extent. While this tended to create a model that fitted well to the existing data, it was often such a tight model that also failed to capture some areas we considered hioghly likely to include TECs but supported limited field data. To capture the broader extent, we used a lower probability threshold. This had the effect of selectively extending the model out to cover a larger area (onto a number of sites classified in the site allocation as absent). However, at the slightly lower threshold, we felt more confident that we were capturing the broadest possible extent of the TEC, allowing us to make the decision as to which state forests had the potential to support the TEC, and which did not.

3.7 Aerial Photograph Interpretation (API)

There have rarely been attempts to distinguish rainforest floristic groups using aerial photo interpretation in NSW forests and we had insufficient data to do this in a consistent manner. We relied on API mainly to distinguish rainforest from non-rainforest vegetation, using our thresholds of a maximum of either 30% eucalypt crown cover or 70% crown cover of *Lophostemon confertus*, or both. We mapped all vegetation with visible rainforest (canopy, subcanopy or understorey), which was below both of these thresholds, as potentially rainforest TEC. These thresholds were agreed by the TEC Panel to include all vegetation likely to belong to any of the four rainforest TECs, based on the TEC Panel's interpretation of the final determinations. We believe these thresholds are appropriate for our purpose, but they may not be appropriate for defining rainforest vegetation in other contexts. We also used API to distinguish distinctive image patterns where possible, most notably the presence of *Araucaria cunninghamii* that was potentially useful for discriminating between rainforest floristic types relevant to rainforest TECs. *Araucaria cunninghamii* is reliably discriminated using API because of its unique crown form.

API technicians, experienced in interpretation of NSW forest and vegetation types, used recent high resolution (50 centimetre ground sample distance) stereo digital imagery, in a digital 3D GIS environment, to delineate observable pattern in canopy species dominance and understorey characteristics. Interpreters adopted a viewing scale between 1:1000 and 1:3000 to mark boundaries to infer changes in canopy and/or understorey composition. A mapping pathway and a set of attribute codes were established to ensure consistency in approach between interpreters. We used a minimum mapping polygon size of 0.5 hectares and a minimum polygon width of 20 metres as a guideline for interpreters.

Individual state forests were prioritised for new rainforest mapping on the basis of whether they supported confirmed evidence of any TEC either using our allocations of plot data to a relevant Floyd suballiance or predicted habitat based on our models.

To address rainforest occurring on floodplains, interpreters were provided with our detailed alluvial model as a start point for assessment. Rainforest and adjoining wet sclerophyll forest patterns were mapped as part of an integrated assessment of floodplain and alluvial vegetation communities.

3.8 Integration of Spatial Data

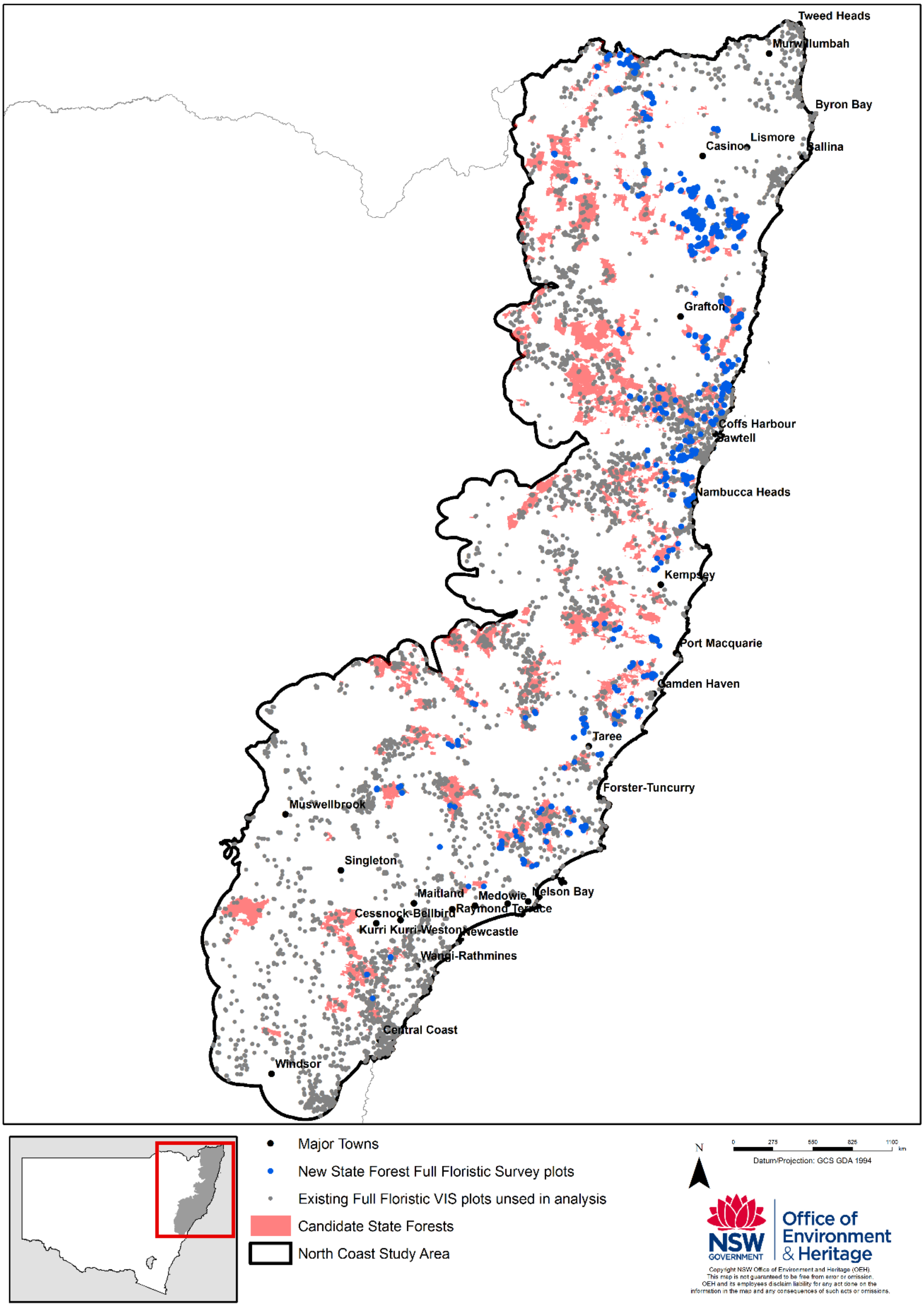
We used the final API line work, in combination with floristic plot data and prediction probabilities from the spatial models, to develop an operational map of rainforest TECs. Rainforest floristic patterns are relatively complex in relation to image patterns and environmental features and our data were limited in the context of the extent of spatial variation in floristic patterns. We did not rely on predictive models to assess rainforest TECs at a site scale. Instead, we used prediction probabilities to determine likelihoods associated with localities within which mapped rainforest patches are found (usually covering entire large API polygons of rainforest or groups of smaller polygons). Our assessments were conservative because we rarely had sufficient data to split or modify rainforest polygons and the TEC final determinations themselves are inclusive of rainforest assemblages that surround the primary suballiances found within mapped patches. As a general principle, we mapped rainforest as TEC if an API polygon or nearby polygon overlapped an area with prediction probabilities above our thresholds, unless there was clear evidence from plot data that the rainforest polygons belonged to floristic groups, which we assessed as not TEC. In cases where floristic data were sparse, we mapped cautiously and included all polygons within suitable environmental domains as TEC. For some state forests, we felt that we had insufficient data to make an informed decision to compile a map and omitted the area from our mapped result (see table 13).

4 Results

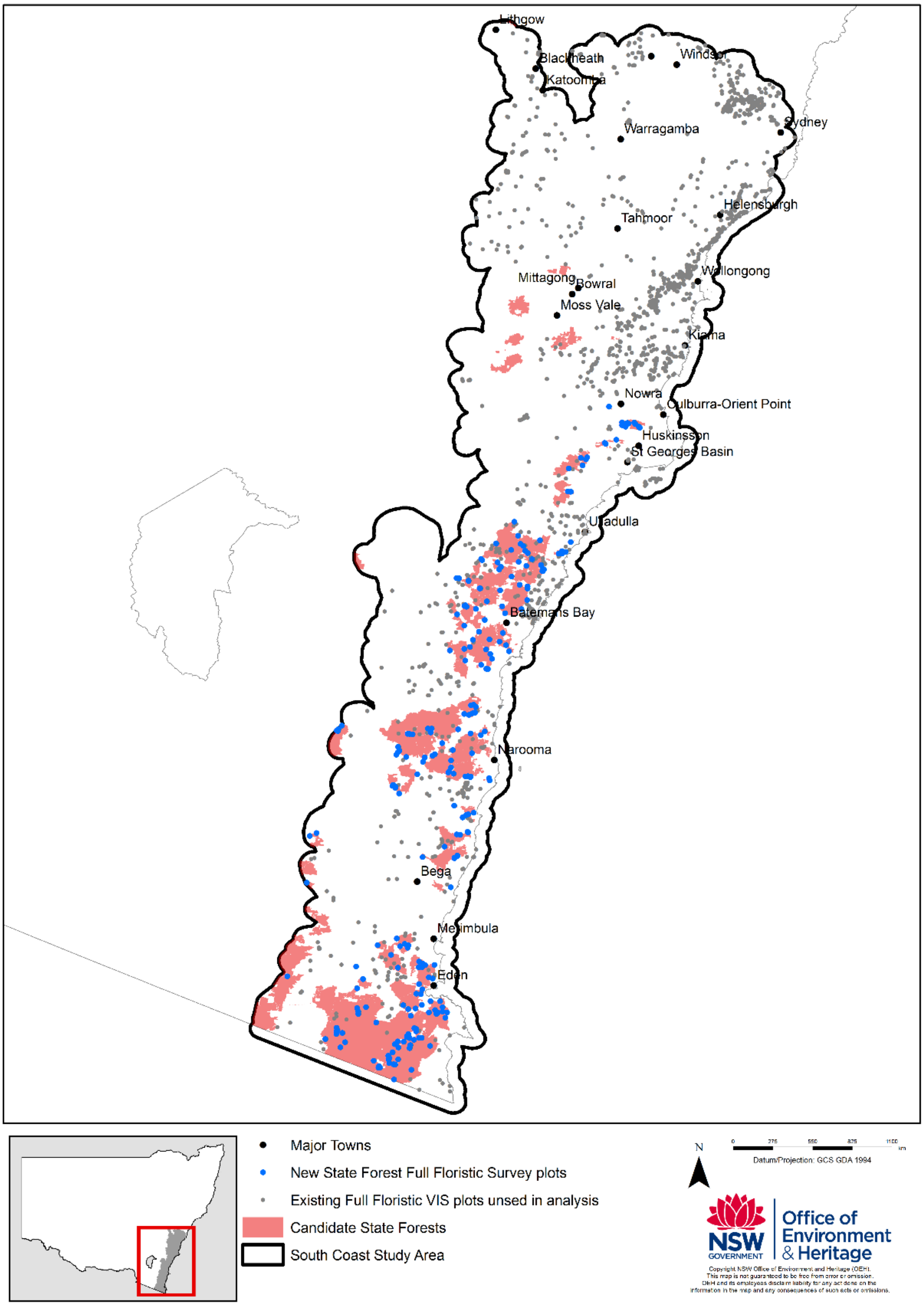
4.1 Survey Effort

Within our study area there were 6845 standard full-floristic plots in the OEH VIS database which we used for our initial analysis, 1228 of which are in State forest. This includes 322 plots that were surveyed specifically for our project. The location of these plots is shown in map 5 and 6 below for the north and south coast study areas.

<u>Map 5</u>: Location of 545 (blue) (including 322 rainforest samples) full floristic vegetation survey plots undertaken on state forest on the North Coast as part of this project and other (existing) full floristic plot data (grey) used in the analysis.



<u>Map 6</u>: Location of 310 (blue) (including 22 rainforest samples) new full floristic vegetation survey plots undertaken on state forest on the South Coast as part of this project and other (existing) full floristic plot data (grey) used in the analysis.



4.2 Classification Analyses

4.2.1 Relationships to existing classifications

Of the 6845 plots analysed, 2558 belonged to rainforest floristic groups in a very broad floristic sense, although many of these groups included a relatively low proportion of rainforest flora and may not be considered rainforest in a physiognomic sense. The remaining plots belonged to floristic groups with eucalypt overstorey or were otherwise not rainforest groups. Of the 192 rainforest groups, we allocated 153 groups (80%), comprising 2223 plots (87%), to one or a composite of suballiances.In many cases this assignment was uncertain due to a relatively low degree of similarity between floristic groups and suballiances and difficulty with the great variation in sites within some suballiances. The remaining 335 plots belonged to 39 groups which were not closely related to any of the suballiance sites. Some of these groups may represent vegetation communities which were not sampled by Floyd (1990) and which have not been previously described as rainforest communities.

The groups identified in our analysis comprise vegetation communities previously defined by regional classifications and new rainforest groups defined by our project. Rainforest groups and related eucalypt groups are summarised in Appendix 1, which also shows their relationships with Floyd's suballiance sites and with the final determination assemblage lists. In most cases floristic groups which are usually dominated by eucalypts (including Corymbia and Angophora, but not *Lophostemon* spp.), and represent wet sclerophyll forests (in the sense of Keith 2004), have a low degree of similarity to any rainforest suballiance. However, many rainforest groups, as we have defined them, include some plots with eucalypt canopy.

Based on our results, the plot data do not fully represent Floyd's suballiances. Suballiances which are well sampled by plot data include 28, 33, 37, 16, 7 and 21. This is broadly consistent with the widespread distribution of these suballiances on public land. Suballiances which appear to be unsampled by systematic plot data, but which occur below 600 metres elevation, are 2, 5, 9, 15, 17, 20, 22, 24, 25, 27 and 29. In some cases (2, 9, 24), this is because the suballiance has restricted distribution and there are no systematic sample plots within known areas of occurrence. In other cases, the quantitative analysis has not been able to distinguish separate floristic groups which correspond to these suballiances. This may be because there is only a weak relationship between overall floristic composition and the canopy composition or other features used by Floyd to classify sites into suballiances. Alternatively, in some cases there may be a floristic distinction but insufficient systematic plot data to determine that it exists. Suballiance (SA) 15 is an example of the former. As described by Floyd, this suballiance comprises a group of several geographically scattered sites. In our analysis, plots located in patches of SA15 were allocated to one of three floristic groups, each of which was more closely similar to lists for other suballiances (notably SAs 1, 8, 21 and 28) than SA15 sites. These three floristic groups were much more widely distributed in foothill and lower escarpment areas than suggested by the distribution of SA15 as described by Floyd.

4.2.2 Assessment of plots and communities as Rainforest TECs

Of 175 rainforest floristic groups which occurred solely or predominantly below 600 metres elevation, we assessed 53 groups as likely belonging to one of the four rainforest TECs. Our assessment for the 175 rainforest groups plus potentially related eucalypt groups is shown in Appendix 1, which includes the data we used to make the assessments. In some cases groups were almost equally similar to suballiances cited for two or more TECs and it was not clear to which TEC they should be assigned. Table 7 indicates the number of plots assigned to any of the four TECs across all land tenures.

Table 7 Number of Plots assigned to each of the TECs within the northern and southern study areas

	North Coast		South Coast	
	No. Plots assigned with high confidence	No. Plots assigned with lower confidence	No. Plots assigned with high confidence	No. Plots assigned with lower confidence
LTRF	71	89	72	18
LORF	63	47	77	n/a
LRFP	8	192	n/a	n/a
MURF	n/a	n/a	27	n/a

Lowland Rainforest (LORF)

A summary of findings in relation to the primary suballiances used to define LORF is provided in Table 6. The strongest matches between our floristic groups and the primary LORF suballiances relate to Suballiances 1, 21 and 22 on the north coast and parts of Suballiance 14 that occurs on the Illawarra escarpment in the south coast region.

We experienced difficulties in cases where floristic relationships were ambiguous and our results were not consistent with the distribution or other features of suballiances cited in final determinations. Two groups of relevance to State forests (although more widely distributed outside State forests), RF33 and RF201, were floristically similar to SA21 but were distributed south of Dorrigo (the southern limit of SA21 as described by Floyd 1990). Group 33 included some plots from the vicinity of SA15 reference sites and may be related to a component of SA15. However, this is contrary to the results of floristic analysis, and the group as a whole is more widely distributed than SA15 in the sense of Floyd 1990. Despite the ambiguity and inconsistencies, we assessed these groups as LORF. We had similar difficulty with group RF71, which includes plots from the vicinity of the northern reference sites for SA15, but is floristically similar to reference sites for SA1 and SA8. We also assessed group RF71 as LORF.

Floristic group RF34 is ambiguously related to both SA21 and SA28 and we could not be certain to which of these suballiances the most closely similar reference site belonged. We assessed this group as LORF as a precautionary measure.

Table 6: Summary of outcomes for primary suballiances relating to Lowland Rainforest (LORF) TEC

Primary Suballiance	Outcomes of analysis
1. Argyrodendron trifoliolatum suballiance	Assigned confidently to rainforest stands broadly matching the Floyd distributions. Difficult to distinguish from SA33 and SA28 between Kempsey and Grafton.
5. Castanospermum australe - Dysoxylum muelleri suballiance	Environments not present on SF and not currently represented in any systematic plot data
6. Archontophoenix - Livistona suballiance	Primarily related to sites with impeded drainage. Poorly resolved floristic assemblage. Several of our floristic groups related to SA6 plots but these are not present on state forest. Some palm dominant stands assigned to SA1/33 and are included in LORF. Primarily included within the Lowland Rainforest on Floodplain interpretation applied by this project.

14. Doryphora sassafras - Daphnandra micranthus - Dendrocnide excelsa Ficus-spp. - Toona suballiance	Assigned confidently to rainforest stands on the Illawarra Escarpment, foothills (LORF) and monzonite (MURF). We concluded SA14 in the Watagan Ranges on the Central Coast is more strongly related to the warm temperate SubAlliance 37. In the Barrington region the rainforests assigned to SA14 are more closely related to SA12.
15. Ficus spp. - Dysoxylum fraserianum - Toona - Dendrocnide suballiance	Not separable as a discrete rainforest assemblage. Reference sites visited for this suballiance in the northern part of its range are more strongly related to SA8, SA1 and SA21 and those in the Barrington-Taree region are closest to SA28
21. Araucaria cunninghamii suballiance	We were unable to distinguish floristic differences between SA21 and SA22 but for both combined we achieved similar distribution patterns to Floyd. Difficult to distinguish from SA33 and SA28 between Kempsey and Grafton
22. Flindersia spp. - Araucaria suballiance	

Lowland Rainforest on Floodplain (LRFP)

We have assessed some floristic groups as possible Lowland Rainforest on Floodplains TEC, in cases where they are similar to a cited suballiance and occur substantially in alluvial environments. We were otherwise unable to interpret the floristic nature of LRFP and for our purpose relied on environmental features to determine its occurrence.

Littoral Rainforest (LTRF)

We were able to relate most of the Floyd suballiances used to describe littoral rainforest to multiple groups in our floristic analysis (Appendix 1). On the south coast the primary suballiance (SA20) has few reference sites in Floyd (1990) that are near state forest with the unusual example at Bunga Head the closest. In this instance we relied on the existing classification (unit p210 Littoral Rainforest) of Tozer et al 2010 to provide a greater number of plots against which to compare new plots collected during this project.

Milton Ulladulla Subtropical Rainforest (MURF)

We assigned our rainforest group RF74 as Milton-Ulladulla Subtropical Rainforest. This group includes plots located at specific locations as described in the final determination and on mapped areas of Monzonite. We found RF74 also included plots located in rainforests on related igneous substrates in the Kiama and Wollongong regions. Collectively our RF74 is likely to encompass another TEC, Illawarra Lowlands Subtropical Rainforest.

4.3 Evidence of occurrence on state forest

Of 359 plots on State forest which belong to rainforest floristic groups, 53 belong to groups that we have assessed, (with varying degrees of confidence), as likely to be Lowland Rainforest TEC based on floristic relationships. Table 8 summarises the distribution of these plots among floristic groups. Individual plot locations and assignments are listed in Appendix 2.

Table 8 Distribution of plots in state forest among floristic groups assigned to Lowland Rainforest TEC

Floristic Group	TEC assessment	Number of plots with membership >=0.5	Number of plots with membership <0.5	Total number of plots
RF13	LORF/LRFP	1		1
RF16	LORF	1		1
RF201	LORFposs	2		2
RF202	LORF/LRFP	7		7
RF208	LORF/LRFP	2		2
RF33	LORFposs	2	1	3
RF34	LORFposs	4	1	5
RF44	LORF	17		17
RF6	LORF	1		1
RF71	LORF	10	2	12
RF92	LORF	1	1	2

4.3.1 Lowland Rainforest (LORF)

On the north coast, the most extensive of our floristic groups assigned to LORF in state forest are RF44, RF71 and RF202. RF44 is related to SA21 and is distributed north from Cherry Tree. RF71 appears to be a northern component of SA15, but is related to SA1 and SA8. RF202 is a lowland gully rainforest group occurring mainly in the vicinity of Coffs Harbour and is related to both SA1 and SA33.

Two plots on state forest in the south coast part of our study area belong to group RF92 which we have assessed as the SA14 component of LORF. The primary distribution of this Suballiance extends along the length of the Illawarra Escarpment and adjoining foothills. However these two plots are in the South East Corner Bioregion.. However, we have adopted a loose interpretation of bioregional boundaries, following guidance from the TEC Panel, and have assessed all of floristic group RF92 (SA14) in state forests as LORF. Although SA14 is also recorded in Floyd (1990) from the north coast, we have no evidence of it occurring in state forest north of Sydney.

Photo 1. For those suballiances cited in TEC final determinations we revisited many of the sites identified by Floyd (1990) as reference locations. In some instances these were located within tenures other than state forest such as here in Mallanganee National Park, an example of Suballiance 22. We used plots collected at these locations as a basis for comparison with all other rainforest and wet sclerophyll plots in our study area.

Photo 2. This rainforest patch in Girard State Forest near the Timbarra River is an example given of Suballiance 15 in Floyd (1990). It represents a northern outlier for this suballiance which is otherwise described from areas several hundred kilometres south at Dungog and the Southern Blue Mountains. Our analysis found the Girard state forest plots more strongly related to Suballiances 1 and 21 than the southern examples of Suballiance 15. While Suballiance 1 and 21 are both included within the Lowland Rainforest TEC it demonstrates the difficulties in assigning Suballiances to rainforest patches in a systematic manner.

Photo 3 On the South Coast, Suballiance 14 is included within the Lowland Rainforest TEC where it occurs in Sydney Basin Bioregion and at elevations less than 350 metres asl. The final determination suggests that the TEC does not extend south of the Hawkesbury River. However we found strong relationships between Suballiance 14 and plots located in rainforest along the Illawarra Escarpment including plots allocated to MURF TEC. However we identified only one plot in state forest in the South Coast region here at Mares Hill Flora Reserve, Yadboro State Forest. However this location is outside the Sydney Basin Bioregion and at 360 metres elevation. We included this plot within our reference locations (BMN09D1V) and extended our map beyond the stated bioregions.

4.3.2 Lowland Rainforest on Floodplain

For LRFP, we found no evidence of SA3, the primary cited suballiance for this TEC, in State forest. There were 19 plots which belonged to groups which we assigned to SA33, one of the suballiances which is implied by the final determination to be partially included in LRFP. Only a small proportion of these were in areas which could possibly be considered to be on a floodplain or alluvial subtrate. Due to the difficulties of making a floristic assessment in relation to the LRFP final determination, we simply assessed all rainforest on mapped alluvium as LRFP.

Photo 4 Lowland Rainforest on floodplain TEC was difficult to assign particular rainforest assemblages to it with any confidence. The final determination makes reference to SA3 as the primary unit, but we were unable to assign any plot sampled on state forest to this suballiance. The final determination also includes elements of 10 additional suballiances, including Suballiance 26 (*Waterhousia-Tristaniopsis laurina*) seen here in Myall River SF on an alluvial flat. We resolved to include this suballiance and any other rainforest assemblages occurring on our map of alluvial landscapes as the LRFP TEC.

4.3.3 Littoral Rainforest (LTRF)

We found only limited evidence of Littoral Rainforest occurring in state forest, with a single location within an alluvial flat in Nambucca State Forest identified from our models. We included this within our map of the LRFP TEC.

4.3.4 Milton-Ulladulla Subtropical Rainforest (MURF)

We found no evidence of MURF occurring in state forest.

4.4 Floristic Attributes of Lowland Rainforest TEC

The difficultly relating to the Lowland Rainforest TEC is that it comprises a number of floristically disparate communities or floristic groups, each of which is more similar to other, non-TEC communities than they are to each other. We have characterised the groups separately. Tables 9, 10 and 11 list the thirty most strongly characteristic species of the three groups which comprise most of the LORF in state forest. Our characteristic species are defined against 2558 plots in eastern NSW which we have assigned to rainforest communities.

Of the three groups, we are most confident that groups RF44 and RF71 are referable to LORF because they are clearly similar to primary suballiances (SA1 and SA21) cited in the final determination. Despite RF44 being most similar to a primary suballiance, it has a relatively low proportion of determination assemblage species among its most strongly diagnostic species. This is partly due to the floristically heterogeneous nature of the final determination which, despite the very extensive assemblage list (235 species), does not adequately cover the full range of variation of the suballiances assigned to the TEC.

We included RF202 as LORF, however, the relationships to suballiances are less distinct. It includes plots at Floyds suballiance 1 locations but the floristic group in which it occurs has stronger floristic relationships to suballiance 33, a secondary suballiance cited in the final determination. These secondary suballiances are included in LORF on the basis of their proximity to the primary suballiances. We included RF202 because it is likely to cover transitional rainforest assemblages relevant to LORF.

Table 9: The thirty most strongly characteristic species of the RF44 component of LORF in order of decreasing contribution to ΔsumAIC, using 22 plots assigned to RF44 with a high degree of confidence compared to the remaining 2534 plots, excluding those assigned to possible RF44. Species annotated with '(D)' are listed in the final determination assemblage. Mean is mean cover score over all plots including zeros. Median is derived from non-zero scores only. Zeros may represent small values, due to rounding.

Species	RF44 freq	RF44 mean	RF44 med	other freq	other mean	other med	ΔAIC
Casearia multinervosa	0.86	1.6	2	0	0.0	1	-175
Arytera divaricata (D)	1	2.5	3	0.04	0.1	2	-139
Gossia hillii (D)	0.68	1.1	1	0.01	0.0	1	-111
Gossia bidwillii (D)	0.86	1.8	2	0.03	0.1	2	-110
Uvaria leichhardtii	0.86	2.1	3	0.04	0.1	2	-102

Species	RF44 freq	RF44 mean	RF44 med	other freq	other mean	other med	ΔAIC
Aphananthe philippinensis	0.86	1.9	2	0.04	0.1	2	-102
Cupaniopsis parvifolia	0.73	1.4	2	0.02	0.0	2	-93
Alchornea ilicifolia (D)	0.86	1.6	2	0.05	0.1	1.5	-93
Elattostachys xylocarpa	0.59	1.1	2	0.01	0.0	1	-90
Siphonodon australis	0.59	0.9	1	0.01	0.0	2	-90
Austrosteenisia blackii	0.82	1.6	2	0.04	0.1	1	-88
Mallotus philippensis (D)	0.95	2.4	3	0.1	0.2	2	-86
Capparis arborea (D)	0.95	1.6	2	0.1	0.2	1	-84
Marsdenia pleiadenia (D)	0.5	0.8	2	0.01	0.0	1	-72
Cleistanthus cunninghamii	0.77	1.7	2	0.05	0.1	2	-72
Ixora beckleri	0.55	0.7	1	0.01	0.0	1	-70
Excoecaria dallachyana	0.32	0.6	2	0	0.0	2	-61
Secamone elliptica	0.32	0.6	2	0	0.0	1	-58
Croton insularis	0.45	1.1	2.5	0.01	0.0	1	-55
Bridelia exaltata	0.41	0.6	1	0.01	0.0	1	-52
Dendrocnide photinophylla	0.55	1.2	2.5	0.03	0.1	1	-51
Toechima tenax	0.27	0.8	3	0	0.0	2	-51
Araucaria cunninghamii (D)	0.59	1.2	3	0.04	0.1	2	-51
Cryptocarya bidwillii	0.32	0.8	3	0	0.0	1	-48
Capparis sarmentosa	0.23	0.4	2	0	0.0	0	-47
Drypetes deplanchei (D)	0.68	1.0	1	0.09	0.2	1	-44
Psydrax odorata	0.36	0.4	1	0.01	0.0	1	-42
Alyxia ruscifolia	0.64	0.6	1	0.07	0.1	1	-42
Pittosporum multiflorum (D)	1	1.9	2	0.39	0.7	2	-39
Croton acronychioides	0.23	0.3	1	0	0.0	1	-38

Table 10: The thirty most strongly characteristic species of the RF71 component of LORF in order of decreasing contribution to ΔsumAIC, using 13 plots assigned to RF71 with a high degree of confidence compared to the remaining 2542 plots, excluding those assigned to possible RF71. Species annotated with '(D)' are listed in the final determination assemblage. Mean is mean cover score over all plots including zeros. Median is derived from non-zero scores only. Zeros may represent small values, due to rounding.

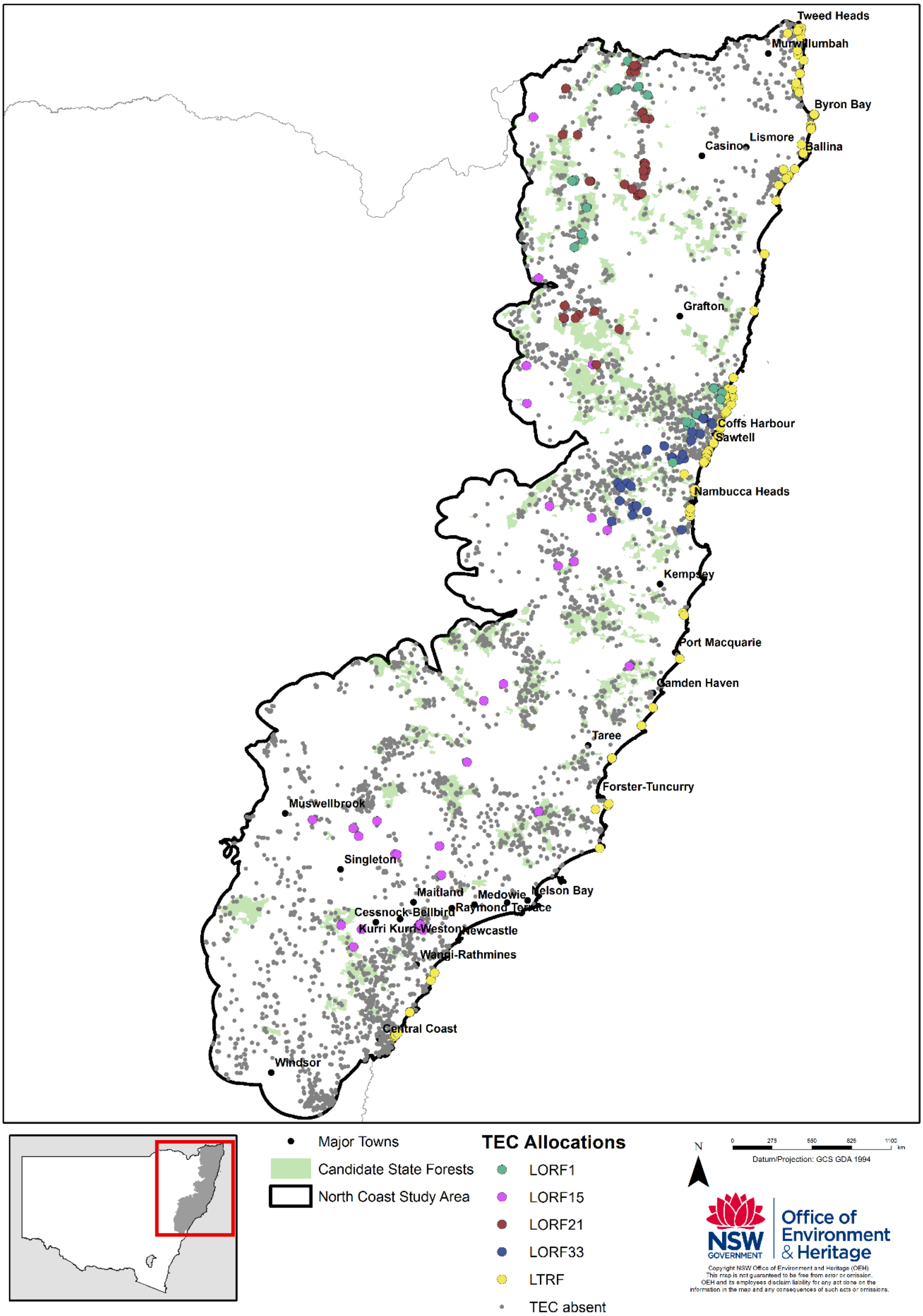
Species	RF71 freq	RF71 mean	RF71 med	other freq	other mean	other med	ΔAIC
Ripogonum elseyanum (D)	1	2.5	3	0.04	0.1	2	-81
Alocasia brisbanensis	1	1.0	1	0.06	0.1	1	-69
Cryptocarya erythroxylon	0.85	1.4	2	0.03	0.0	1	-66

Species	RF71 freq	RF71 mean	RF71 med	other freq	other mean	other med	ΔAIC
Linospadix monostachyos	1	2.5	3	0.12	0.2	2	-53
Archontophoenix cunninghamiana (D)	1	3.7	4	0.17	0.4	2	-44
Pteris umbrosa (D)	0.85	1.2	1	0.09	0.2	2	-41
Neolitsea dealbata (D)	0.92	1.5	2	0.18	0.3	2	-32
Lastreopsis munita (D)	0.62	1.2	2	0.04	0.1	2	-31
Diploglottis australis (D)	0.92	1.2	1	0.19	0.3	1	-30
Cordyline petiolaris (D)	0.69	0.7	1	0.07	0.1	1	-29
Dysoxylum rufum	0.62	0.8	1	0.06	0.1	1	-26
Embelia australiana	0.77	0.9	1	0.13	0.2	1	-25
Endiandra muelleri subsp. muelleri (D)	0.69	1.1	1	0.09	0.2	1	-25
Cissus antarctica (D)	1	2.1	2	0.38	0.8	2	-23
Cephalaralia cephalobotrys	0.69	1.1	2	0.11	0.2	1	-22
Pollia crispata (D)	0.54	0.6	1	0.06	0.1	1	-21
Callerya megasperma	0.38	1.0	3	0.02	0.0	2	-21
Piper hederaceum var. hederaceum (D)	0.62	1.0	1	0.09	0.2	1	-20
Elatostema stipitatum	0.31	0.4	1	0.01	0.0	2	-20
Syzygium corynanthum (D)	0.31	1.0	3	0.01	0.0	2	-20
Daphnandra apatela (D)	0.62	0.8	1	0.1	0.2	2	-19
Croton verreauxii	0.62	0.9	1	0.11	0.2	2	-17
Elatostema reticulatum	0.38	0.9	2	0.03	0.1	2	-17
Parsonsia fulva (D)	0.31	0.5	1.5	0.01	0.0	2	-17
Alpinia caerulea (D)	0.54	0.5	1	0.08	0.1	1	-16
Caldcluvia paniculosa (D)	0.62	0.9	1	0.12	0.3	2	-16
Diospyros pentamera (D)	0.62	0.7	1	0.12	0.2	1	-16
Myrsine subsessilis (D)	0.31	0.3	1	0.01	0.0	1	-16
Palmeria scandens	0.69	1.2	2	0.17	0.3	2	-15
Asplenium australasicum (D)	0.85	1.2	1	0.29	0.4	1	-15

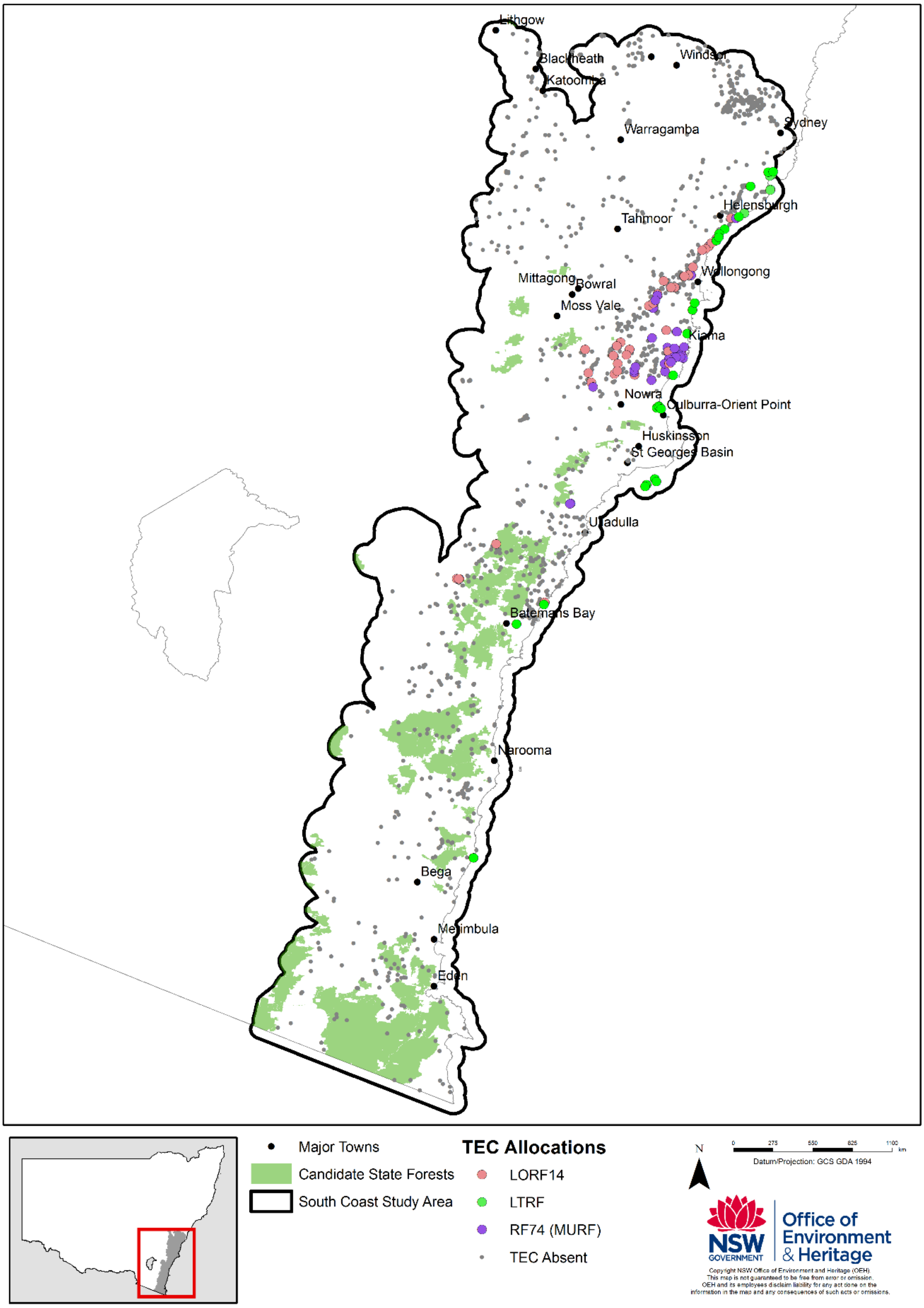
Table 11: The thirty most strongly characteristic species of the RF202 component of LORF in order of decreasing contribution to ΔsumAIC, using 11 plots assigned to RF202 with a high degree of confidence compared to the remaining 2547 plots. Species annotated with '(D)' are listed in the final determination assemblage. Mean is mean cover score over all plots including zeros. Median is derived from non-zero scores only. Zeros may represent small values, due to rounding.

Species	RF202 freq	RF202 mean	RF202 med	other freq	other mean	other med	ΔAIC
Agyrodendron trifoliatum (D)	1	3.1	3	0.02	0.1	3	-77
Akania bidwillii	0.91	1.4	1.5	0.03	0.0	1	-59
Calamus muelleri	1	2.0	2	0.06	0.1	2	-58
Elattostachys nervosa (D)	1	1.3	1	0.06	0.1	1	-58
Pothos longipes	1	1.9	2	0.06	0.1	2	-58
Piper hederaceum var. hederaceum (D)	1	2.0	2	0.09	0.1	1	-51
Endiandra muelleri subsp. muelleri (D)	1	1.7	2	0.09	0.2	1	-50
Alocasia brisbanensis	0.91	1.1	1	0.07	0.1	1	-46
Linospadix monostachyos	1	2.7	3	0.12	0.2	2	-44
Sarcopteryx stipata	1	1.3	1	0.12	0.2	1	-44
Beilschmiedia elliptica	0.73	0.9	1	0.02	0.0	1	-44
Niemeyera whitei	0.55	1.0	2	0.01	0.0	2	-38
Tabernaemontana pandacaqui	0.91	0.9	1	0.1	0.1	1	-37
Archontophoenix cunninghamiana (D)	1	3.6	4	0.17	0.4	2	-37
Ripogonum discolor (D)	0.91	1.6	2	0.11	0.2	2	-35
Platycerium superbum (D)	0.82	1.0	1	0.08	0.1	1	-33
Syzygium francisii (D)	0.55	1.1	1.5	0.02	0.0	2	-32
Dysoxylum rufum	0.73	1.0	1	0.06	0.1	1	-30
Capparis arborea (D)	0.82	1.2	1	0.11	0.2	1	-28
Planchonella australis (D)	0.82	1.0	1	0.11	0.2	2	-28
Hodgkinsonia ovatiflora	0.55	0.6	1	0.02	0.0	1	-27
Neolitsea dealbata (D)	0.91	1.2	1	0.18	0.3	2	-25
Sloanea woollsii (D)	0.73	1.6	2.5	0.08	0.2	2	-25
Sloanea australis (D)	0.73	1.5	1.5	0.09	0.2	2	-25
Asplenium australasicum (D)	1	1.1	1	0.29	0.4	1	-25
Diploglottis australis (D)	0.91	1.2	1	0.2	0.3	1	-24
Mischocarpus pyriformis	0.55	0.6	1	0.03	0.1	2	-23
Syzygium crebrinerve (D)	0.45	0.5	1	0.02	0.0	1	-23
Cryptocarya obovata	0.64	0.6	1	0.07	0.1	1	-22
Uvaria leichhardtii	0.55	0.7	1	0.04	0.1	2	-21

Map 6: Site Allocation for Rainforest TECs on the North Coast



Map 7: Site Allocation for Rainforest TECs on the South Coast



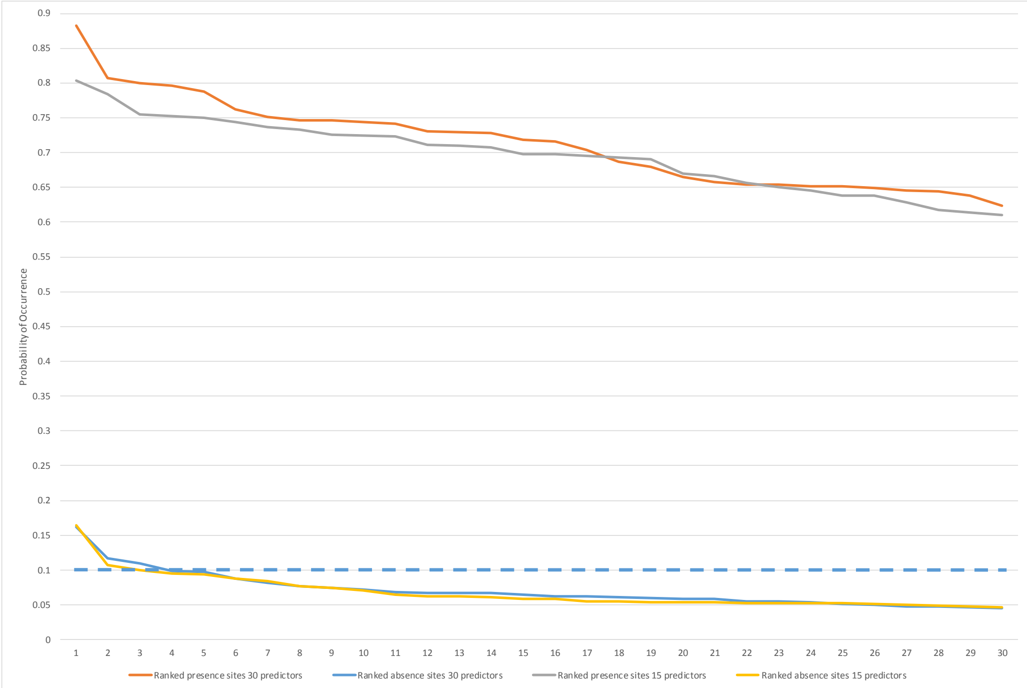
4.5 Indicative TEC Mapping

4.4.1 Model Performance

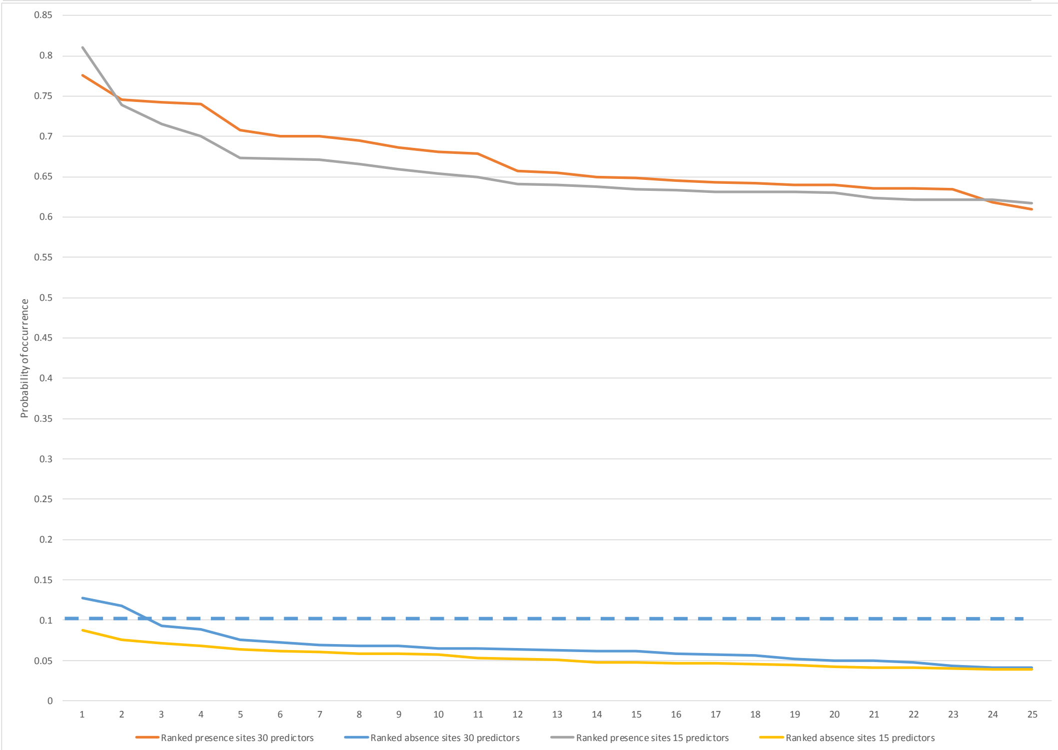
On the North Coast, we generated Random Forest presence-absence models for LTRF and LORF suballiances 1, 15, 21 and 33, and for suballiance 14 on the South Coast.
Figure 1 shows plots of the predicted probability of occurrence for sites allocated to a TEC (in order of descending probability) plotted against the same number of highest ranked absence plots. Across the twelve sets of models (five with 15 predictors and five with 30 predictors) there was no overlap between the lowest probability of occurrence value for a TEC present site, and the highest probability of occurrence for a TEC absent site. Thus choosing any threshold between these two values results in 100% of all present and absent sites being correctly classified. Each set of plots also shows two thresholds settings , used to guide our interpretation of distribution.

<u>Figure 1</u>: Predicted probability of occurrence values for sites allocated each TEC (in order of descending probability) plotted against the same number of highest ranked absence plots. Separate models were developed using 15 and 30 predictors. The order of the plots are a) LORF1, b) LORF15, c) LORF21, d) LORF33, e) LORF 14, f) LTRF.

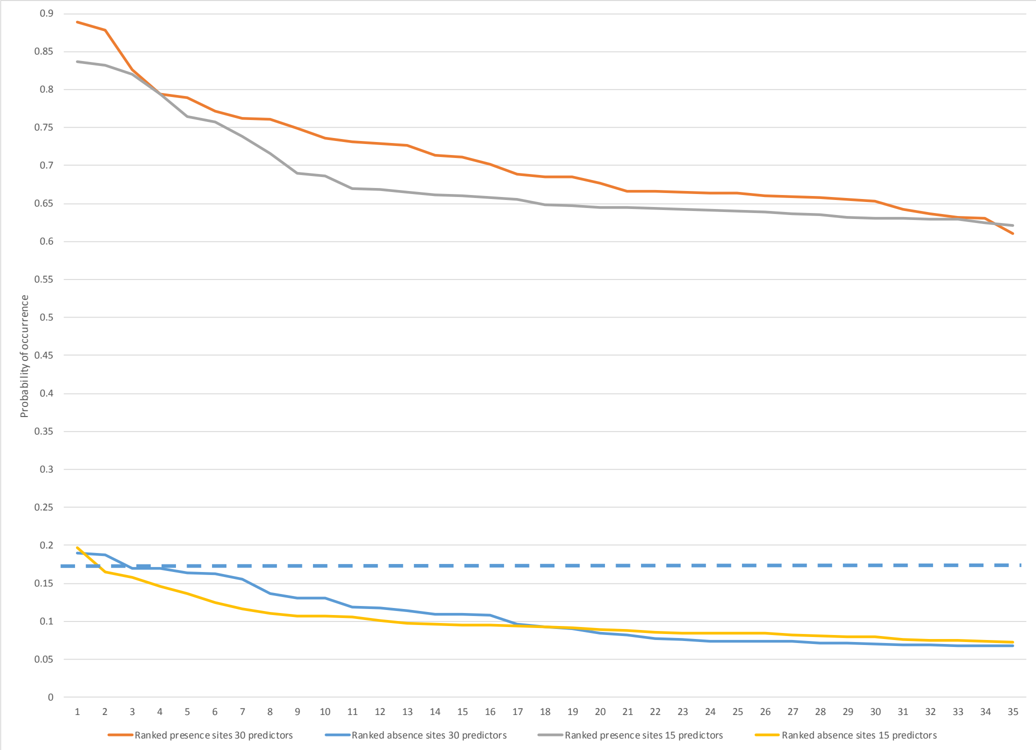
a) LORF 1



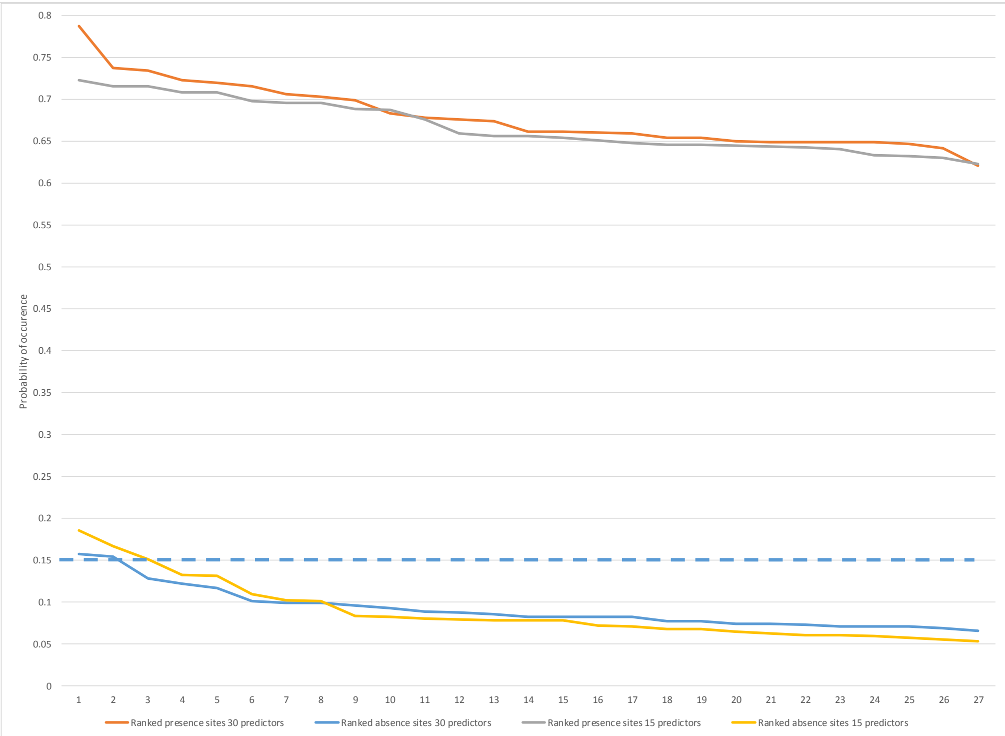
LORF15



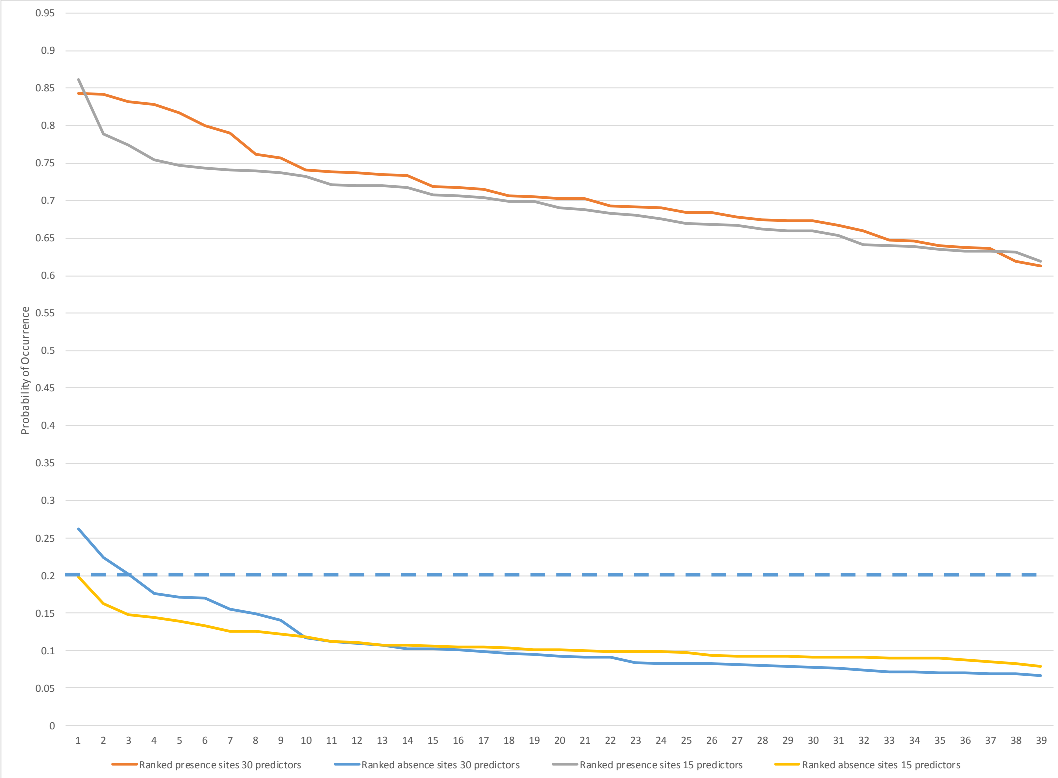
LORF21



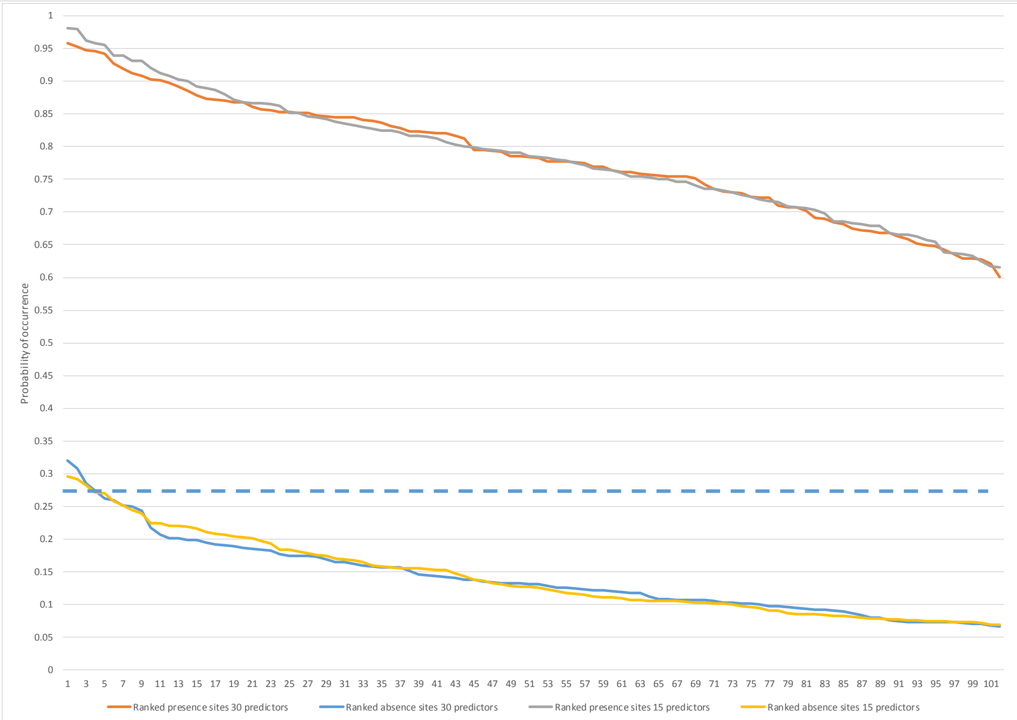
LORF33



LORF14



b) LTRF

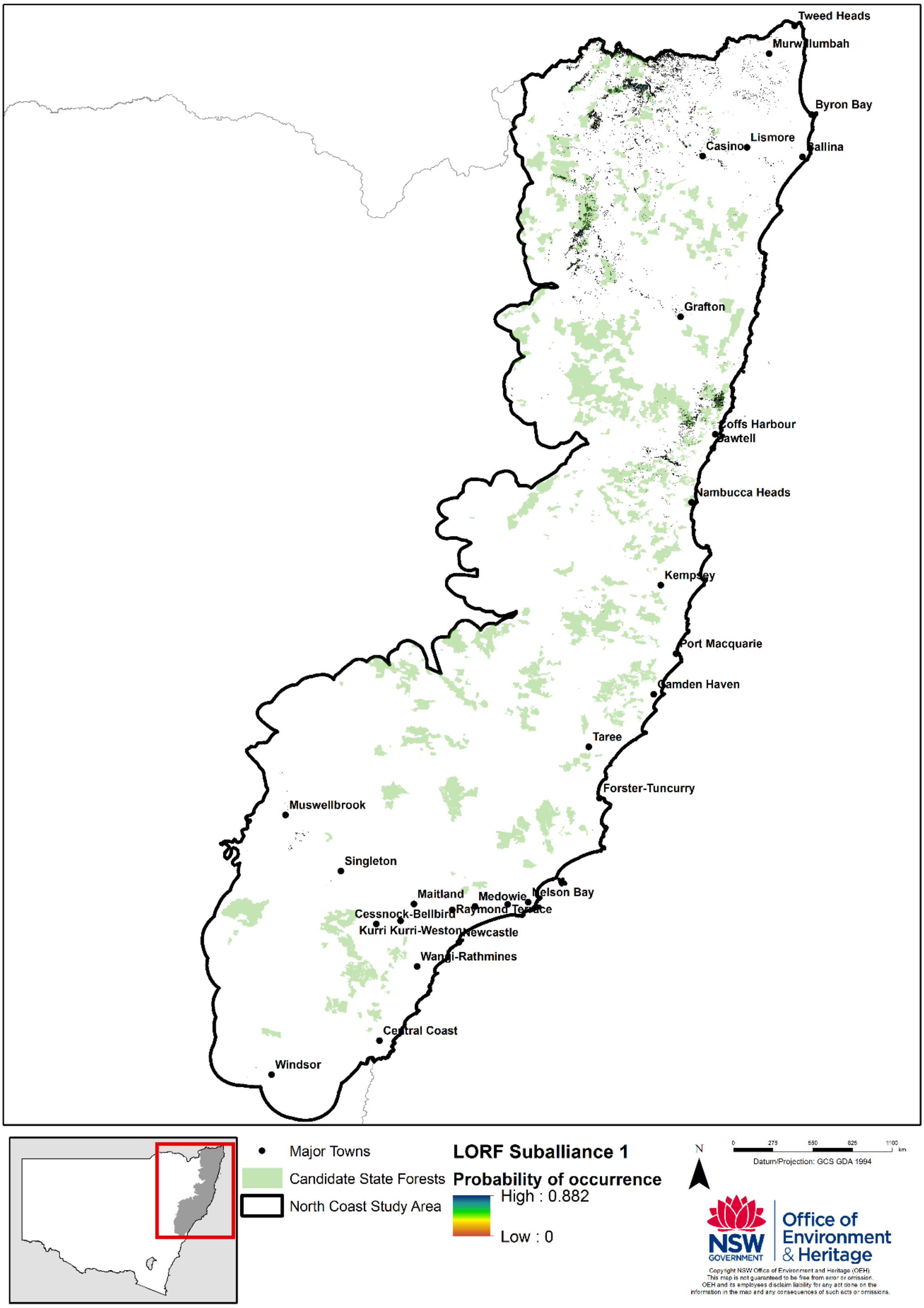


4.4.2 TEC Indicative Maps

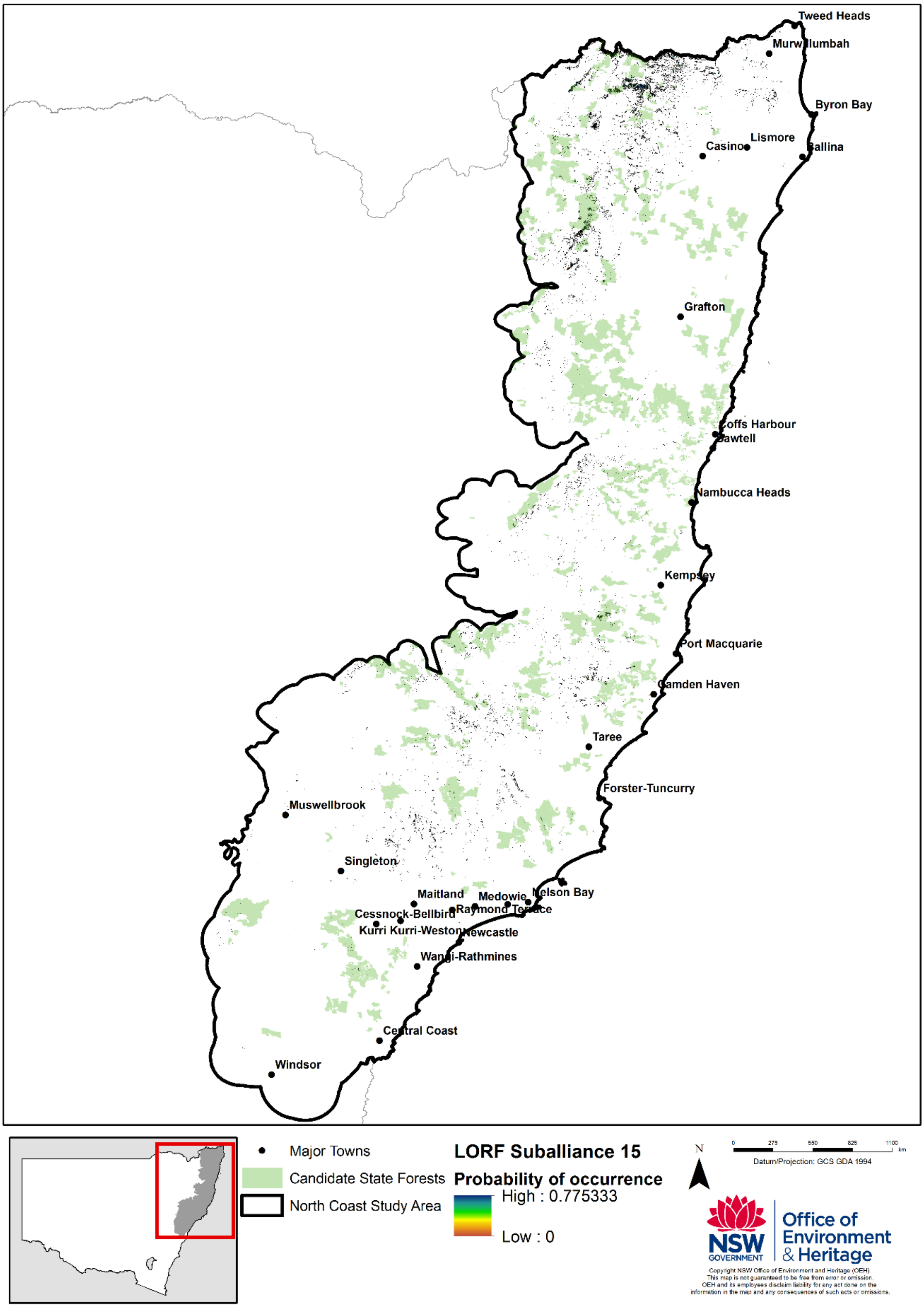
The indicative maps predict the distribution of a TEC based on the probability of occurrence values above a particular threshold. For the thresholds marked in Fig. 1 we accept a very small level of misclassification of absence sites (generally no more than 5 out of 5000+ sites). This has the effect of expanding out the models just enough to account for spatial inaccuracies that may exist in the data.

From the modelling, we ended up with four possible indicative maps for each community. This included two sets of models (each with 15 and 30 predictors), and two thresholds to predict the potential extent of the community. All four sets of predicted occurrence maps were examined in ArcGIS using ADS40 imagery as the backdrop, and an assessment made as to which model/threshold aligned with our understanding of rainforest distribution and related image patterns. The models were also checked against any existing vegetation mapping, field data and new API mapping. In most cases (but not always) the models with 30 predictors and the higher of the two thresholds (narrower distribution) provided models with greatest confidence. Maps 8-15 show the predicted distribution of the TECs across all tenure.

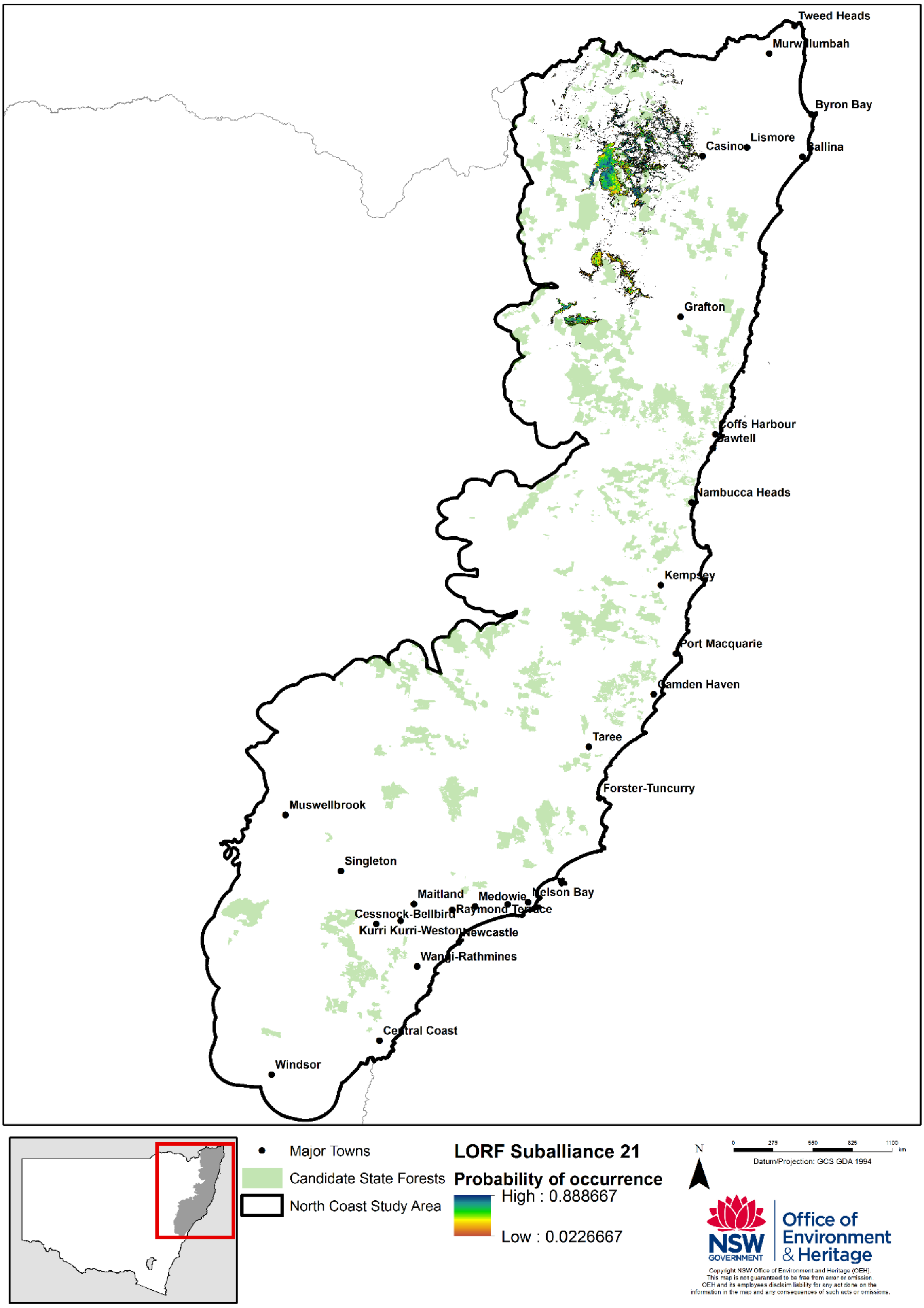
Map 8: Indicative map showing the potential distribution of LORF sub alliance 1



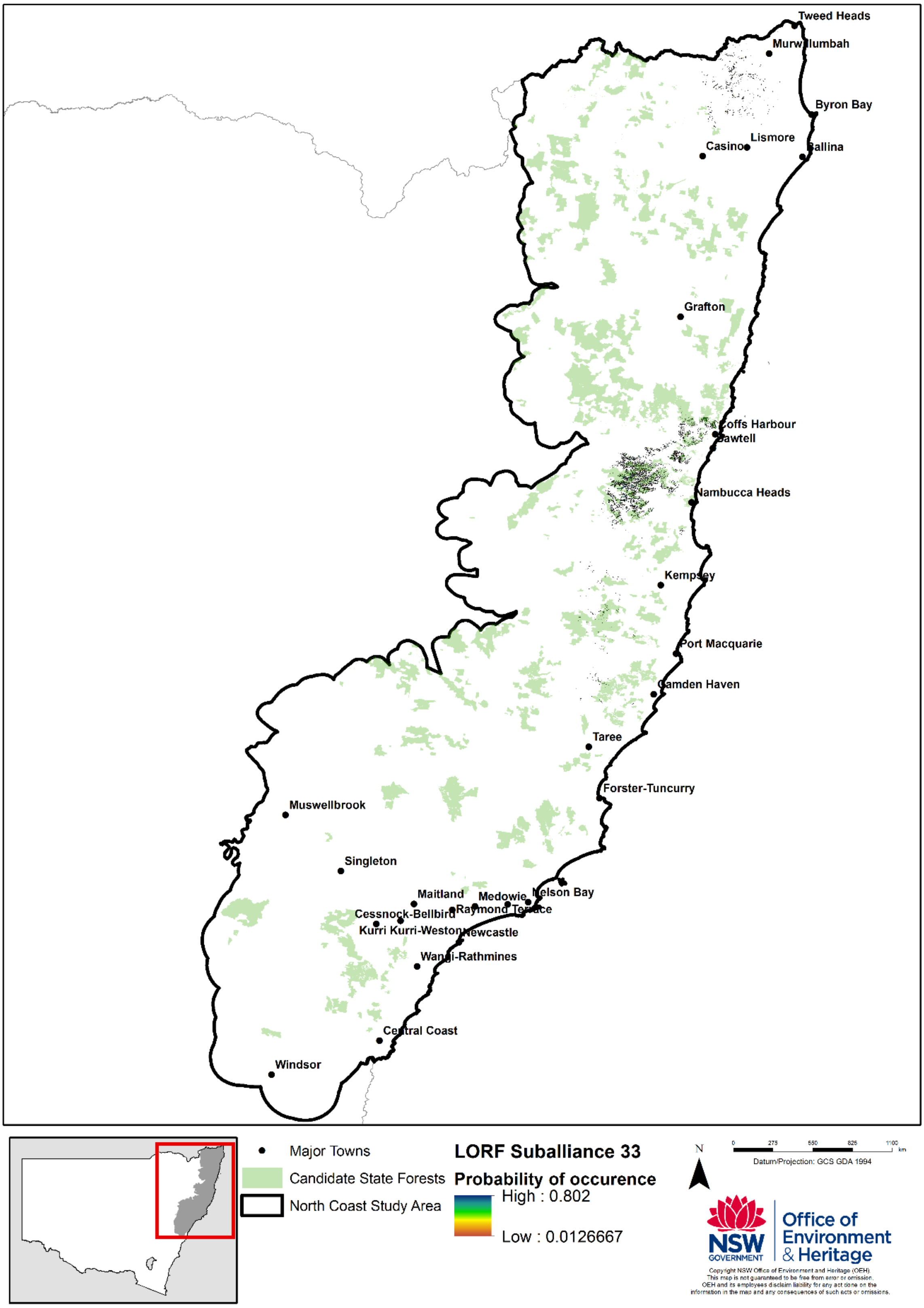
Map 9: Indicative map showing the potential distribution of LORF sub alliance 15



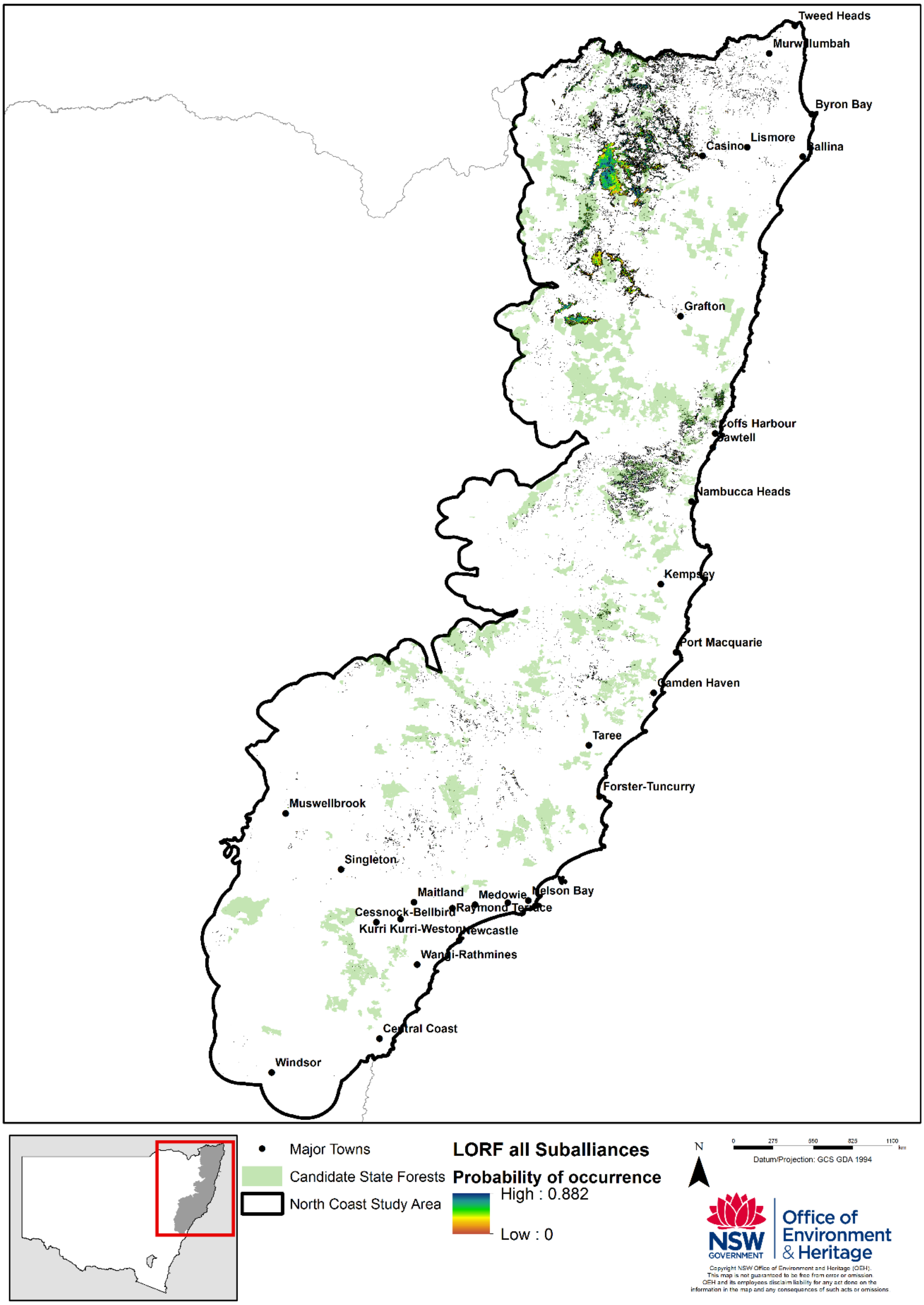
Map 10: Indicative map showing the potential distribution of LORF sub alliance 21



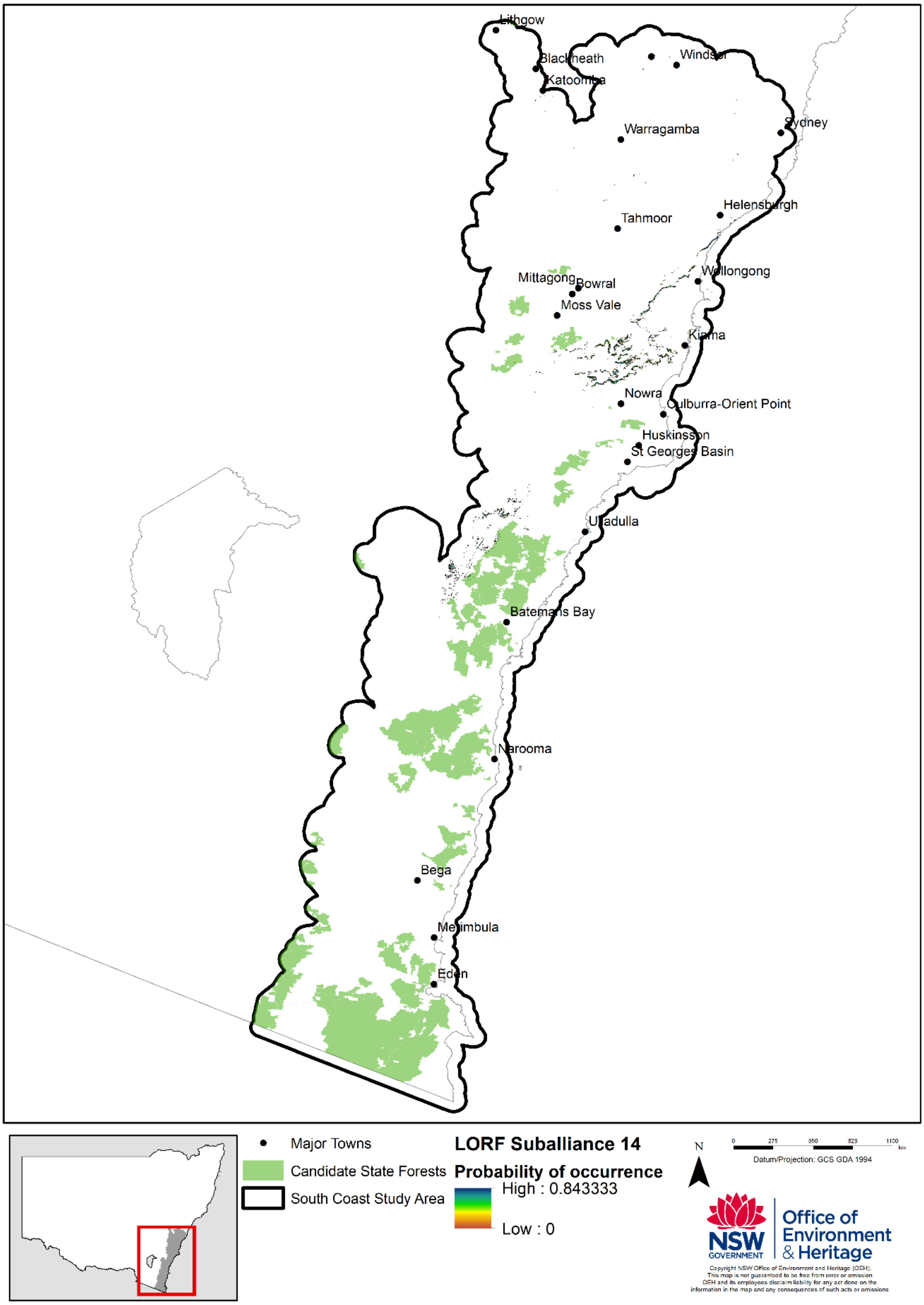
Map 11: Indicative map showing the potential distribution of LORF sub alliance 33



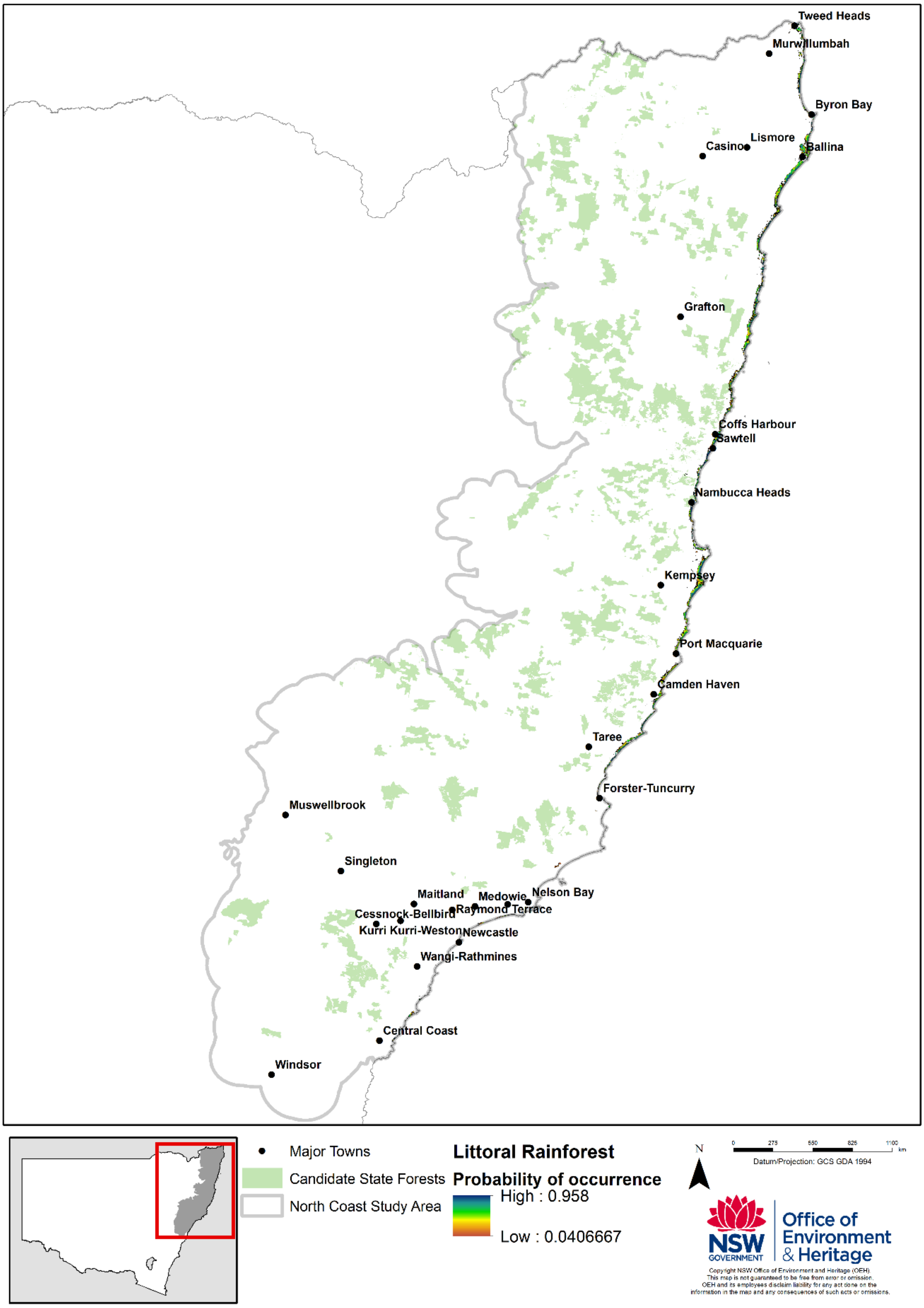
Map 12: Indicative map showing the potential distribution of all suballiances on the North Coast



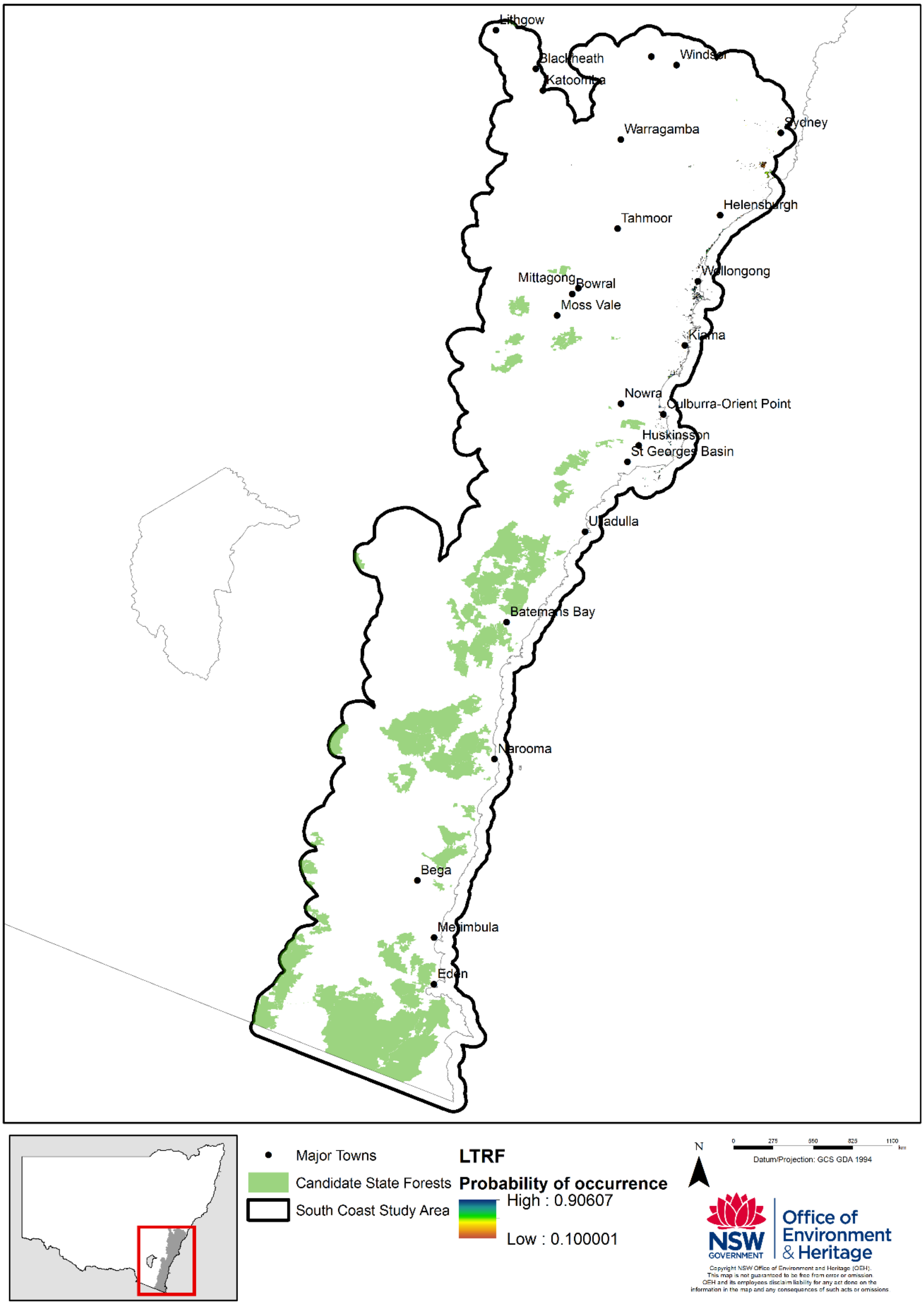
Map 13: Indicative map showing the potential distribution of LORF sub alliance 14



Map 14: Indicative map showing the potential distribution of LTRF on the North Coast



Map 15: Indicative map showing the potential distribution of LTRF on the South Coast



4.4.3 Environmental Relationships

Individual fitted functions for predictors in the Random Forest models are useful for determining whether the models match what we know about the broad distribution and habitat requirements of a TEC. For example, we know from the final determination that LORF "*may be associated with a range of high-nutrient geological substrates, notably basalts and fine-grained sedimentary rocks, on coastal plains and plateaux, footslopes and foothills. In the north of its range, Lowland Rainforest is found up to 600 metres above sea level, but in the Sydney Basin bioregion it is limited to elevations below 350 metres.*"

Table 12 lists the variables that were selected in models with 15 predictors across the five LORF suballiances and LTRF. The scaled variable importance values for each model are also provided in Fig. 2. These give a measure of the relative contribution each variable has on the overall model, with low standardised variable importance values having relatively little impact on the probability of occurrence values.

The most important set of predictors include a range of climate variables, that when combined interact to constrain the broad distribution of the TECs. Soil pH is also highly important for LORF15 and LORF21. Other variables of importance include elevation and its surrogate distance to the coast (all communities except LORF15), remote sensing variables that relate to long-term seasonal patterns in vegetation greenness (LORF14 and LORF15), and several other soil profile variables including bulk density (LORF14 and LORF 21), clay content (LORF33), silt content (LORF15) and soil organic carbon (LORF14).

The shape of the individual fitted functions for each model are shown in Fig. 3. The response functions for variables are by and large consistent across the different TEC models, and follow the responses one would expect for rainforest communities.

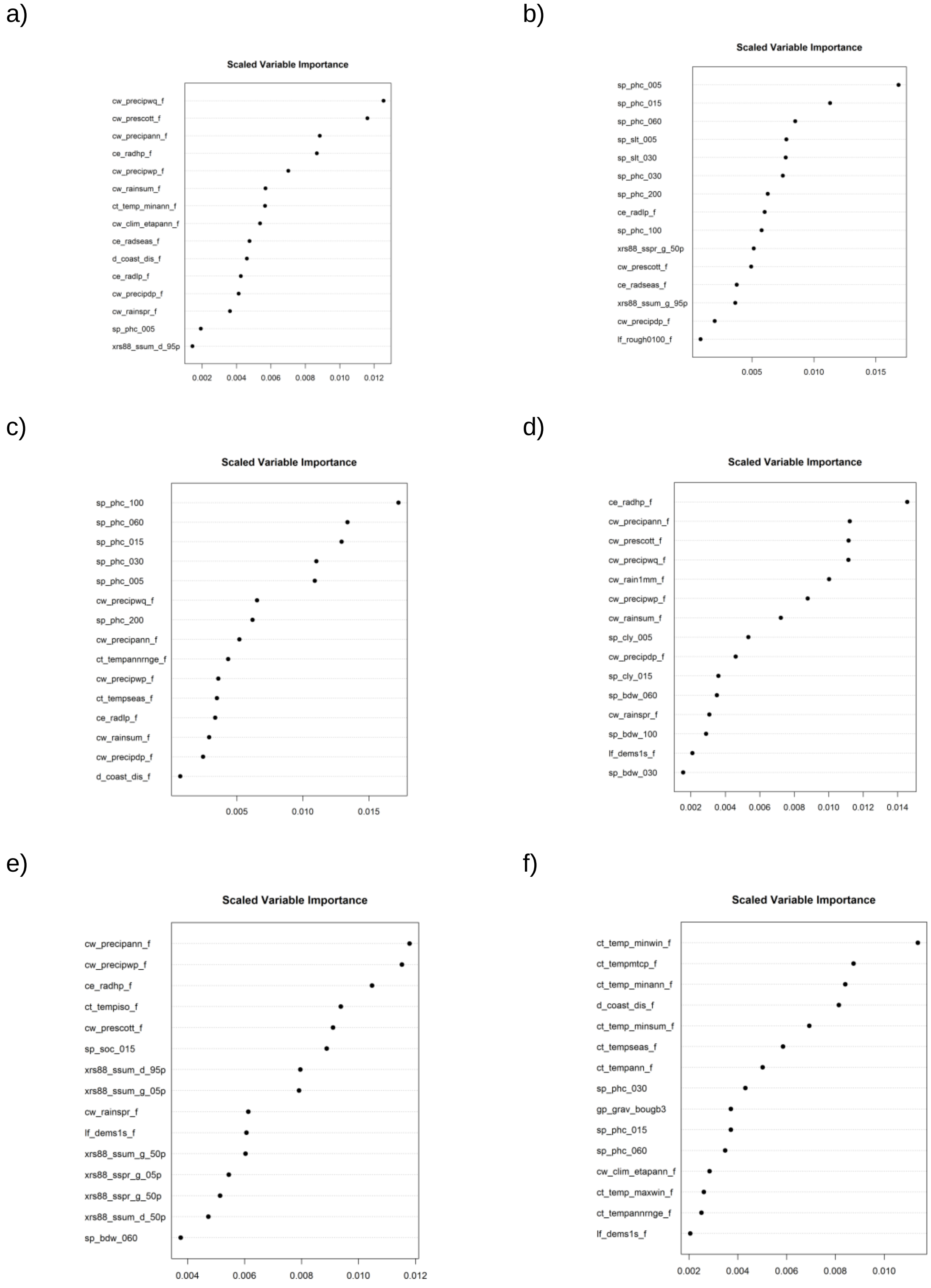
Table 12: List of variables selected in Random Forest models associated with15 predictors

Data Layer Code	Data Layer description	LORF1	LORF14	LORF15	LORF21	LORF33	LTRF
cw_precipann_f	Annual Precipitation (bio12)	1	1		1	1	
cw_precipdp_f	Precipitation of Driest Period (bio14)	1		1	1	1	
cw_precipwp_f	Precipitation of Wettest Period (bio13)	1	1		1	1	
cw_prescott_f	Prescott Index	1	1	1		1	
ce_radhp_f	Highest Period Radiation (bio21)	1	1			1	
ce_radlp_f	Lowest Period Radiation (bio22)	1		1	1		
cw_precipwq_f	Precipitation of Wettest Quarter (bio14)	1			1	1	
cw_rainspr_f	Average Rainfall - Spring	1	1			1	
cw_rainsum_f	Average Rainfall - Summer	1			1	1	
d_coast_dis_f	Distance from NSW East Coast (Euclidian)	1			1		1
lf_dems1s_f	Elevation from 1 sec SRTM smoothed DEM (DEM-S)		1			1	1
sp_phc_005	pH (calcium chloride) (0 - 5cm)	1		1	1		
sp_phc_015	pH (calcium chloride) (5 - 15cm)			1	1		1
sp_phc_030	pH (calcium chloride) (15 - 30cm)			1	1		1

Data Layer Code	Data Layer description	LORF1	LORF14	LORF15	LORF21	LORF33	LTRF
sp_phc_060	pH (calcium chloride) (30 - 60cm)			1	1		1
ce_radseas_f	Radiation of Seasonality: Coefficient of Variation (bio23)	1		1			
ct_temp_minann_f	Average daily min temperature - Annual	1					1
ct_tempannrnge_f	Temperature Annual Range: difference between bio5 and bio6 (bio7)				1		1
ct_tempiso_f	Isothermality 2/7 (bio3)		1			1	
ct_tempseas_f	Temperature Seasonality: Coefficient of Variation (bio4)				1		1
cw_clim_etapann_f	Average areal potential evapotranspiration - Annual	1					1
sp_bdw_060	Bulk density (30 - 60cm)		1			1	
sp_phc_100	pH (calcium chloride) (60 - 100cm)			1	1		
sp_phc_200	pH (calcium chloride) (100 - 200cm)			1	1		
xrs88_sspr_g_50p	Landsat 25-year seasonal greenesss in spring (50th percentile)		1	1			
xrs88_ssum_d_95p	Landsat 25-year seasonal dry vegetation in spring (95th percentile)	1	1				
ct_temp_maxwin_f	Average daily max temperature - Winter						1
ct_temp_minsum_f	Average daily min temperature - Summer						1
ct_temp_minwin_f	Average daily max temperature - Winter						1
ct_tempann_f	Annual Mean Temperature (bio1)						1
ct_tempmtcp_f	Min Temperature of Coldest Period (bio6)						1
cw_rain1mm_f	Average Number of days with rainfall greater than 1mm Annual					1	
gp_grav_bougb3	Bouguer gravity - band 3						1
lf_rough0100_f	Neighbourhood topographical roughness based on the standard deviation of elevation in a circular 1000 m neighbourhood. Derived from DEM-S			1			
sp_bdw_015	Bulk density (5 - 15cm)					1	
sp_cly_005	Clay content (%) (0 - 5cm)					1	
sp_cly_015	Clay content (%) (5 - 15cm)					1	
sp_slt_005	Silt content (%) (0 - 5cm)			1			
sp_slt_030	Silt content (%) (15 - 30cm)			1			
sp_soc_015	Soil Organic Carbon (%) (5 - 15cm)		1				

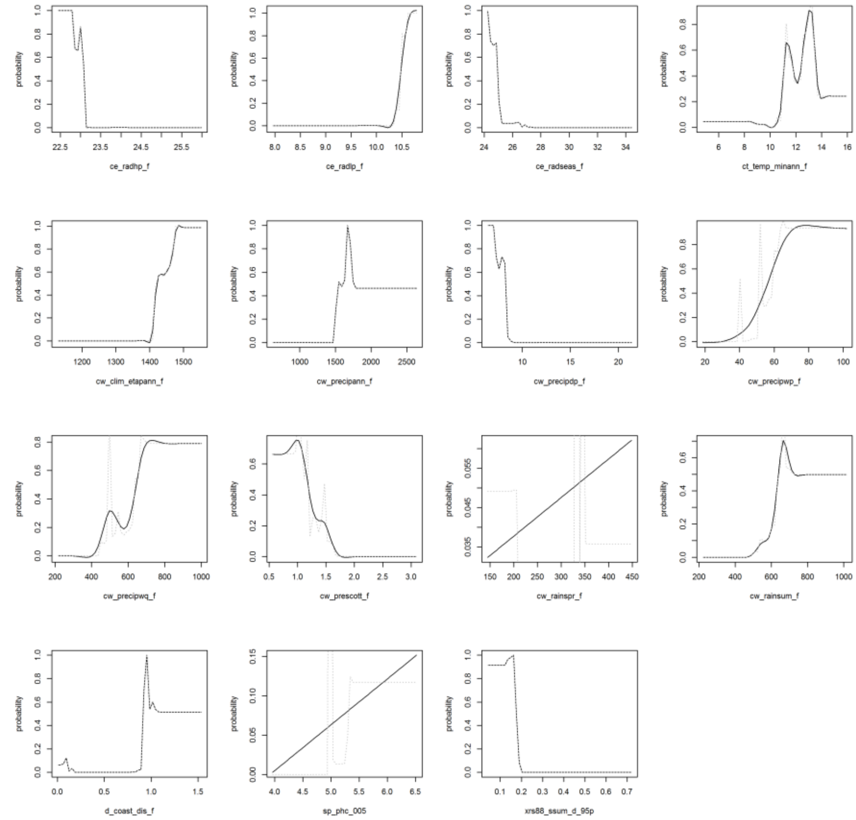
Data Layer Code	Data Layer description	LORF1	LORF14	LORF15	LORF21	LORF33	LTRF
xrs88_sspr_g_05p	Landsat 25-year seasonal greenesss in spring (5th percentile)		1				
xrs88_ssum_d_50p	Landsat 25-year seasonal dry vegetation in spring (50th percentile)		1				
xrs88_ssum_g_05p	Landsat 25-year seasonal greenesss in summer (5th percentile)		1				
xrs88_ssum_g_50p	Landsat 25-year seasonal greenesss in summer (50th percentile)		1				
xrs88_ssum_g_95p	Landsat 25-year seasonal greenesss in summer (95th percentile)			1			
Total		15	15	15	15	15	15

Figure 2: Scaled variable importance values in relation to models with 15 predictors. a) LORF1, b) LORF15, c) LORF21, d) LORF33, e) LORF 14, f) LTRF.



<u>Figure 3</u>: Shape of individual fitted functions in relation to models with 15 predictors. a) LORF1, b) LORF15, c) LORF21, d) LORF33, e) LORF 14, f) LTRF.

a)



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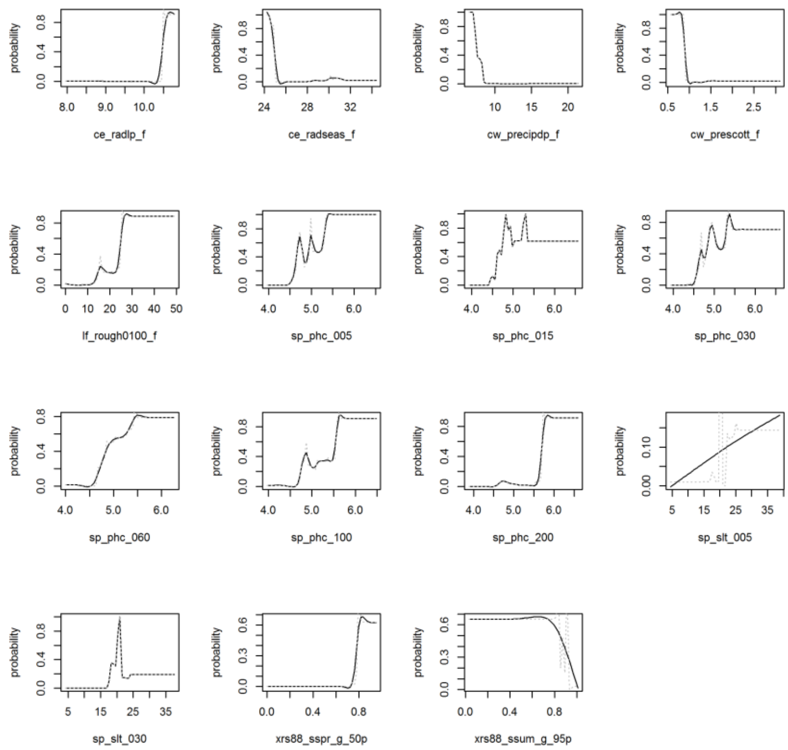
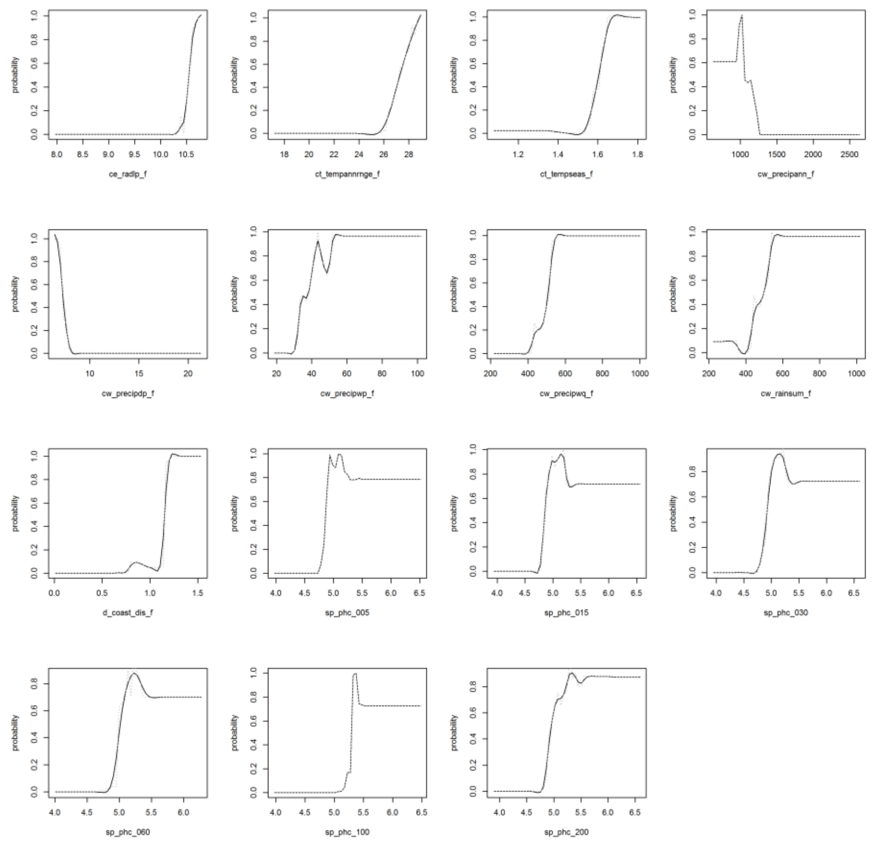


c)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cw_precipwq_f
cw_rainsum_f
d_coast_dis_f
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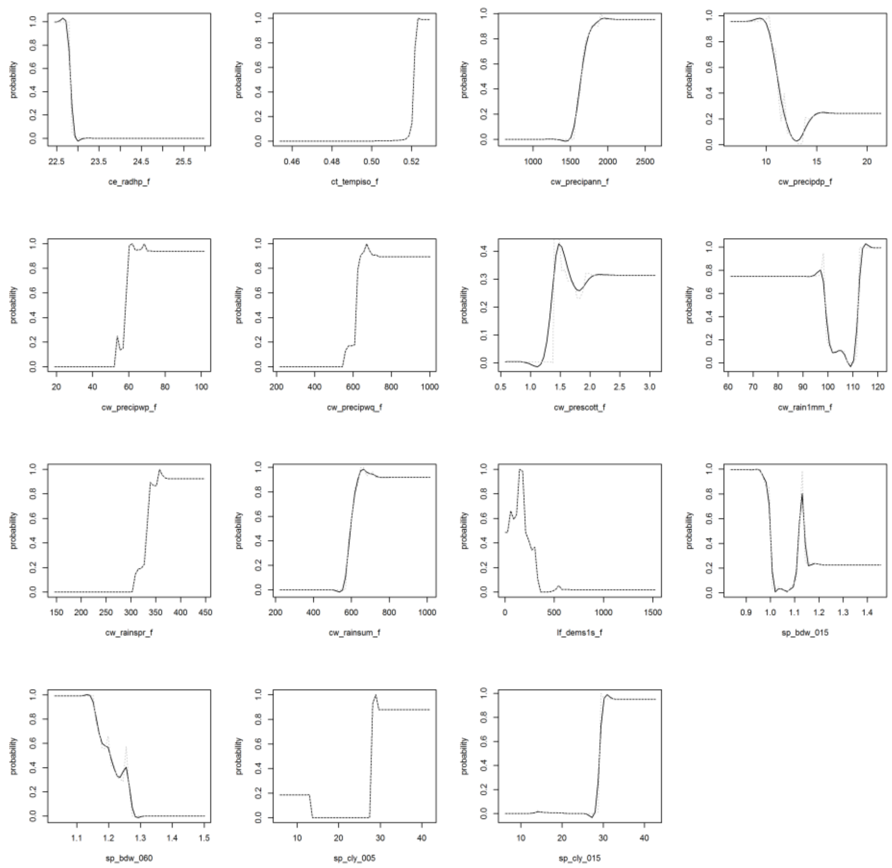
sp_phc_030
sp_phc_060
sp_phc_100
sp_phc_200

d)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cw_prescott_f
cw_rain1mm_f
cw_rainspr_f
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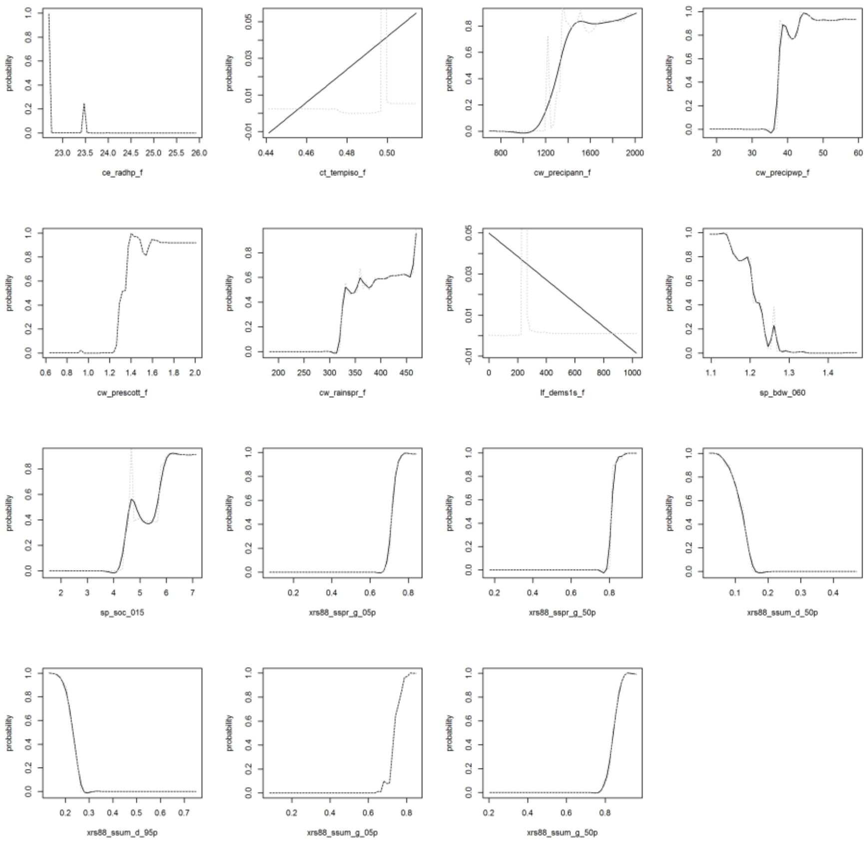
sp_bdw_015
sp_bdw_060
sp_cly_005
sp_cly_015

e)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sp_bdw_060
sp_soc_015
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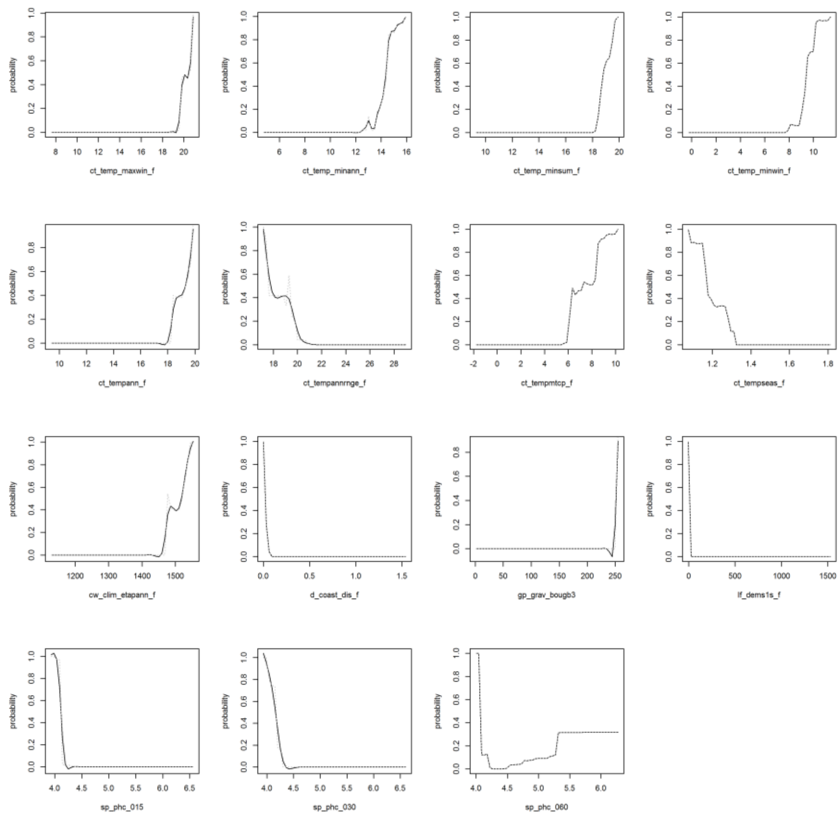
xrs88_ssum_g_50p

f)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ct_tempmtcp_f
ct_tempseas_f
cw_clim_etapann_f
d_coast_dis_f
gp_grav_bougb3
lf_dems1s_f
sp_phc_015
sp_phc_030
sp_phc_060

4.6 Operational TEC Mapping

Based on our interpretation of the relevant phrases in the final determination, we mapped Lowland Rainforest TEC at the patch scale. We regarded patches as the mapped API units which met our rainforest mapping criteria and which were bounded either by a State forest boundary or by surrounding non-rainforest vegetation (usually eucalypt-dominated forest). We assessed a patch as either wholly LORF, if any part of it was known or likely to be LORF using plot data or results of any of the predictive models, or wholly not TEC, if none of it was likely to be LORF. The only exception to this general rule was to use an elevation threshold where large patches included substantial areas above 600 m. In this case we delineated the upper elevation based on changes in topography which were likely to indicate a change of floristic community, which was usually at about 850 m elevation. Maps 16-18 show examples of operational mapping for LORF in some north coast forest areas.

We believe that our mapping is conservative. Where data are limited and there is doubt, we have taken a precautionary approach and been inclusive. The final determination applies imprecise membership conditions and in many instances it is not possible to apply greater precision than our TEC Panels interpretation if the operational maps are to be inclusive of the final determination. A consequence is that we are highly likely to include areas of rainforest that are not a primary suballiance cited in the determination and may include some substantial areas of secondary suballiances or suballiances not cited at all.

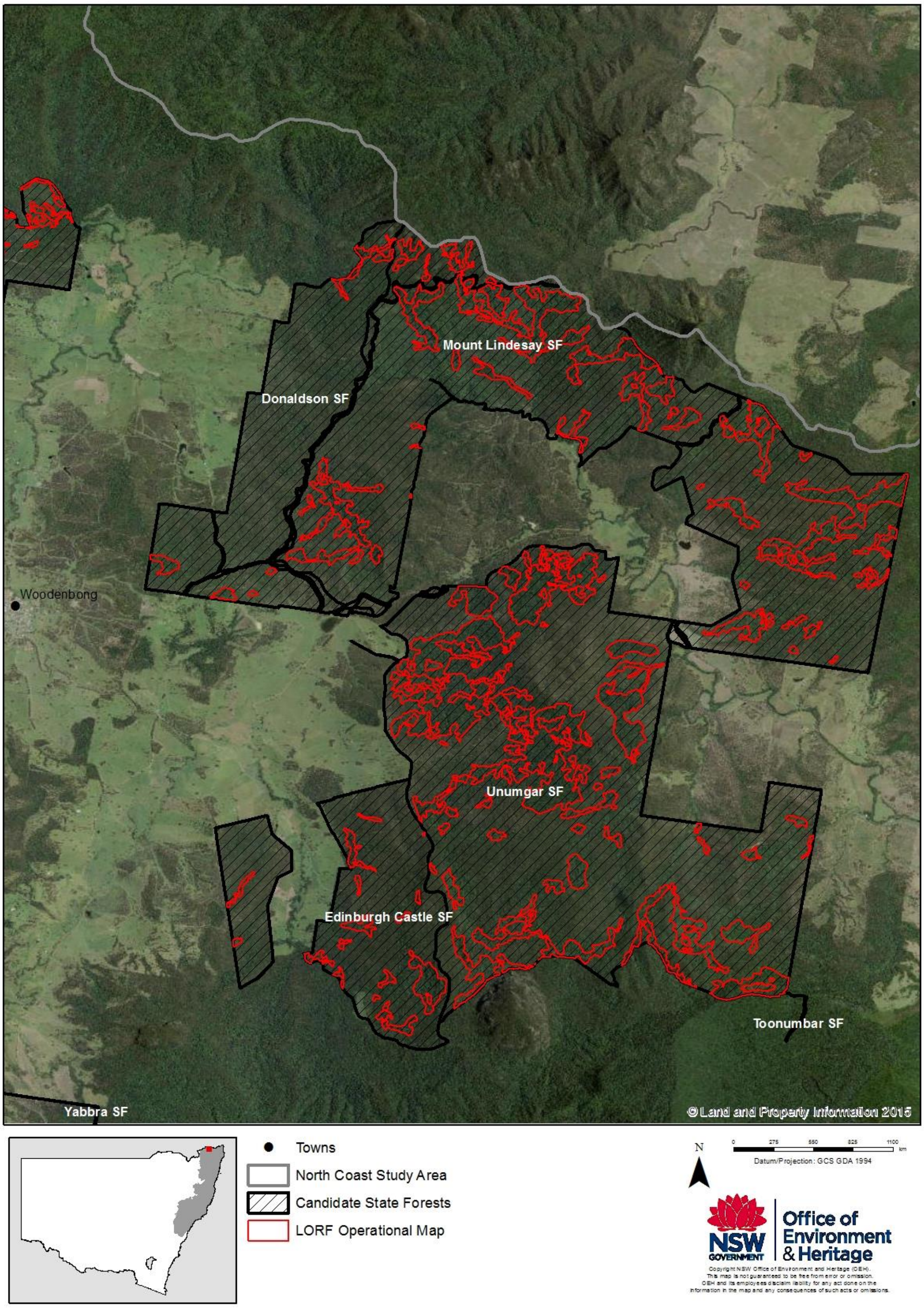
There were a number of State forests (Table 13) for which we don't have API coverage, or, in which we don't have any plot data to confirm the presence or absence of LORF TEC. However, the presence of LORF nearby and the outputs of predictive models suggest it may be present, most likely in a very limted extent. We believe that more data is required to assess the occurrence, if any, of LORF in these State forests and we have excluded them from our mapping.

Table 13. State forests in which LORF may be present but which we have not mapped

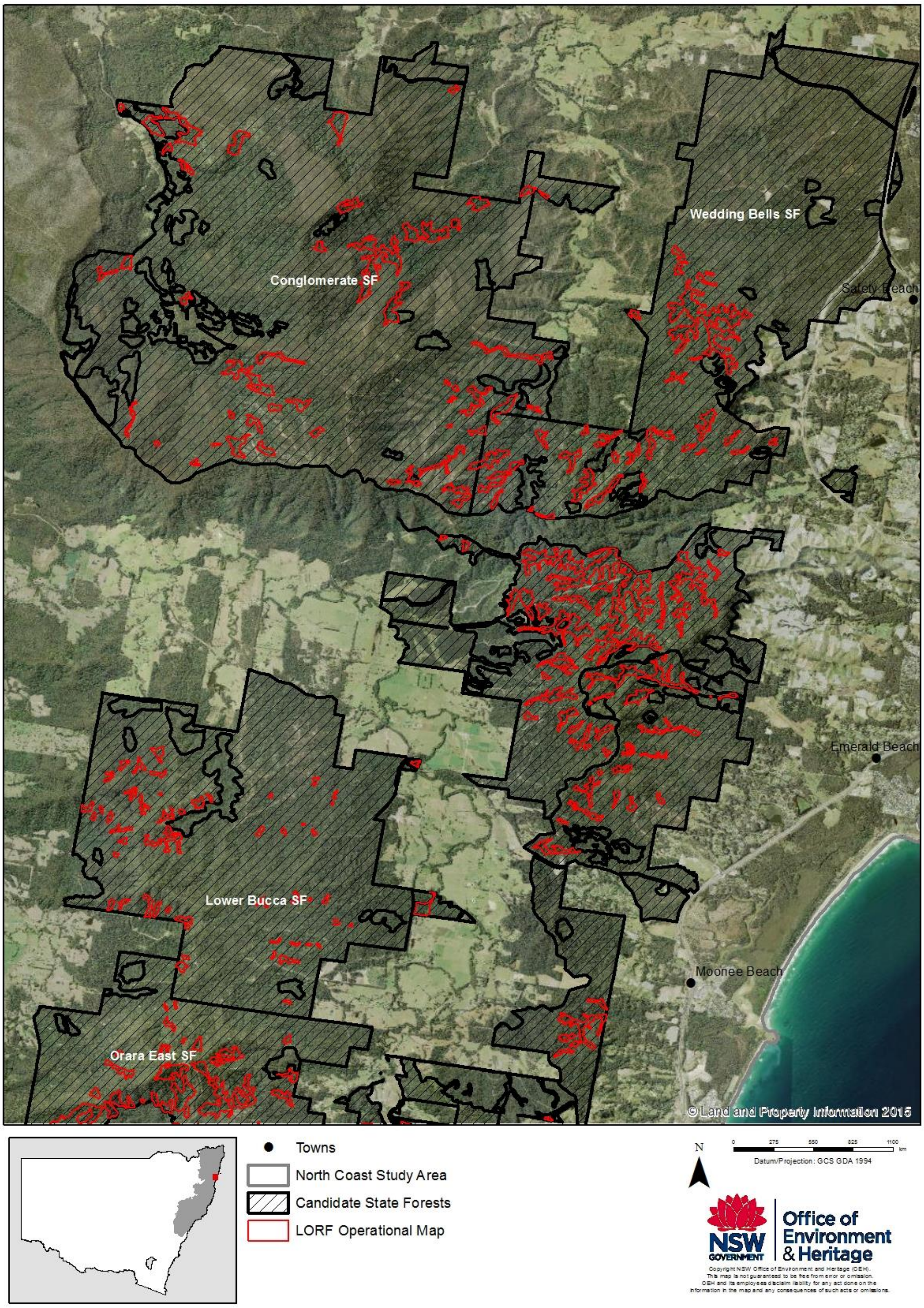
Boundary Creek	Kangaroo River
Broken Bago	Kerewong
Cairncross	Kippara
Chaelundi	Malara
Comboyne	Mernot
Coneac	Mount Boss
Dalmorton	Bonalbo

We mapped Lowland Rainforest on Floodplains TEC as all API units with rainforest canopy or subcanopy where they were within the boundary of our alluvial model. This has likely resulted in inclusion of areas which are not LRFP, but this is difficult to assess due to the lack of floristic information of diagnostic value in the final determination. Map 19 gives an example of operational mapping for LRFP in Bulahdelah State Forest.

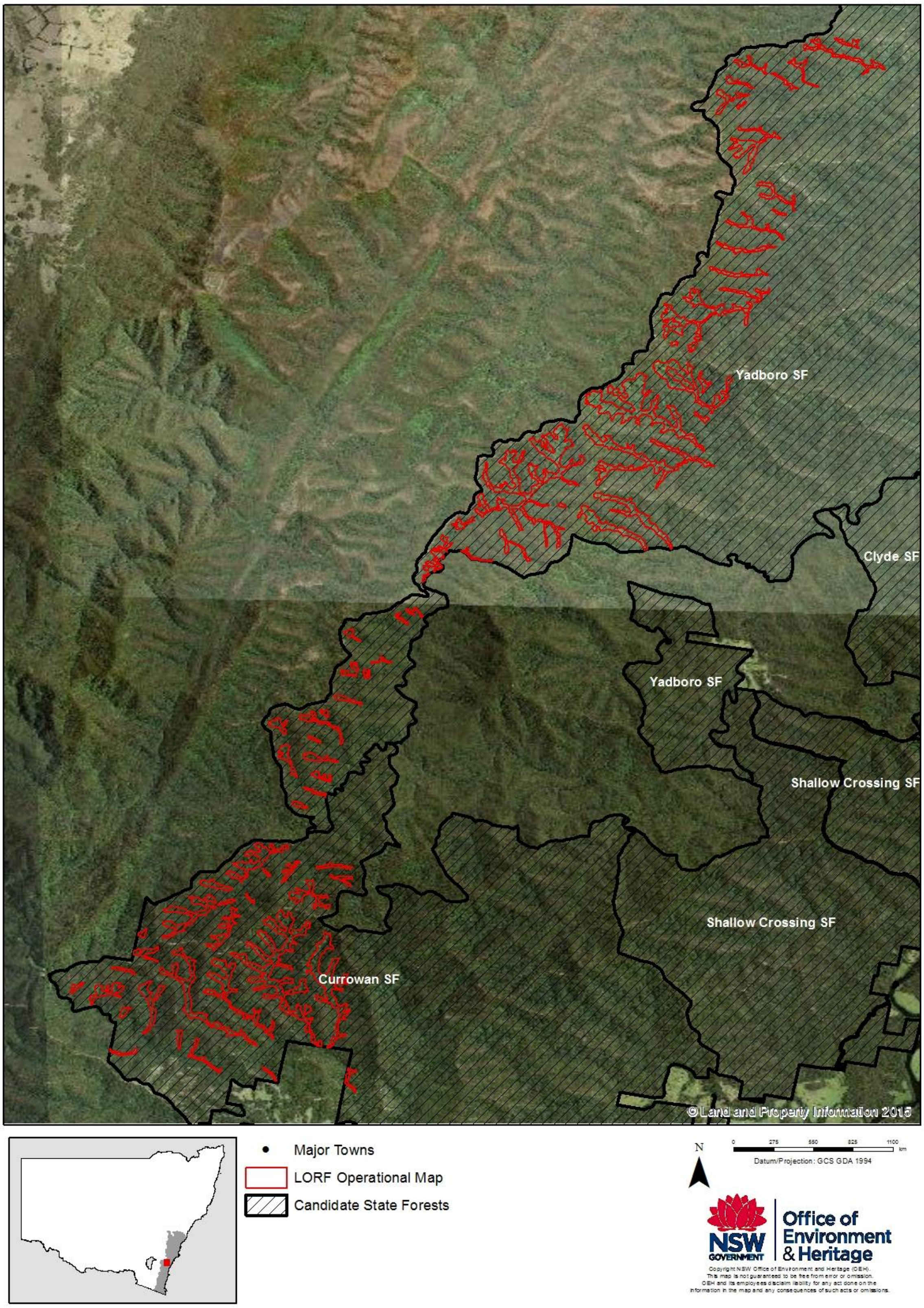
Map 16: Example of operational map for LORF state forests east of Woodenbong



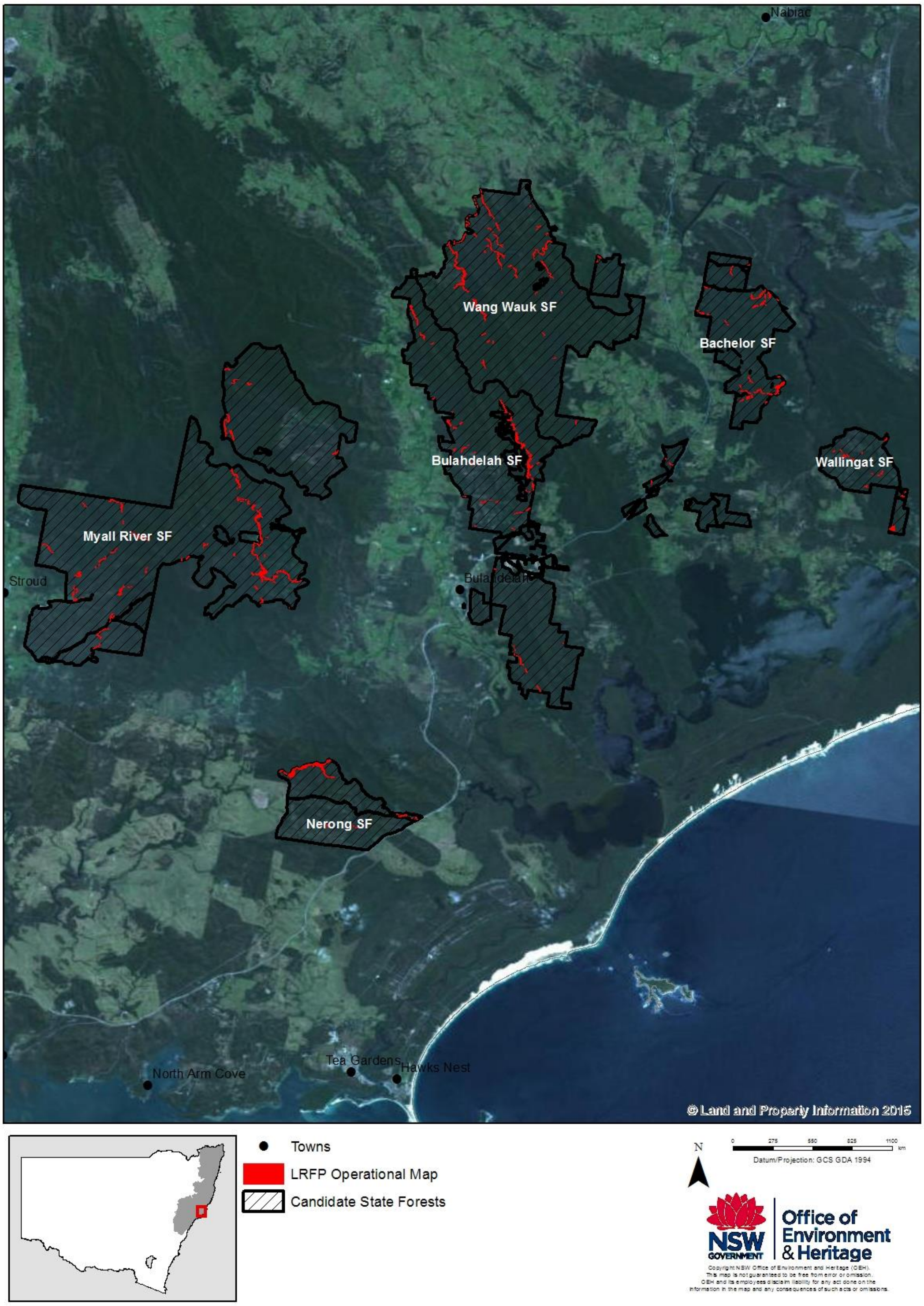
Map 17: Example of operational map for LORF in state forests north of Coffs Harbour



Map 18: Example of operational map for LORF on South Coast



Map 19: Example of operational map for LRFP around Bulahdelah State Forest



5 Discussion

5.1 Summary

5.1.1 Cited suballiances and final determination species assemblage list

For the suballiance 1 and 21/22 components of LORF, we found a generally high degree of consistency between floristic groups, the composition and distribution of the suballiances and similarities with the final determination assemblage list. However, we experienced difficulties in the southern part of the range of these components, in the Coffs Harbour-Kempsey area, where there is substantial overlap in floristic composition, but not necessarily spatial overlap, between suballiances 1 and 33 and between 21 and 28. We did not find any systematic plot which matched suballiances 5 and 6, and there are no reference sites for either of these in State forest. For suballiance 14, we found consistent relationships with south coast rainforest, but not for our north coast study area. We did not find any evidence for suballiance 14 occurring in north coast State forests despite multiple plots sampling Floyds reference sites for the suballiance on state forest. We had particular difficulty with suballiance 15. The floristic groups most likely to belong the SA15 (because they include plots from close proximity to SA15 reference sites) are more similar to other suballiance sites, and are far more widely distributed than the sites that Floyd describes. The experience with both SA14 and SA15 are indicative of the difficulties in applying the Floyd suballiances as a diagnostic tool. The distribution of both of these suballiances extend across significant environmental and latitudinal gradients (in the case of SA15 from Casino to the southern Blue Mountains) and the floristic variation within the suballiances is high.

Suballiances which are partially included in the final determination by the use of qualifying phrases (e.g. ...where they occur in conjunction with...) are mostly both extensive and well conserved. It is clear from the final determination that these are not fully encompassed as TEC, but the vagueness of the qualifying phrases ensures that the meaning is difficult to intepret. Even where there is a spatial relationship between primary and secondary suballiances, we had difficulty interpreting the extent to which a secondary suballiance is included as TEC. It is often the case that vegetation which belongs to a primary suballiance is a small part of a much larger patch of a secondary suballiance, (a patch generally being mapped rainforest surrounded by eucalypt forest). Following TEC Panel guidance, as a general principle we assessed TECs at the patch scale because there is no indication in the final determination of where boundaries should be delineated. The absence of a precise boundary rule in the LORF final determination to define the inclusion of secondary suballiances necessitates a precautionary interpretation. In some areas (for example, State forests of the Nambucca Valley), our mapping of the TEC is likely to include large areas of secondary suballiances owing to their proximity to one of the primary suballinaces. In other cases it has resulted in mapped TEC exceeding 600 metres elevation, up to 850 metres.

For Lowland Rainforest on Floodplain, we did not find any floristic group which we could clearly attribute to SA3 (the only suballiance cited as being fully included by the final determination). However, one group which occurred on floodplains was related to both SA3 and SA1. We regarded this group as unambiguously LRFP, but we found no evidence that it occurs in State forest. We found a very poor relationship between the final determination assemblage list and any floristic group, and we were unable to use the assemblage list to make an assessment of whether a floristic group belonged to LRFP.

5.1.2 Distribution and Habitat Descriptors

The final determinations include sets of environmental descriptors that may assist in locating rainforest TECs. However, there is considerable uncertainty as to the extent to which these criteria need to be satisfied in order to assign the TECs. We adopted only those criteria which were accompanied by statements that suggested a definitive association, and even then, other factors were also taken into account.

The most definitive locational descriptor is the bioregional boundary, because this is one of only two descriptors (the other being the assemblage of species) which comprise the statutory definition of an ecological community under the *TSC Act*. Lowland Rainforest is determined as being within NSW North Coast and Sydney Basin Bioregions, but of the cited suballiances only suballiances 14 and 15 occur in Sydney Basin Bioregion and north of the Hawkesbury River. However, we found several examples of Suballiance 14 present in state forests in the South East Corner Bioregion forming part of an extensive subtropical rainforest assemblage along the Illawarra escarpment.

The final determination for LORF strongly implies a maximum elevation threshold of 600m in the north coast bioregion and 350m in the Sydney Basin bioregion. We have used this as one factor in our assessment of whether floristic groups are likely to belong to LORF, but otherwise we have not strictly applied this threshold. Although the groups which we have assessed as LORF occur predominantly below 600 m, we recorded relevant plots above the thresholds currently applied in the determination. This includes elevations above 400 metres on the south coast and up to 650 metres on the north coast. On the north coast our mapping extends 850 metres to cover adjoining secondary suballiances cited in the final determination.

As noted above, for Lowland Rainforest on Floodplain we were not able to use the assemblage list or any other floristic descriptors to delineate areas within State forest. We relied entirely on our interpretation of the word 'floodplain' in the title (although this is not an explicit descriptor in the text of the final determination). This required the identification of suitable landscapes. There is no reference in the final determination to mapped information defining floodplain and the determination lacks detail to apply a diagnostic rule to a site. The project adopted a precautionary interpretation of the landscape criteria by using the best available published maps, models of water flow accumulation using fine scale digital models and aerial photographic interpretation. We believe that the layers that we generated offer the best available representation of candidate floodplain landscapes on state forest, although we acknowledge that we have included alluvial features which may not occur on a scale sufficient to be called a floodplain.

5.2 TEC Panel Review and Assessment

5.2.1 Summary of discussions

The results of the community analysis and map products were subject to a review process by the TEC Panel. A summary of the discussions for each TEC are presented in Appendix 3. Key points of discussion are provided in the following paragraphs.

In the strict statutory sense, bioregional boundaries delimit TECs. However, for LORF our results indicated that the suballiance 14 component extended outside the final determination boundaries, into adjacent South East Corner (SEC) Bioregion. The occurrence across the boundary was not continuous, but patches of LORF occurred on both sides of the bioregional boundary. The TEC Panel reasoned that, where a vegetation type occurs on both sides of a bioregional boundary to the extent that part of the occurrence is just outside the boundary, it should be assessed as a single occurrence and not strictly limited to within the boundary. It is uncertain how thresholds of distance and patchiness should be applied in this case. We found that the suballiance 14 community in SEC Bioregion occurred up to 25 kilometres from the bioregional boundary and about 30 kilometres from the nearest known occurrence in Sydney Basin, which indicates that the areas of occurrence may be relatively disjunct compared to patch separation within areas of occurrence. We took a precautionary approach and included all of this occurrence as LORF. Our interpretation and approach may not be appropriate for other purposes.

The TEC Panel was unable to resolve the ambiguity of the qualifying phrases which pertain to the suballiances which are only partially included in LORF and those which are included '...where they occur in conjunction with...' primary suballiances. The TEC Panel considered that a spatial relationship was implied, in the sense that they were included where they were contiguous with a primary suballiance within a rainforest patch. Thresholds of extent beyond primary suballiance boundaries were uncertain and the TEC Panel could not rule out other interpretations. As a result, we included floristically ambiguous groups (e.g. those with characteristics of both SA1 and SA33) as LORF even if we were not certain that they were contiguous with an area which more clearly belonged to LORF.

With respect to the LRFP final determination, the TEC Panel was unable to resolve the meaning of the phrase, 'Elements of ... also occur', pertaining to suballiances which are cited but not necessarily fully included in the final determination. Our investigation found that these suballiances occur extensively away from floodplains, or in some cases (SA23) very rarely if ever, occur on floodplains. In the absence of any diagnostic floristic information or any useful descriptors in the text of the determination, the TEC Panel resolved to include all rainforest vegetation within our alluvial model area as LRFP, on the basis that this was consistent in a broad sense with the use of 'floodplain' in the name of the TEC.

Final state forest-EEC occurrence matrix

Table 14 provides a summary of the area of LORF mapped on state forest within the IFOA area. The total area mapped as the TEC includes 13,209 hectares on the North Coast and 827 hectares on the south coast. Maps 20 and 21 show the occurrence of the TEC by state forest on the north and south coasts respectively. Table 15 summarises the area mapped for LRFP by state forest on the north coast. A total of 680 hectares was mapped for the TEC and is restricted to the North Coast Bioregion only. Map 22 identifies the state forests where LRFP was mapped.

Table 14: Lowland Rainforest occurrence matrix by state forest.

State Forest	SF Area (Ha)	LORF Mapped Area (Ha)	% LORF	State Forest (SF)	SF Area (Ha)	LORF Mapped Area (Ha)	% LORF
North Coast				Nambucca	1,510	9	0.6%
Bagawa	5,384	135	2.5%	Nana Creek	1,793	312	17.4%
Bald Knob	1,695	45	2.7%	Newry	2,841	233	8.2%
Billilimbra	3,853	5	0.1%	Nulla-five Day	3,370	36	1.1%
Boambee	821	53	6.5%	Nymboida	6,400	428	6.7%
Bowman	3,187	69	2.2%	Oakes	7,639	624	8.2%
Buckra Bendinni	1,766	197	11.2%	Orara East	3,983	408	10.2%
Bungabbee	1,097	14	1.3%	Orara West	4,459	509	11.4%
Candole	6,574	8	0.1%	Pee Dee	62	14	22.6%
Cherry Tree	1,636	128	7.8%	Pine Brush	3,966	32	0.8%
Cherry Tree West	321	29	9.0%	Pine Creek	1,219	67	5.5%
Collombatti	4,126	30	0.7%	Ramornie	6,175	227	3.7%
Conglomerate	5,162	232	4.5%	Richmond Range	6,340	449	7.1%
Diehappy	1,275	226	17.7%	Roses Creek	1,790	500	27.9%
Donaldson	2,331	282	12.1%	Scotchman SF	4,158	466	11.2%
Eden Creek	1,179	6	0.5%	South Toonumbar	410	10	2.4%
Edinburgh Castle	949	82	8.6%	Sugarloaf	3,151	27	0.9%

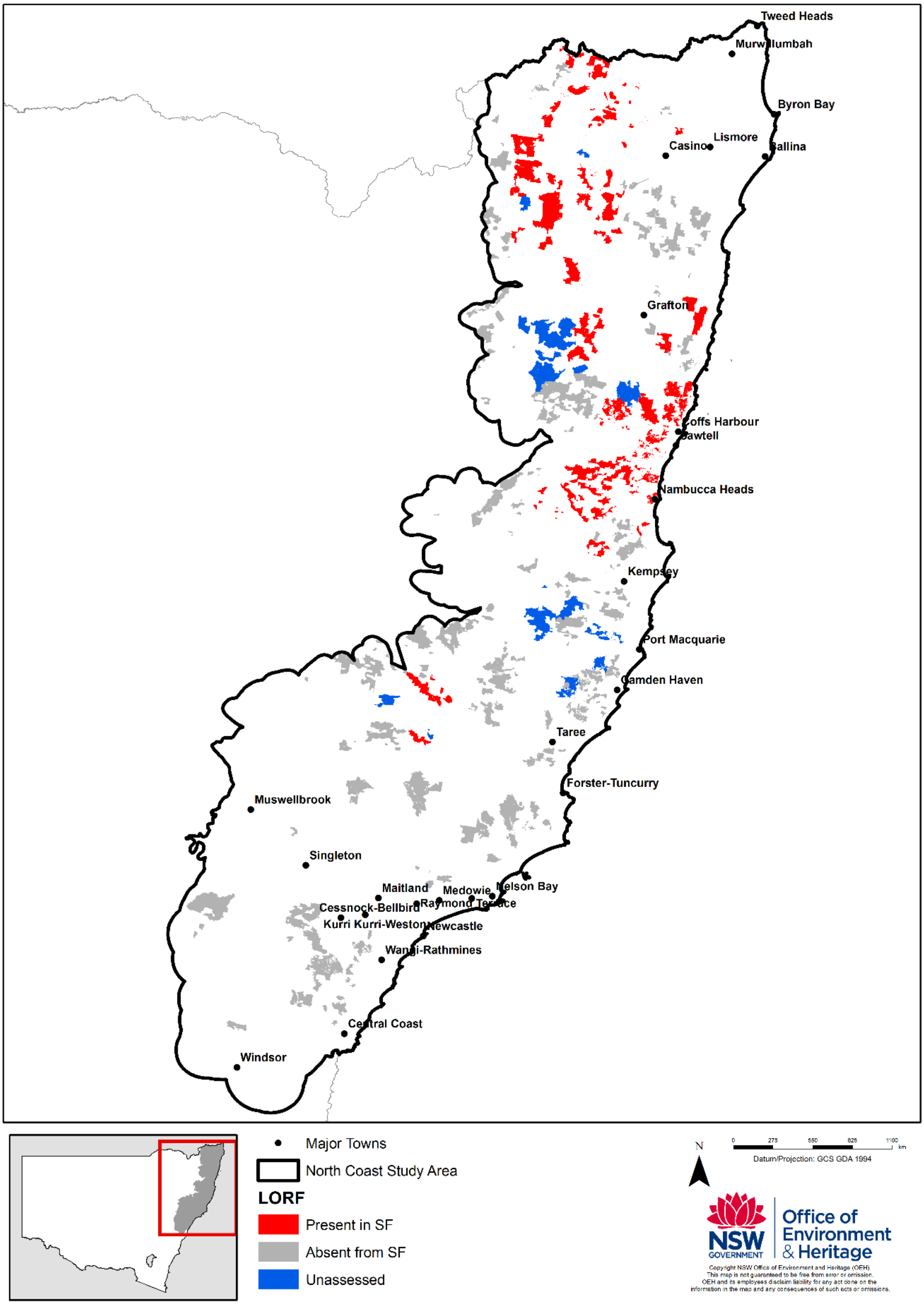
State Forest	SF Area (Ha)	LORF Mapped Area (Ha)	% LORF	State Forest (SF)	SF Area (Ha)	LORF Mapped Area (Ha)	% LORF
Ewingar	18,433	1,401	7.6%	Tarkeeth	530	52	9.8%
Gilgurry	9,531	24	0.3%	Thumb Creek	3,944	116	2.9%
Girard	18,851	81	0.4%	Toonumbar	1,528	74	4.8%
Giro	9,933	554	5.6%	Tuckers Nob	1,885	310	16.4%
Gladstone	6,230	440	7.1%	Unumgar	3,563	841	23.6%
Glenugie	4,952	15	0.3%	Viewmont	702	46	6.6%
Grange	7,802	531	6.8%	Washpool	2,961	173	5.8%
Irishman	2,733	331	12.1%	Way Way	1,268	87	6.9%
Keybarbin	3,707	8	0.2%	Wedding Bells	4,645	391	8.4%
Koreelah	708	5	0.7%	Wild Cattle Creek	9,667	16	0.2%
Little Newry	189	1	0.5%	Woodenbong	306	17	5.6%
Lower Bucca	2,621	78	3.0%	Yabbra	8,417	114	1.4%
Marara	5,351	324	6.1%	Total		13,209	5.2%
Mistake	5,638	469	8.3%	*South Coast*			
Mount Belmore	9,181	274	3.0%	Currowan	11,977	326	2.7%
Mount Lindesay	3,046	505	16.6%	Yadboro	10,750	501	4.7%
Mount Marsh	3,636	1	0.0%	Total		827	3.6%
Mount Pikapene	553	38	6.9%	Grand Total		14,036	5.1%

Table 15: Lowland Rainforest on floodplain occurrence matrix by state forest.

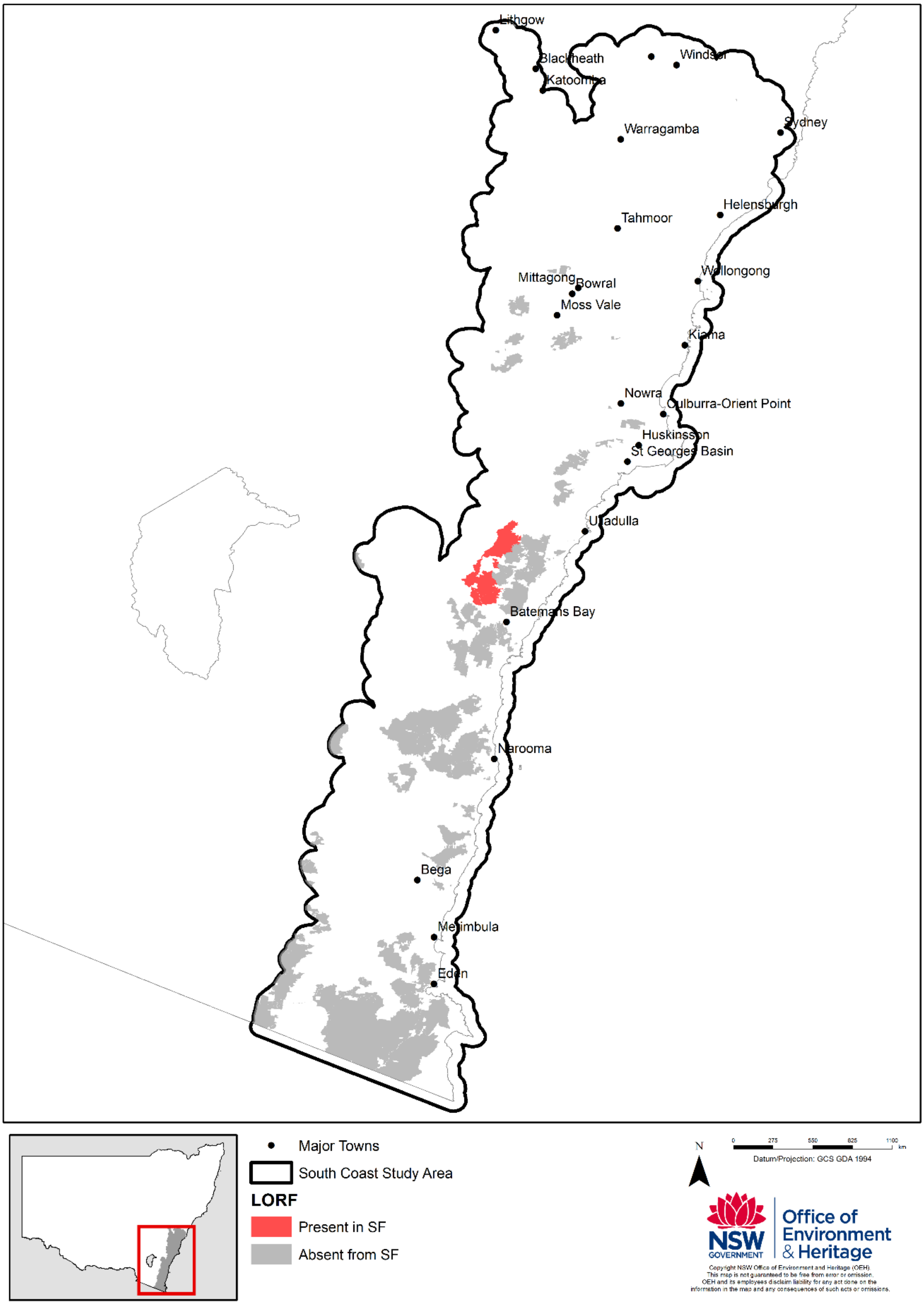
State Forest (SF)	SF Area (Ha)	LRFP Mapped Area (Ha)	% LRFP	State Forest (SF)	SF Area (Ha)	LRFP Mapped Area (Ha)	% LRFP
Bachelor	2,642	24.1	0.91%	Mistake	5,638	5.8	0.10%
Bagawa	5,384	9.2	0.17%	Mount Boss	17,165	9.5	0.06%
Ballengarra	6,106	2.8	0.05%	Myall River	13,611	76.5	0.56%
Bellangry	6,411	9.5	0.15%	Nambucca	1,510	0.6	0.04%
Boambee	821	1	0.12%	Nana Creek	1,793	0.5	0.03%
Bril Bril	2,333	12.9	0.55%	Nerong	2,173	34.2	1.57%
Broken Bago	3,543	3.2	0.09%	Newfoundland	5,939	23.3	0.39%
Bulahdelah	7,799	42.1	0.54%	Newry	2,841	10.6	0.37%
Bulls Ground	2,010	2.2	0.11%	North Branch	796	0.3	0.04%
Burrawan	2,040	1.2	0.06%	Oakes	7,639	11.8	0.15%
Cairncross	4,487	7.1	0.16%	Orara East	3,983	37.7	0.95%
Collombatti	4,126	8.4	0.20%	Orara West	4,459	50.8	1.14%
Comboyne	2,576	2.9	0.11%	Pine Brush	3,966	12.2	0.31%
Conglomerate	5,162	12.3	0.24%	Pine Creek	1,219	4.5	0.37%

Cowarra	1,687	1.3	0.08%	Queens Lake	576	4	0.69%
Diehappy	1,275	3.9	0.31%	Roses Creek	1,790	9.4	0.53%
Gibberagee	10,574	1.9	0.02%	Scotchman	4,158	18.6	0.45%
Gladstone	6,230	9.3	0.15%	Tamban	7,632	2.2	0.03%
Glenugie	4,952	8.7	0.18%	Tuckers Nob	1,885	5.7	0.30%
Ingalba	6,632	13.4	0.20%	Upsalls Creek	923	1.6	0.17%
Irishman	2,733	1.1	0.04%	Viewmont	702	2.3	0.33%
Kangaroo River	11,399	6.6	0.06%	Wallingat	1,240	9.1	0.73%
Kerewong	3,665	13.8	0.38%	Wang Wauk	8,330	51.9	0.62%
Kippara	5,554	2.8	0.05%	Way Way	1,268	6.5	0.51%
Kiwarrak	6,535	14.1	0.22%	Wedding Bells	4,645	29.3	0.63%
Lansdowne	4,118	3.3	0.08%	Wild Cattle Creek	9,667	26.6	0.28%
Lorne	3,257	8.7	0.27%	Yarratt	2,381	0.9	0.04%
Lower Bucca	2,621	1.9	0.07%	Total		680	0.04%
Middle Brother	2,131	3.9	0.18%				

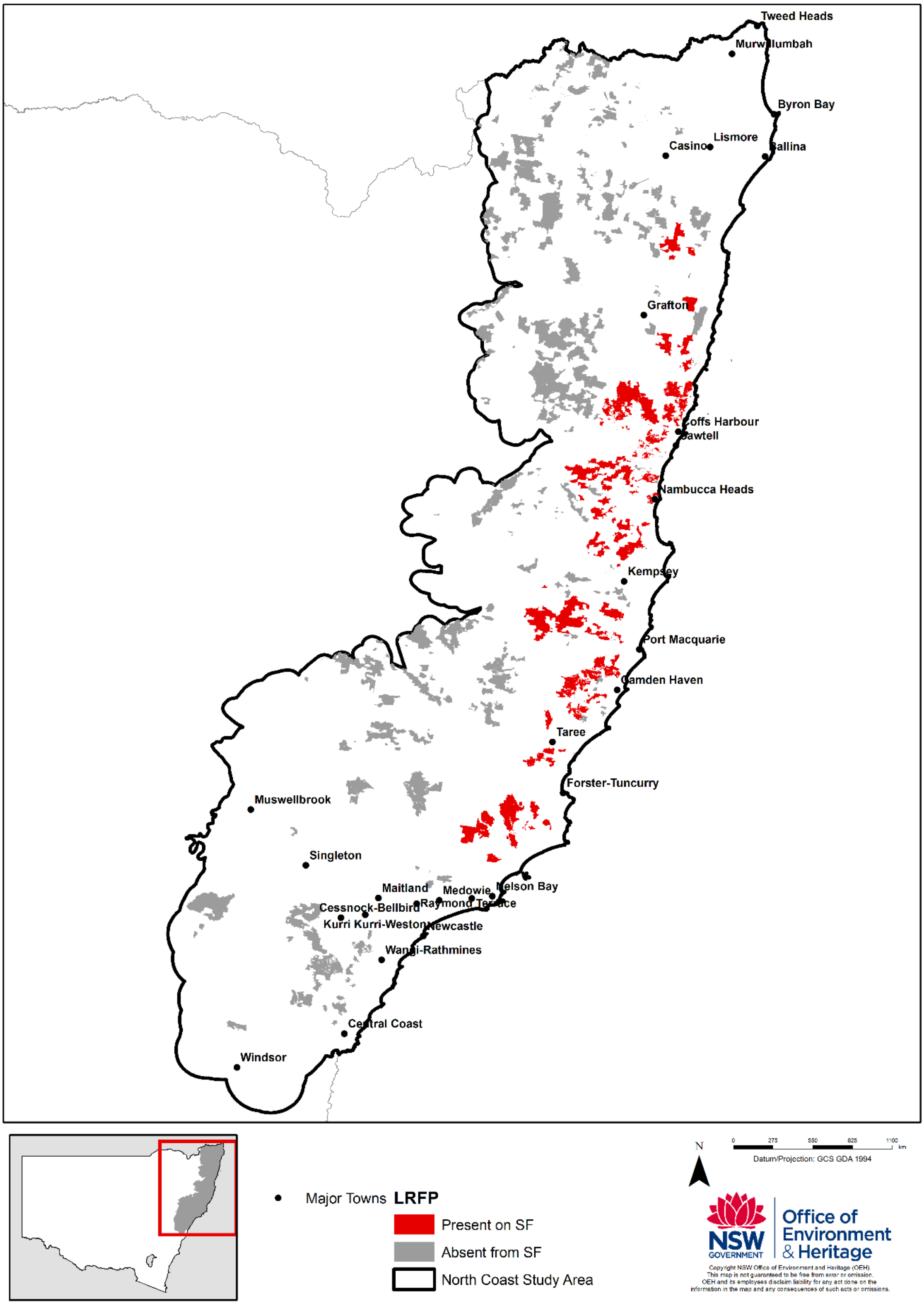
Map 20: **State forests with mapped occurrences of LORF on the North Coast**



Map 21: State forests with mapped occurrences of LORF on the South Coast



Map 22: State forests with mapped occurrences of LRFP on the North Coast



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Appendix 1

TEC assessment for floritic groups or communities

This appendix summarises the assessment of all floristic groups or communities which we have broadly regarded as rainforest and which comprise more than two plots, plus communities which are dominated by eucalypts but have higher than the median proportion of final determination assemblage species for any Rainforest TEC. Results are derived from initial classification then fuzzy clustering of all (6845) rainforest and wet sclerophyll forest plots in eastern NSW as described in the body of the report. Communities have prefixes of MU for Hunter communities, NR for Northern Rivers communities, S for Sydney Basin communities and RF or M for rainforest communities defined for our project. Abbreviations are LORF=Lowland Rainforest TEC, LRFP=Lowland Rainforest on floodplains TEC, LTRF=Littoral rainforest TEC. A suballiance site is an area of variable size, usually a single patch of rainforest, for which a species list is provided in the microfiche enclosed in Floyd (1990) or which is available in the OEH survey database. Suballiance sites with 'AF0' prefix are documented in Floyd (1990) and for these, the 4th and 5th digits indicate the suballiance number. Otherwise, assignment of suballiance is not related to the site number and is less certain. The relative mean proportion is the proportion of the maximum value for the suballiance site. Communities are assigned to suballiances using the following criteria and thresholds as a guide, although in some cases relationships with other suballiance sites not listed in this table are also taken into account:

a. Percentage mean proportion of suballiance species is at least 75, which is the median for all groups resulting from analysis

b. Percentage relative proportion of suballiance species is at least 65, which is the median for all groups resulting from analysis

c. communities which meet neither of these thresholds are assessed based on how closely they approach the thresholds, the number of species in potentially related suballiance sites, the extent to which they are related to other suballiances and main characteristic species.

For eucalypt groups which are related to a suballiance site, the suballiance is shown in parentheses

Community_or_group	Description_long	Total number of plots	Proportion of plots with eucalypt cover >=5%	Proportion of plots >600m elev with membership >=0.5	Proportion of plots in modelled alluvium	Mean proportion of species in LORF assemblage list	Mean proportion of species in LRFP assemblage list	Mean proportion of species in LTRF assemblage list	Suballiance site with the highest mean proportion of species per plot	Mean proportion (col L) as a percentage of the maximum for the suballiance site	Suballiance site with the highest relative mean proportion of species per plot	Relative prop as a percentage of exp max	Assigned suballiance for community	TEC	notes
MU 010	Acmena smithii-Cissus antarctica-Cryptocarya glaucescens-Morinda jasminoides-Eucalyptus saligna	6	100			0.56	0.06	0.55	AF037-2	97	AF026-3	77	(37)		eucalypt group
MU 012	Waterhousea floribunda-Carex longebrachiata-Lomandra hystrix-Morinda jasminoides-Ficus coronata	32	57		67	0.4	0.1	0.4	AF028-2	71	AF026-2	58	26		eucalypt group
MU 020	Breynia oblongifolia-Choricarpia leptopetala-Cayratia clematidea-Dioscorea transversa-Drypetes deplanchei	5	50			0.49	0.01	0.46	AF34-6	74	AF017-5	83	na		floristic relationship not consistent with location or habitat of SA sites
MU 048	Acacia maidenii-Breynia oblongifolia-Corymbia variegata-Eucalyptus siderophloia-Geitonoplesium cymosum	3	100			0.42	0.04	0.54	AF028-2	81	AF46-7	59	na		eucalypt group
MU 050	Smilax australis-Dioscorea transversa-Doodia aspera-Morinda jasminoides-Syncarpia glomulifera	28	100			0.43	0.04	0.48	AF037-2	90	AF030-2	85	na		eucalypt group
NR1000-1586	Wilkiea huegeliana-Endiandra muelleri subsp. muelleri-Morinda jasminoides-Cordyline stricta-Quintinia verdonii	16	100			0.44	0.12	0.37	AF033-1	93	AF73-8	92	(33)		wet sclerophyll forest
NR1000-1589	Archontophoenix cunninghamiana-Blechnum cartilagineum-Calamus muelleri-Neolitsea dealbata-Smilax australis	7	83			0.45	0.06	0.36	AF033-1	94	AF033-1	90	(33)		wet sclerophyll forest

Community_or_group	Description_long	Total number of plots	Proportion of plots with eucalypt cover >=5%	Proportion of plots >600m elev with membership >=0.5	Proportion of plots in modelled alluvium	Mean proportion of species in LORF assemblage list	Mean proportion of species in LRFP assemblage list	Mean proportion of species in LTRF assemblage list	Suballiance site with the highest mean proportion of species per plot	Mean proportion (col L) as a percentage of the maximum for the suballiance site	Suballiance site with the highest relative mean proportion of species per plot	Relative prop as a percentage of exp max	Assigned suballiance for community	TEC	notes
NR1000-1613	Cissus antarctica-Cryptocarya microneura-Lophostemon confertus-Smilax australis-Guioa semiglauca	10	100			0.45	0.01	0.4	AF028-2	81	AF021-5	73	(28)		wet sclerophyll forest
NR1000-1627	Claoxylon australe-Commersonia bartramia-Cordyline congesta-Dioscorea transversa-Geitonoplesium cymosum	4	75		50	0.42	0.07	0.48	AF033-1	82	AF033-1	78	(33)		wet sclerophyll forest
NR1000-1665	Smilax australis-Guioa semiglauca-Denhamia bilocularis-Eucalyptus propinqua-Notelaea longifolia	30	96		4	0.43	0.03	0.37	AF028-2	84	AF66-2	66	(28)		wet sclerophyll forest
NR1500-1142	Smilax australis-Blechnum cartilagineum-Geitonoplesium cymosum-Lophostemon confertus-Lomandra longifolia	16	100		25	0.26	0.02	0.43	AF033-1	71	AF029-1	55	na		eucalypt group
NR1500-1153	Cupaniopsis anacardioides-Dianella caerulea-Geitonoplesium cymosum-Lomandra longifolia-Lophostemon suaveolens	3	100		100	0.29	0.07	0.46	AF115-3	66	AF016-2	72	na		eucalypt group
NR1500-1157	Casuarina glauca-Cupaniopsis anacardioides-Entolasia marginata-Eucalyptus tereticornis-Glochidion ferdinandi var. pubens	3	100		50	0.35	0.04	0.46	AF033-1	69	AF016-2	74	na		eucalypt group
NR1500-929	Blechnum cartilagineum-Dioscorea transversa-Cordyline stricta-Morinda jasminoides-Pseuderanthemum variabile	60	90		19	0.33	0.04	0.42	AF033-1	83	AF73-8	81	(33)		wet sclerophyll forest

Community_or_group	Description_long	Total number of plots	Proportion of plots with eucalypt cover >=5%	Proportion of plots >600m elev with membership >=0.5	Proportion of plots in modelled alluvium	Mean proportion of species in LORF assemblage list	Mean proportion of species in LRFP assemblage list	Mean proportion of species in LTRF assemblage list	Suballiance site with the highest mean proportion of species per plot	Mean proportion (col L) as a percentage of the maximum for the suballiance site	Suballiance site with the highest relative mean proportion of species per plot	Relative prop as a percentage of exp max	Assigned suballiance for community	TEC	notes
NR1500-930	Blechnum cartilagineum-Cryptocarya rigida-Eucalyptus pilularis-Caldcluvia paniculosa-Allocasuarina torulosa	11	100			0.37	0.06	0.37	AF033-1	83	AF73-8	92	(33)		wet sclerophyll forest
NR1500-933	Synoum glandulosum-Blechnum cartilagineum-Cryptocarya rigida-Eucalyptus microcorys-Psychotria loniceroides	86	100	79		0.38	0.01	0.36	AF24-3	91	AF84-11	56	(30/ 37)		elevation over 600m; wet sclerophyll forest
NR1500-939	Breynia oblongifolia-Dianella caerulea-Doodia aspera-Eustrephus latifolius-Gymnostachys anceps	18	100	20		0.32	0	0.36	AF028-2	67	AF84-15	55	na		eucalypt group
NR1500-964	Synoum glandulosum-Cissus antarctica-Cryptocarya microneura-Eupomatia laurina-Guioa semiglauca	42	86	18		0.49	0.06	0.44	AF033-1	85	AF021-5	78	(33)		wet sclerophyll forest
NR1500-967	Cissus antarctica-Smilax australis-Alpinia caerulea-Polyscias elegans-Guioa semiglauca	48	82		5	0.45	0.03	0.41	AF028-2	77	AF5-8	40	(28)		wet sclerophyll forest
NR700-398	Doodia aspera-Lophostemon confertus-Notelaea longifolia-Pseuderanthemum variabile-Adiantum hispidulum	5	75			0.32	0.02	0.42	AF028-2	79	AF66-2	63	(28)		wet sclerophyll forest

Community_or_group	Description_long	Total number of plots	Proportion of plots with eucalypt cover >=5%	Proportion of plots >600m elev with membership >=0.5	Proportion of plots in modelled alluvium	Mean proportion of species in LORF assemblage list	Mean proportion of species in LRFP assemblage list	Mean proportion of species in LTRF assemblage list	Suballiance site with the highest mean proportion of species per plot	Mean proportion (col L) as a percentage of the maximum for the suballiance site	Suballiance site with the highest relative mean proportion of species per plot	Relative prop as a percentage of exp max	Assigned suballiance for community	TEC	notes
NR700-399	Archirhodomyrtus beckleri-Eucalyptus grandis-Guioa semiglauca-Tabernaemontana pandacaqui-Blechnum cartilagineum	24	93			0.38	0.04	0.44	AF033-1	89	AF026-2	65	(33)		wet sclerophyll forest
NR700-403	Adiantum formosum-Cissus antarctica-Eucalyptus saligna-Acmena smithii-Pittosporum multiflorum	7	100	50		0.55	0.09	0.5	AF028-2	88	AF013-4	94	(13/ 28)		wet sclerophyll forest
NR700-406	Cissus antarctica-Eucalyptus dunnii-Adiantum formosum-Lophostemon confertus-Diploglottis australis	31	100	44	4	0.57	0.08	0.47	AF028-2	86	AF84-11	56	(28)		wet sclerophyll forest (Dunn's White Gum TEC)
NR700-409	Blechnum cartilagineum-Guioa semiglauca-Dioscorea transversa-Lophostemon confertus-Smilax australis	13	90			0.44	0.06	0.42	AF033-1	95	AF033-1	91	(33)		wet sclerophyll forest
NR700-410	Dioscorea transversa-Elaeocarpus obovatus-Geitonoplesium cymosum-Guioa semiglauca-Jagera pseudorhus	3	100			0.42	0.08	0.47	AF033-1	77	AF32-10	46	(33)		wet sclerophyll forest
NR700-411	Lophostemon confertus-Smilax australis-Synoum glandulosum-Notelaea longifolia-Psychotria loniceroides	14	67		17	0.35	0.03	0.47	AF028-2	73	AF018-1	70	na		eucalypt group
NR700-426	Cissus hypoglauca-Lomandra longifolia-Smilax australis-Syncarpia glomulifera-Synoum glandulosum	3	100	50		0.41	0	0.37	AF028-2	77	AF84-15	68	(28)		wet sclerophyll forest

Community_or_group	Description_long	Total number of plots	Proportion of plots with eucalypt cover >=5%	Proportion of plots >600m elev with membership >=0.5	Proportion of plots in modelled alluvium	Mean proportion of species in LORF assemblage list	Mean proportion of species in LRFP assemblage list	Mean proportion of species in LTRF assemblage list	Suballiance site with the highest mean proportion of species per plot	Mean proportion (col L) as a percentage of the maximum for the suballiance site	Suballiance site with the highest relative mean proportion of species per plot	Relative prop as a percentage of exp max	Assigned suballiance for community	TEC	notes
NR700-431	Adiantum aethiopicum-Allocasuarina torulosa-Breynia oblongifolia-Cissus antarctica-Clematis aristata	3	100			0.38	0.03	0.38	AF028-2	76	AF021-5	66	(28)		wet sclerophyll forest
NR700-432	Morinda jasminoides-Acmena smithii-Notelaea longifolia-Dioscorea transversa-Pseuderanthemum variabile	14	100		50	0.42	0.07	0.48	AF028-2	87	AF49-1	85	(28)		wet sclerophyll forest
NR700-433	Oplismenus imbecillis-Pellaea nana-Pittosporum multiflorum-Streblus brunonianus-Adiantum hispidulum	4	100			0.48	0.07	0.39	AF028-2	79	AF109-5	77	(28)		wet sclerophyll forest
NR700-435	Cissus antarctica-Diospyros australis-Pittosporum multiflorum-Dioscorea transversa-Geitonoplesium cymosum	10	83			0.55	0.06	0.49	AF028-2	91	AF46-2	91	(28)		wet sclerophyll forest
NR700-450	Actephila lindleyi-Arytera divaricata-Cissus antarctica-Dendrocnide excelsa-Dendrocnide photinophylla	4	67			0.58	0.09	0.38	AF021-3	84	AF5-8	43	na		
NR700-459	Acmena smithii-Cissus sterculiifolia-Cordyline stricta-Corymbia intermedia-Cupaniopsis anacardioides	5	60		80	0.52	0.06	0.62	AF115-3	100	AF016-3	115	16	LTRFp ossibl e	substantial eucalypts
NR700-467	Austromyrtus dulcis-Corymbia intermedia-Lomandra longifolia-Acronychia imperforata-Pandorea pandorana subsp. pandorana	9	100		62	0.29	0.01	0.41	AF115-3	69	AF55-1	62	na		eucalypt group

Community_or_group	Description_long	Total number of plots	Proportion of plots with eucalypt cover >=5%	Proportion of plots >600m elev with membership >=0.5	Proportion of plots in modelled alluvium	Mean proportion of species in LORF assemblage list	Mean proportion of species in LRFP assemblage list	Mean proportion of species in LTRF assemblage list	Suballiance site with the highest mean proportion of species per plot	Mean proportion (col L) as a percentage of the maximum for the suballiance site	Suballiance site with the highest relative mean proportion of species per plot	Relative prop as a percentage of exp max	Assigned suballiance for community	TEC	notes
NR700-473	Corymbia intermedia-Hibbertia scandens-Pteridium esculentum-Smilax australis-Cupaniopsis anacardioides	23	100		92	0.29	0.01	0.47	AF115-3	84	AF115-3	96	na		eucalypt group
NR700-477	Melaleuca saligna-Cordyline stricta-Eucalyptus robusta-Gahnia clarkei-Lomandra longifolia	5	100		67	0.31	0	0.42	AF037-2	66	AF48-9	26	na		eucalypt group
NR700-485	Cupaniopsis anacardioides-Geitonoplesium cymosum-Stephania japonica-Smilax australis-Viola silicestris	14	100		80	0.34	0.05	0.46	AF115-3	69	AF018-2	63	na		eucalypt group
NR700-488	Alphitonia excelsa-Morinda jasminoides-Breynia oblongifolia-Lomandra longifolia-Lophostemon suaveolens	8	100		50	0.36	0.04	0.4	AF028-2	69	AF026-3	68	na		eucalypt group
NR700-629	Eucalyptus robusta-Blechnum indicum-Gahnia clarkei-Elaeocarpus reticulatus-Melaleuca quinquenervia	20	92		92	0.4	0.07	0.38	AF023-1	59	AF55-1	55	na		eucalypt group
RF1	Arthropteris tenella-Lastreopsis microsora-Pittosporum multiflorum-Asplenium australasicum-Cissus antarctica	40	3	20	13	0.6	0.14	0.39	AF012-5	100	AF012-1	85	12		
RF10	Archontophoenix cunninghamiana-Calamus muelleri-Cyathea leichhardtiana-Wilkiea huegeliana-Adiantum silvaticum	6				0.47	0.12	0.28	AF033-1	100	AF033-1	95	33		

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RF100	Pellaea nana-Doryphora sassafras-Microsorum scandens-Adiantum formosum-Marsdenia rostrata	11				0.45	0.08	0.25	AF037-2	85	AF014-2	103	37/14	LORF	
RF102	Doryphora sassafras-Pandorea pandorana subsp. pandorana-Urtica incisa-Dicksonia antarctica-Hedycarya angustifolia	9	25			0.36	0.02	0.2	AF036-5	89	AF040-3	115	36/40		
RF103	Blechnum nudum-Blechnum patersonii-Bursaria spinosa-Centella asiatica-Clematis aristata	3				0.23	0.02	0.17	AF036-5	82	AF036-5	97	36		
RF105	Doryphora sassafras-Eustrephus latifolius-Melicytus dentatus-Smilax australis-Acacia melanoxylon	21	15			0.43	0.04	0.27	AF036-5	85	AF020-5	95	36/37/14/20	LORF/ LTRF	Almost equally similar to 14, 36 and 37
RF106	Pellaea nana-Adiantum formosum-Daphnandra apatela-Melicytus dentatus-Pyrrosia rupestris	13	15			0.55	0.06	0.33	AF150-1	91	AF71-9	89	14	LORF	Closest to AF sites blue Gum Flat, Cambewarra Mtn
RF107	Dicksonia antarctica-Blechnum wattsii-Histiopteris incisa-Polystichum proliferum-Smilax australis	12	22			0.13	0	0.08	AF036-5	76	AF044-5	110	44		
RF108	Dicksonia antarctica-Fieldia australis-Microsorum pustulatum-Parsonsia brownii-Asplenium flabellifolium	3				0.25	0.04	0.02	AF047-3	100	AF011-1	90	11/47		

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RF109	Dicksonia antarctica-Eucrmoor-Fieldia australis-Smilax australis-Pandorea pandorana subsp. pandorana	10	10			0.33	0.03	0.16	AF054-3	96	AF038-2	86	54		
RF11	Calamus muelleri-Archontophoenix cunninghamiana-Cordyline stricta-Morinda jasminoides-Tabernaemontana pandacaqui	10			44	0.44	0.17	0.42	AF033-1	89	AF006-2	65	33	LRFP possib le	
RF110	Dicksonia antarctica-Parsonsia brownii-Coprosma quadrifida-Nothofagus moorei-Smilax australis	14		100		0.22	0.01	0.06	AF047-3	85	AF051-3	113	47/5 1		elevation over 600m
RF111	Doryphora sassafras-Pyrrosia rupestris-Quintinia sieberi-Dicksonia antarctica-Lomandra spicata	6	33	100		0.3	0.02	0.09	AF047-3	92	AF040-2	111	40/4 7		elevation over 600m
RF112	Blechnum nudum-Leptospermum polygalifolium-Callistemon pallidus-Elaeocarpus holopetalus-Smilax australis	7	17	100		0.16	0	0.13	AF036-5	61	AF71-1	71	na		elevation over 600m
RF113	Wilkiea huegeliana-Guioa semiglauca-Synoum glandulosum-Blechnum cartilagineum-Endiandra globosa	13				0.51	0.06	0.44	AF033-1	98	AF006-2	64	33		
RF114	Adiantum hispidulum-Alyxia ruscifolia-Calamus muelleri-Cordyline rubra-Cryptocarya laevigata	3				0.46	0.05	0.41	AF023-1	94	AF006-2	64	23		

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RF115	Cupaniopsis anacardioides-Geitonoplesium cymosum-Glochidion sumatranum-Melicope elleryana-Smilax australis	8	14		57	0.41	0.06	0.47	AF033-1	86	AF033-1	82	33	LRFP	
RF116	Cupaniopsis anacardioides-Geitonoplesium cymosum-Guioa semiglauca-Maclura cochinchinensis-Commelina diffusa	6			25	0.55	0.07	0.58	AF016-2	100	AF016-2	93	16	LTRF	
RF117	Smilax australis-Geitonoplesium cymosum-Jagera pseudorhus-Alphitonia excelsa-Maclura cochinchinensis	10			20	0.46	0.04	0.51	AF028-2	85	AF66-2	61	28		
RF118	Centella asiatica-Guioa semiglauca-Maclura cochinchinensis-Cupaniopsis anacardioides-Casuarina glauca	8			67	0.33	0.07	0.54	AF033-1	73	AF106-2	57	na		
RF119	Cupaniopsis anacardioides-Guioa semiglauca-Jagera pseudorhus-Lophostemon confertus-Melaleuca quinquenervia	3	33		33	0.41	0.06	0.49	AF033-1	71	AF8-2	73	na		
RF12	Archontophoenix cunninghamiana-Heritiera trifoliolata-Neolitsea dealbata-Pothos longipes-Trophis scandens	4			75	0.61	0.3	0.39	AF66-5	100	AF001-4	101	1/4/33	LORF/LRFP	AF66-5 is Woolgoolga Creek (SA4/33)

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RF121	Callitris columellaris-Geitonoplesium cymosum-Breynia oblongifolia-Corymbia intermedia-Cupaniopsis anacardioides	6	20			0.39	0.04	0.44	AF016-2	80	AF016-2	75	16?	LTRFpossible	
RF123	Cordyline stricta-Guioa semiglauca-Syzygium oleosum-Drypetes deplanchei-Myrsine variabilis	8			67	0.54	0.06	0.66	AF115-3	97	AF016-2	93	16	LTRF	AF115-3 is Bundagen FR, SA16
RF124	Archidendron hendersonii-Cupaniopsis anacardioides-Exocarpos latifolius-Geitonoplesium cymosum-Planchonella chartacea	6			50	0.48	0.07	0.48	AF016-2	97	AF016-1	71	16	LTRF	
RF125	Cryptocarya triplinervis var. pubens-Doodia aspera-Eupomatia laurina-Wilkiea huegeliana-Arytera divaricata	11				0.49	0.09	0.59	AF033-1	82	AF018-1	76	33/18?	LTRFpossible	
RF126	Casuarina glauca-Cupaniopsis anacardioides-Parsonsia straminea-Juncus kraussii subsp. australiensis-Melaleuca saligna	8			100	0.32	0.01	0.43	AF115-3	70	AF016-1	62	na		
RF127	Casuarina glauca-Cupaniopsis anacardioides-Geitonoplesium cymosum-Livistona australis-Maclura cochinchinensis	4			100	0.45	0.11	0.55	AF016-2	89	AF67-1	58	16	LTRF	

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RF128	Cupaniopsis anacardioides-Aegiceras corniculatum-Avicennia marina subsp. australasica-Crinum pedunculatum-Casuarina glauca	7			100	0.3	0.06	0.36	AF114-2	81	AF006-1	72	6?	LRFP possible	
RF129	Archontophoenix cunninghamiana-Hypolepis muelleri-Livistona australis-Marsdenia rostrata-Melaleuca quinquenervia	9			89	0.41	0.12	0.43	AF033-1	68	AF016-2	70	na		
RF130	Cupaniopsis anacardioides-Melaleuca quinquenervia-Smilax australis-Archontophoenix cunninghamiana-Geitonoplesium cymosum	10			100	0.48	0.12	0.63	AF115-3	80	AF018-4	80	16?/ 18?	LTRFpossible	AF115-3 is Bundagen FR, SA16
RF131	Melaleuca quinquenervia-Acmena smithii-Archontophoenix cunninghamiana-Ficus coronata-Hypolepis muelleri	6			100	0.53	0.27	0.58	AF033-1	74	AF003-1	51	na		
RF132	Acmena smithii-Eucalyptus saligna-Livistona australis-Melaleuca biconvexa-Morinda jasminoides	3				0.41	0.1	0.53	AF018-4	92	AF106-1	76	18	LTRF	
RF133	Parsonsia straminea-Melaleuca quinquenervia-Blechnum indicum-Melicope elleryana-Elaeocarpus reticulatus	20			87	0.32	0.05	0.31	AF033-1	51	AF115-1	59	na		

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RF134	Gahnia clarkei-Hypolepis muelleri-Pittosporum undulatum-Acacia melanoxylon-Alphitonia excelsa	3			67	0.45	0.13	0.35	AF033-1	82	AF045-4	34	33/45		
RF136	Acmena smithii-Banksia integrifolia subsp. monticola-Lomandra longifolia-Oplismenus imbecillis-Pittosporum undulatum	25	23			0.36	0.03	0.55	AF028-2	67	AF020-1	78	20/28		
RF137	Alphitonia excelsa-Livistona australis-Smilax australis-Breynia oblongifolia-Endiandra sieberi	14	9			0.52	0.03	0.61	AF115-3	85	AF020-1	82	16	LTRF	AF115-3 is Bundagen FR, SA16
RF138	Cupaniopsis anacardioides-Hibbertia scandens-Lomandra longifolia-Geitonoplesium cymosum-Smilax australis	8			40	0.37	0.02	0.49	AF115-3	74	AF55-3	68	16	LTRF	AF115-3 is Bundagen FR, SA16
RF139	Syzygium paniculatum-Acmena smithii-Banksia integrifolia subsp. monticola-Breynia oblongifolia-Lomandra longifolia	11			43	0.39	0.05	0.6	AF115-3	87	AF018-2	79	16	LTRF	AF115-3 is Bundagen FR, SA16
RF140	Banksia integrifolia subsp. monticola-Cupaniopsis anacardioides-Smilax australis-Acronychia imperforata-Geitonoplesium cymosum	29			32	0.32	0.02	0.52	AF115-3	76	AF82-1	72	16?	LTRFpossible	AF115-3 is Bundagen FR, SA16

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RF142	Breynia oblongifolia-Banksia integrifolia subsp. monticola-Commelina diffusa-Cupaniopsis anacardioides-Lomandra longifolia	26			5	0.24	0.01	0.49	AF115-3	73	AF018-2	75	18?	LTRFpossible	
RF143	Alphitonia excelsa-Hibbertia scandens-Imperata cylindrica-Melaleuca quinquenervia-Microlaena stipoides	4	33		100	0.17	0.02	0.31	AF115-3	57	AF006-5	63	na		
RF146	Commelina diffusa-Dichondra repens-Imperata cylindrica-Microlaena stipoides-Oplismenus imbecillis	6				0.24	0.03	0.27	AF037-2	53	AF016-2	55	na		
RF147	Casuarina cunninghamiana-Microlaena stipoides-Lomandra longifolia-Dichondra repens-Oplismenus aemulus	21	25			0.17	0.03	0.18	AF028-2	47	AF46-5	40	na		
RF148	Notelaea longifolia-Dianella caerulea-Eustrephus latifolius-Geitonoplesium cymosum-Pandorea pandorana subsp. pandorana	7	33		33	0.29	0.01	0.41	AF019-5	76	AF027-4	56	19?	LTRFpossible	
RF15	Acmena smithii-Cissus antarctica-Ficus coronata-Alocasia brisbanensis-Archontophoenix cunninghamiana	4				0.52	0.14	0.42	AF033-1	89	AF10-1	89	33		

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RF150	Morinda jasminoides-Oplismenus imbecillis-Viola silicestris-Commelina diffusa-Ficus coronata	5			100	0.46	0.1	0.55	AF033-1	73	AF026-3	71	26?/33?	LRFP possible	
RF151	Parsonsia straminea-Ficus coronata-Lomandra hystrix-Myrsine variabilis-Pseuderanthemum variabile	7			33	0.39	0.1	0.43	AF028-2	76	AF026-1	78	26/28		
RF152	Ficus coronata-Oplismenus aemulus-Adiantum hispidulum-Castanospermum australe-Casuarina cunninghamiana	3				0.39	0.24	0.44	AF34-6	70	AF024-3	80	24		
RF154	Casuarina glauca-Croton verreauxii-Geitonoplesium cymosum-Maclura cochinchinensis-Pseuderanthemum variabile	3			100	0.39	0.09	0.36	AF34-6	83	AF025-3	106	25		
RF155	Ficus rubiginosa-Pellaea nana-Geitonoplesium cymosum-Melicytus dentatus-Asplenium flabellifolium	18	21			0.34	0	0.28	AF028-2	70	AF030-3	86	30		
RF156	Celastrus australis-Dendrocnide excelsa-Eustrephus latifolius-Alectryon subcinereus-Ficus rubiginosa	5				0.61	0.1	0.48	AF028-2	90	AF109-3	77	28		
RF157	Adiantum aethiopicum-Ficus rubiginosa-Oplismenus aemulus-Pandorea pandorana-Austrostipa verticillata	8	29			0.32	0.02	0.19	AF031-2	86	AF032-3	106	31/32		

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RF158	Pellaea nana-Nyssanthes diffusa-Brachychiton populneus-Dichondra repens-Notelaea microcarpa var. velutina	11		20		0.21	0.01	0.15	AF031-2	70	AF103-2	35	na		
RF159	Cayratia clematidea-Cissus antarctica-Clerodendrum tomentosum-Urtica incisa-Alectryon subcinereus	9				0.4	0	0.25	AF028-2	69	AF031-3	56	na		
RF162	Backhousia myrtifolia-Asplenium flabellifolium-Bursaria spinosa-Notelaea longifolia-Pellaea nana	20	36			0.21	0	0.16	AF028-2	49	AF029-4	42	na		
RF163	Backhousia myrtifolia-Clematis aristata-Pandorea pandorana subsp. pandorana-Adiantum aethiopicum-Desmodium varians	6	40	20		0.23	0	0.2	AF028-2	46	AF030-3	64	na		
RF164	Bursaria spinosa-Plectranthus parviflorus-Backhousia myrtifolia-Clematis aristata-Oplismenus imbecillis	12	30			0.2	0	0.15	AF028-2	43	AF046-3	17	na		
RF165	Adiantum aethiopicum-Angophora floribunda-Backhousia myrtifolia-Bursaria spinosa-Persoonia sp. aff. linearis (Macleay-Apsley)	3				0.1	0	0.06	AF028-2	31	AF98-1	32	na		
RF166	Acacia prominens-Backhousia myrtifolia-Breynia oblongifolia-Bursaria spinosa-Clerodendrum tomentosum	5				0.4	0.02	0.32	AF028-2	70	AF027-4	60	na		

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RF168	Pellaea nana-Pandorea pandorana subsp. pandorana-Backhousia myrtifolia-Asplenium flabellifolium-Geitonoplesium cymosum	41	4			0.35	0.01	0.25	AF028-2	67	AF030-3	85	30		
RF169	Pandorea pandorana subsp. pandorana-Urtica incisa-Pellaea nana-Melicytus dentatus-Clematis glycinoides var. submutica	27	29			0.32	0.02	0.27	AF028-2	66	AF030-1	84	30		
RF170	Adiantum aethiopicum-Backhousia myrtifolia-Adiantum formosum-Breynia oblongifolia-Doodia aspera	9	33			0.41	0.02	0.33	AF028-2	75	AF030-1	99	30		
RF171	Cayratia clematidea-Eustrephus latifolius-Pellaea nana-Plectranthus parviflorus-Adiantum formosum	11	18			0.47	0.04	0.3	AF028-2	79	AF027-4	56	28		
RF172	Backhousia myrtifolia-Callicoma serratifolia-Calochlaena dubia-Blechnum cartilagineum-Doodia aspera	6				0.34	0.06	0.33	AF037-2	87	AF029-1	69	37		
RF173	Backhousia myrtifolia-Notelaea venosa-Lepidosperma urophorum-Morinda jasminoides-Pittosporum revolutum	11	12			0.4	0.01	0.3	AF037-2	72	AF045-3	37	na		
RF174	Alyxia ruscifolia-Backhousia myrtifolia-Pyrrosia rupestris-Stenocarpus salignus-Bulbophyllum exiguum	3		100		0.23	0.01	0.19	AF028-2	53	AF029-4	67	na		elevation over 600m

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RF175	Backhousia myrtifolia-Eucalyptus punctata-Bursaria spinosa-Lepidosperma laterale-Cheilanthes sieberi	14	54			0.18	0	0.06	AF028-2	40	AF63-3	15	na		
RF176	Aristida ramosa-Cymbopogon refractus-Geijera salicifolia-Notelaea microcarpa var. velutina-Spartothamnella juncea	4	25			0.04	0	0.01	AF031-2	37	AF103-2	30	na		
RF178	Acmena smithii-Marsdenia rostrata-Morinda jasminoides-Eustrephus latifolius-Oplismenus imbecillis	40	23			0.41	0.02	0.37	AF028-2	69	AF020-5	93	20	LTRFpossible	
RF18	Cissus hypoglauca-Sarcopteryx stipata-Wilkiea huegeliana-Archontophoenix cunninghamiana-Calamus muelleri	28	10	5	5	0.46	0.09	0.34	AF033-1	96	AF033-3	99	33		
RF180	Doodia aspera-Backhousia myrtifolia-Morinda jasminoides-Acmena smithii-Pyrrosia rupestris	21	18			0.44	0.05	0.35	AF037-2	91	AF030-2	88	37		
RF181	Ficus coronata-Pellaea nana-Acmena smithii-Doodia aspera-Pittosporum undulatum	21		8		0.5	0.06	0.37	AF037-2	87	AF030-2	83	37		
RF182	Acmena smithii-Adiantum aethiopicum-Doodia aspera-Geitonoplesium cymosum-Oplismenus imbecillis	4				0.46	0.05	0.48	AF028-2	81	AF49-1	75	28		
RF183	Doodia aspera-Dioscorea transversa-Smilax australis-Wilkiea huegeliana-Cissus antarctica	52	27			0.47	0.03	0.54	AF028-2	87	AF030-2	85	28/30		

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RF184	Acmena smithii-Livistona australis-Morinda jasminoides-Oplismenus imbecillis-Eustrephus latifolius	32				0.46	0.07	0.55	AF037-2	86	AF020-3	89	37		
RF185	Morinda jasminoides-Ripogonum fawcettianum-Smilax australis-Trochocarpa laurina-Cryptocarya glaucescens	8			20	0.44	0.04	0.42	AF037-2	87	AF40-5	52	37		
RF187	Syncarpia glomulifera-Backhousia myrtifolia-Doodia aspera-Smilax australis-Dianella caerulea	26	13			0.27	0	0.26	AF037-2	66	AF030-2	72	30		
RF188	Oplismenus aemulus-Microlaena stipoides-Pratia purpurascens-Adiantum aethiopicum-Backhousia myrtifolia	10	20			0.15	0.01	0.16	AF037-2	49	AF030-2	47	na		
RF189	Backhousia myrtifolia-Dianella caerulea-Glycine clandestina-Lepidosperma laterale-Oplismenus aemulus	3				0.18	0	0.18	AF037-2	51	AF027-4	44	na		
RF19	Ceratopetalum apetalum-Doryphora sassafras-Tasmannia insipida-Orites excelsus-Linospadix monostachyos	22		35	10	0.4	0.1	0.27	AF033-1	93	AF035-2	59	33	LRFP possib le	
RF190	Backhousia myrtifolia-Geitonoplesium cymosum-Adiantum aethiopicum-Breynia oblongifolia-Eustrephus latifolius	43	30			0.35	0.01	0.31	AF028-2	68	AF030-1	82	30		

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RF192	Ficus coronata-Synoum glandulosum-Viola silicestris-Cissus hypoglauca-Gahnia clarkei	7	50			0.39	0.1	0.53	AF020-3	100	AF020-3	94	20	LTRF	
RF193	Endiandra sieberi-Eucalyptus pilularis-Lomandra longifolia-Notelaea longifolia-Acmena smithii	12	62			0.4	0.03	0.47	AF020-3	95	AF020-3	89	20	LTRFp ossibl e	high proportion of eucalypts
RF194	Calochlaena dubia-Smilax glyciphylla-Notelaea longifolia-Pittosporum undulatum-Dianella caerulea	22	25			0.29	0.02	0.41	AF037-2	79	AF020-3	84	20		
RF195	Glochidion ferdinandi var. pubens-Lomandra longifolia-Adiantum aethiopicum-Geitonoplesium cymosum-Acmena smithii	13	17		50	0.22	0.01	0.35	AF037-2	62	AF026-1	57	na		
RF196	Elaeocarpus reticulatus-Oplismenus imbecillis-Dianella caerulea-Viola silicestris-Cissus hypoglauca	15	36			0.17	0	0.21	AF037-2	45	AF046-2	21	na		
RF197	Acacia irrorata-Dichondra repens-Doodia aspera-Entolasia marginata-Acronychia oblongifolia	3		33		0.29	0	0.28	AF028-2	55	AF020-3	53	na		
RF198	Acacia melanoxylon-Adiantum hispidulum-Blechnum cartilagineum-Cryptocarya rigida-Diospyros australis	5	50	75		0.36	0.06	0.25	AF033-5	78	AF63-16	53	33?		elevation over 600m

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RF199	Hibbertia scandens-Blechnum cartilagineum-Lomandra longifolia-Elaeocarpus reticulatus-Pteridium esculentum	12		50		0.3	0.03	0.35	AF033-1	79	AF033-1	75	33		
RF2	Palmeria scandens-Diploglottis australis-Wilkiea huegeliana-Eupomatia laurina-Morinda jasminoides	25		56		0.53	0.08	0.4	AF007-3	98	AF007-3	106	7		
RF20	Blechnum cartilagineum-Lomandra spicata-Schizomeria ovata-Caldcluvia paniculosa-Palmeria scandens	42	33	81		0.41	0.04	0.33	AF24-3	99	AF24-3	100	33?		elevation over 600m
RF200	Eustrephus latifolius-Smilax australis-Blechnum cartilagineum-Cissus hypoglauca-Tylophora barbata	18	7			0.18	0.01	0.16	AF037-2	53	AF045-2	35	na		
RF201	Asplenium australasicum-Cissus antarctica-Diploglottis australis-Elattostachys nervosa-Guioa semiglauca	4				0.6	0.08	0.44	AF028-2	87	AF021-5	86	28/21?	LORF possible	
RF202	Archontophoenix cunninghamiana-Asplenium australasicum-Calamus muelleri-Elattostachys nervosa-Endiandra muelleri subsp. muelleri	11			18	0.52	0.19	0.37	AF66-5	96	AF001-4	100	1/4/33	LORF/LRFP	AF66-5 is Woolgoolga Creek (SA4/33)
RF203	Akania bidwillii-Archontophoenix cunninghamiana-Arthropteris tenella-Asplenium australasicum-Baloghia inophylla	3				0.55	0.1	0.39	AF66-5	99	AF011-2	85	4/33	LRFP possible	AF66-5 is Woolgoolga Creek (SA4/33)

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RF204	Acronychia wilcoxiana-Alpinia caerulea-Archontophoenix cunninghamiana-Arthropteris tenella-Asplenium australasicum	3	33			0.57	0.1	0.49	AF028-2	78	AF66-3	91	7		AF66-3 is Waihou FR, SA7
RF205	Archontophoenix cunninghamiana-Blechnum patersonii-Cissus antarctica-Cissus hypoglauca-Cyathea leichhardtiana	3				0.44	0.09	0.29	AF007-3	90	AF5-10	36	7		
RF206	Doryphora sassafras-Linospadix monostachyos-Polyosma cunninghamii-Pothos longipes-Sarcopteryx stipata	12		11		0.42	0.15	0.26	AF007-3	99	AF70-11	93	7/33		AF70-11 is Wilson River (old FR), SA33
RF207	Arthropteris tenella-Asplenium australasicum-Derris involuta-Diploglottis australis-Heritiera actinophylla	7				0.46	0.15	0.25	AF007-3	87	AF84-14	94	7		AF84-14 is Dardanelles Ck, New Eng NP, SA7
RF208	Asplenium australasicum-Cissus antarctica-Diploglottis australis-Embelia australiana-Endiandra muelleri subsp. muelleri	7				0.51	0.16	0.36	AF40-8	100	AF40-8	101	1?/33?	LORF/ LRFP	AF40-8 is Undumburra Creek, SA uncertain, probably 1 or 33
RF21	Blechnum cartilagineum-Schizomeria ovata-Cissus hypoglauca-Dianella caerulea-Elaeocarpus reticulatus	8		20		0.4	0.04	0.32	AF24-3	86	AF40-5	54	33?/ 35?		AF24-3 is Norman Jolly reserve, SA33 or 35

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RF22	Lophostemon confertus-Cissus antarctica-Doodia aspera-Lastreopsis microsora-Cryptocarya rigida	40	7		21	0.49	0.03	0.42	AF028-2	84	AF021-5	81	28		
RF23	Asplenium australasicum-Lophostemon confertus-Lomandra spicata-Wilkiea huegeliana-Cephalaralia cephalobotrys	13		29		0.49	0.13	0.37	AF028-2	73	AF84-16	85	7/33 ?		
RF24	Lophostemon confertus-Doodia aspera-Dioscorea transversa-Dianella caerulea-Tripladenia cunninghamii	16				0.39	0.04	0.38	AF028-2	77	AF66-2	56	28		
RF25	Cissus hypoglauca-Cordyline stricta-Dianella caerulea-Dioscorea transversa-Guioa semiglauca	5	20		20	0.39	0.05	0.49	AF028-2	74	AF115-4	69	28		
RF26	Cissus antarctica-Pittosporum multiflorum-Cordyline petiolaris-Croton verreauxii-Dioscorea transversa	16		33		0.53	0.04	0.38	AF028-2	87	AF021-5	75	28		
RF27	Geitonoplesium cymosum-Cissus antarctica-Doodia aspera-Adiantum hispidulum-Dioscorea transversa	33		26		0.45	0.06	0.34	AF028-2	88	AF028-2	92	28		
RF28	Alphitonia excelsa-Celastrus subspicata-Cordyline stricta-Geitonoplesium cymosum-Notelaea longifolia	5				0.47	0.04	0.34	AF028-2	90	AF028-2	94	28		

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RF29	Backhousia myrtifolia-Dioscorea transversa-Elaeodendron australe-Pandorea pandorana subsp. pandorana-Cissus antarctica	8				0.57	0.06	0.49	AF028-2	89	AF127-20	87	28		
RF3	Arthropteris tenella-Asplenium australasicum-Lastreopsis microsora-Microsorum scandens-Doryphora sassafras	26		95		0.52	0.15	0.3	AF007-3	98	AF007-4	71	7		elevation over 600m
RF31	Backhousia myrtifolia-Geitonoplesium cymosum-Notelaea longifolia-Pandorea pandorana subsp. pandorana-Dioscorea transversa	4				0.43	0	0.48	AF028-2	84	AF029-1	69	28		
RF32	Dendrocnide excelsa-Diospyros australis-Elattostachys nervosa-Mallotus philippensis-Capparis arborea	9				0.59	0.14	0.43	AF34-6	83	AF58-2	60	28		
RF33	Streblus brunonianus-Capparis arborea-Alectryon subcinereus-Baloghia inophylla-Dendrocnide excelsa	16		8		0.63	0.12	0.44	AF028-2	92	AF008-2	94	8/28 ?/21 ?	LORF possib le	
RF34	Alectryon subcinereus-Baloghia inophylla-Mallotus philippensis-Morinda jasminoides-Streblus brunonianus	14		8		0.61	0.12	0.41	AF028-2	92	AF46-1	104	28/2 1?	LORF possib le	AF46-1 is Chandlers Creek FR, SA28 or may include SA21
RF35	Capparis arborea-Tetrastigma nitens-Backhousia sciadophora-Dioscorea transversa-Elaeodendron australe	14		62		0.55	0.06	0.36	AF028-2	97	AF127-17	90	28		

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RF36	Alchornea ilicifolia-Capparis arborea-Cissus antarctica-Drypetes deplanchei-Gossia bidwillii	13		8		0.55	0.06	0.35	AF028-2	92	AF022-1	89	28	LTRFp oss	
RF37	Diospyros australis-Drypetes deplanchei-Guioa semiglauca-Notelaea longifolia-Pandorea pandorana subsp. pandorana	5			25	0.57	0.06	0.61	AF028-2	86	AF016-4	89	28/1 6	LTRFp ossibl e	
RF38	Aphananthe philippinensis-Arytera distylis-Capparis arborea-Cryptocarya triplinervis var. pubens-Cupaniopsis anacardioides	3			67	0.43	0.1	0.43	AF34-6	80	AF61-4	84	21?/ 23	LORF possib le	AF61-4 is Coolgardie Rd Wardell, SA23
RF39	Streblus brunonianus-Adiantum formosum-Cissus antarctica-Pittosporum multiflorum-Claoxylon australe	22	5	20		0.59	0.08	0.45	AF028-2	95	AF028-2	99	28		
RF4	Lomandra spicata-Orites excelsus-Tasmannia insipida-Caldcluvia paniculosa-Pittosporum multiflorum	68	4	98		0.47	0.11	0.28	AF007-3	98	AF012-2	94	7/12		elevation over 600m
RF40	Ficus coronata-Adiantum formosum-Cissus antarctica-Doodia aspera-Stephania japonica	9		20		0.51	0.09	0.42	AF028-2	85	AF028-2	89	28		
RF41	Backhousia sciadophora-Geitonoplesium cymosum-Jasminum volubile-Pellaea nana-Solanum stelligerum	17		43		0.45	0.03	0.29	AF028-2	88	AF103-1	89	28		

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RF43	Capparis arborea-Cissus antarctica-Everistia vacciniifolia var. nervosa-Gossia bidwillii-Psychotria loniceroides	6	33			0.52	0.09	0.38	AF028-2	82	AF028-1	95	28		
RF44	Pittosporum multiflorum-Arytera divaricata-Capparis arborea-Mallotus philippensis-Alchornea ilicifolia	24	9			0.47	0.09	0.33	AF34-6	82	AF021-1	69	21	LORF	
RF45	Adiantum hispidulum-Cissus antarctica-Flindersia schottiana-Mallotus philippensis-Stenocarpus sinuatus	3			67	0.51	0.17	0.42	AF34-6	87	AF11-2	88	21	LORF	AF34-6 is Rotary Park list, SA21
RF46	Alectryon subcinereus-Backhousia myrtifolia-Clerodendrum tomentosum-Elaeocarpus obovatus-Ficus rubiginosa	3			50	0.8	0.2	0.48	AF028-2	88	AF002-1	67	2	LORF ?	
RF47	Capparis arborea-Mallotus philippensis-Pandorea pandorana subsp. pandorana-Streblus brunonianus-Adiantum aethiopicum	6				0.57	0.06	0.43	AF028-2	88	AF49-3	65	28		
RF49	Elattostachys nervosa-Legnephora moorei-Mallotus philippensis-Dysoxylum fraserianum-Heritiera actinophylla	5				0.65	0.12	0.51	AF010-3	94	AF007-5	90	7/10		

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RF5	Doryphora sassafras-Lomandra spicata-Pittosporum multiflorum-Cryptocarya meissneriana-Microsorum scandens	27		100	4	0.48	0.1	0.22	AF007-3	100	AF007-3	108	7		elevation over 600m
RF50	Adiantum formosum-Alangium villosum-Aphananthe philippinensis-Capparis arborea-Daphnandra micrantha	3			67	0.66	0.2	0.48	AF128-1	100	AF001-2	97	1/3	LORF/ LRFP	AF128-1 is Wingham Brush (SA3)
RF6	Akania bidwillii-Arthropteris tenella-Asplenium australasicum-Cissus antarctica-Diploglottis australis	4				0.45	0.14	0.33	AF001-4	87	AF73-6	86	1	LORF	
RF60	Adiantum hispidulum-Cissus antarctica-Dioscorea transversa-Doodia aspera-Ficus coronata	3				0.44	0.12	0.48	AF028-2	77	AF114-2	86	23?		AF114-2 is Gould Is NR, SA23?
RF61	Adiantum hispidulum-Ficus rubiginosa-Geitonoplesium cymosum-Lophostemon confertus-Pyrrosia confluens var. confluens	3		50		0.26	0.01	0.23	AF028-2	60	AF64-4	42	na		
RF62	Adiantum aethiopicum-Bursaria spinosa-Desmodium varians-Dianella caerulea-Doodia aspera	3				0.32	0.05	0.24	AF028-2	69	AF028-2	72	na		
RF64	Guioa semiglauca-Arytera distylis-Cordyline rubra-Archontophoenix cunninghamiana-Dioscorea transversa	18			20	0.47	0.14	0.36	AF033-1	87	AF34-7	61	33	LRFP possib le	

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RF65	Archontophoenix cunninghamiana-Calamus muelleri-Cordyline rubra-Hedraianthera porphyropetala-Linospadix monostachyos	12			18	0.48	0.16	0.37	AF033-1	82	AF006-2	58	6?	LRFP possib le	
RF67	Alpinia caerulea-Archontophoenix cunninghamiana-Asplenium australasicum-Cordyline petiolaris-Cupaniopsis anacardioides	3			50	0.5	0.11	0.61	AF34-6	81	AF11-3	92	21	LORF	AF11-3 is Hayters Hill east, SA21; AF34-6 is Rotary Park list, SA21
RF68	Alphitonia excelsa-Archontophoenix cunninghamiana-Diospyros pentamera-Doodia aspera-Dysoxylum mollissimum	3			33	0.63	0.14	0.54	AF023-1	94	AF006-2	63	23	LRFP possib le	
RF69	Aphananthe philippinensis-Caesalpinia subtropica-Capparis arborea-Cleistanthus cunninghamii-Diospyros fasciculosa	3				0.41	0.07	0.33	AF34-6	80	AF34-8	79	21	LORF	AF34-6 is Rotary Park list, SA21; AF34-8 is Wilson Park, SA21
RF7	Archontophoenix cunninghamiana-Linospadix monostachyos-Pothos longipes-Calamus muelleri-Cissus hypoglauca	14	9		9	0.5	0.17	0.33	AF033-1	95	AF32-7	73	33/1 ?	LRFP possib le	
RF70	Arthropteris tenella-Melodinus australis-Pittosporum multiflorum-Anthocarapa nitidula-Diospyros pentamera	24		36		0.54	0.15	0.34	AF34-6	79	AF33-5	72	7		AF33-5 is Tooloom Scrub, SA 7

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RF71	Ripogonum elseyanum-Alocasia brisbanensis-Archontophoenix cunninghamiana-Diploglottis australis-Linospadix monostachyos	16		8		0.59	0.18	0.37	AF13-1	100	AF008-3	74	1	LORF	AF13-1 is Sandy Creek, Bungdoozle, SA1
RF72	Archontophoenix cunninghamiana-Baloghia inophylla-Mallotus philippensis-Alpinia caerulea-Arthropteris tenella	9		11		0.58	0.2	0.4	AF10-6	90	AF5-8	43	7		AF10-6 is Black Scrub, SA7
RF73	Archontophoenix cunninghamiana-Asplenium australasicum-Carronia multisepalea-Cordyline rubra-Dendrocnide excelsa	5		60		0.49	0.19	0.3	AF001-1	100	AF001-1	96	1	LORF possible	some elevation over 600m
RF74	Streblus brunonianus-Gymnostachys anceps-Adiantum formosum-Arthropteris tenella-Baloghia inophylla	32	15			0.65	0.19	0.53	AF023-5	96	AF014-4	110	23/14	LORF	
RF75	Arthropteris tenella-Brachychiton acerifolius-Eustrephus latifolius-Livistona australis-Piper hederaceum var. hederaceum	3				0.65	0.25	0.6	AF023-5	100	AF019-1	86	23		
RF76	Geitonoplesium cymosum-Elaeodendron australe-Streblus brunonianus-Eustrephus latifolius-Pandorea pandorana subsp. pandorana	66	35			0.53	0.06	0.44	AF028-2	90	AF020-1	80	28		

Community_or_group	Description_long	Total number of plots	Proportion of plots with eucalypt cover >=5%	Proportion of plots >600m elev with membership >=0.5	Proportion of plots in modelled alluvium	Mean proportion of species in LORF assemblage list	Mean proportion of species in LRFP assemblage list	Mean proportion of species in LTRF assemblage list	Suballiance site with the highest mean proportion of species per plot	Mean proportion (col L) as a percentage of the maximum for the suballiance site	Suballiance site with the highest relative mean proportion of species per plot	Relative prop as a percentage of exp max	Assigned suballiance for community	TEC	notes
RF77	Waterhousea floribunda-Lomandra hystrix-Ficus coronata-Streblus brunonianus-Adiantum hispidulum	50	2		27	0.45	0.17	0.34	AF028-2	74	AF026-2	60	26	LRFP possib le	Intensive Waterhousea floribunda survey, mostly disturbed riparian plots, none in SF
RF78	Ceratopetalum apetalum-Grammitis billardierei-Blechnum wattsii-Gahnia sieberiana-Gleichenia microphylla	3				0.19	0.12	0	AF036-5	86	AF036-2	44	33/3 6		
RF8	Archontophoenix cunninghamiana-Lastreopsis microsora-Neolitsea dealbata-Sloanea australis-Cissus antarctica	23	5		15	0.58	0.17	0.39	AF81-1	96	AF104-1	65	7?		AF81-1 is 'Lorien', Landsdowne, SA7?
RF81	Lomandra longifolia-Tristaniopsis laurina-Ceratopetalum apetalum-Entolasia stricta-Pittosporum undulatum	15				0.23	0.05	0.21	AF037-2	50	AF026-2	43	na		
RF82	Acmena smithii-Ceratopetalum apetalum-Dianella caerulea-Dracophyllum secundum-Leucopogon lanceolatus	3				0.2	0.05	0.11	AF037-2	63	AF48-2	31	na		
RF83	Lomatia myricoides-Lomandra longifolia-Sticherus flabellatus-Ceratopetalum apetalum-Tristaniopsis laurina	21	12			0.09	0.04	0.06	AF037-2	31	AF48-9	11	na		

Community_or_group	Description_long	Total number of plots	Proportion of plots with eucalypt cover >=5%	Proportion of plots >600m elev with membership >=0.5	Proportion of plots in modelled alluvium	Mean proportion of species in LORF assemblage list	Mean proportion of species in LRFP assemblage list	Mean proportion of species in LTRF assemblage list	Suballiance site with the highest mean proportion of species per plot	Mean proportion (col L) as a percentage of the maximum for the suballiance site	Suballiance site with the highest relative mean proportion of species per plot	Relative prop as a percentage of exp max	Assigned suballiance for community	TEC	notes
RF84	Ceratopetalum apetalum-Callicoma serratifolia-Acmena smithii-Smilax glyciphylla-Sticherus flabellatus	13	11	11		0.32	0.08	0.34	AF037-2	85	AF026-2	58	37		
RF85	Ceratopetalum apetalum-Eucalyptus piperita-Sticherus flabellatus-Blechnum cartilagineum-Calochlaena dubia	5	50			0.16	0.06	0.17	AF037-2	58	AF026-2	44	na		
RF86	Ceratopetalum apetalum-Lomandra longifolia-Callicoma serratifolia-Pittosporum undulatum-Adiantum aethiopicum	11	33			0.25	0.09	0.29	AF037-2	74	AF026-2	63	na		Syd Basin RF02
RF87	Backhousia myrtifolia-Ceratopetalum apetalum-Acmena smithii-Blechnum cartilagineum-Morinda jasminoides	40	7			0.4	0.07	0.34	AF037-2	97	AF034-1	102	34/37		
RF88	Blechnum cartilagineum-Ceratopetalum apetalum-Acmena smithii-Cyathea australis-Doryphora sassafras	24	30			0.36	0.06	0.21	AF037-2	93	AF036-2	44	37		
RF89	Orites excelsus-Blechnum wattsii-Doryphora sassafras-Lomandra spicata-Ceratopetalum apetalum	30	8	100		0.34	0.04	0.19	AF048-4	100	AF036-3	96	36/48		elevation over 600m
RF9	Linospadix monostachyos-Melodinus australis-Microsorum scandens-Pittosporum multiflorum-Sloanea australis	7		71		0.39	0.14	0.19	AF033-1	86	AF039-2	54	33		

Community_or_group	Description_long	Total number of plots	Proportion of plots with eucalypt cover >=5%	Proportion of plots >600m elev with membership >=0.5	Proportion of plots in modelled alluvium	Mean proportion of species in LORF assemblage list	Mean proportion of species in LRFP assemblage list	Mean proportion of species in LTRF assemblage list	Suballiance site with the highest mean proportion of species per plot	Mean proportion (col L) as a percentage of the maximum for the suballiance site	Suballiance site with the highest relative mean proportion of species per plot	Relative prop as a percentage of exp max	Assigned suballiance for community	TEC	notes
RF90	Ceratopetalum apetalum-Doryphora sassafras-Acmena smithii-Morinda jasminoides-Blechnum cartilagineum	46	12	3		0.47	0.08	0.31	AF037-2	97	AF037-1	91	37		
RF91	Livistona australis-Acmena smithii-Ceratopetalum apetalum-Cryptocarya glaucescens-Doryphora sassafras	18	23			0.52	0.14	0.47	AF037-2	93	AF006-4	72	37		
RF92	Doryphora sassafras-Adiantum formosum-Microsorum scandens-Arthropteris tenella-Ficus coronata	42	24			0.61	0.19	0.48	AF014-3	100	AF013-4	97	14/13	LORF	
RF93	Doryphora sassafras-Acmena smithii-Morinda jasminoides-Ceratopetalum apetalum-Cryptocarya glaucescens	73	5			0.52	0.12	0.42	AF037-2	95	AF038-1	95	37/38		
RF94	Acmena smithii-Morinda jasminoides-Cryptocarya glaucescens-Guioa semiglauca-Pittosporum multiflorum	43	3		23	0.57	0.09	0.55	AF037-2	91	AF026-3	77	37		
RF95	Ficus coronata-Neolitsea dealbata-Lastreopsis microsora-Waterhousea floribunda-Cissus antarctica	14			27	0.56	0.15	0.43	AF028-2	87	AF46-5	53	28		
RF96	Morinda jasminoides-Archontophoenix cunninghamiana-Doryphora sassafras-Acmena smithii-Ripogonum fawcettianum	26	5		5	0.6	0.15	0.45	AF037-2	100	AF037-2	112	37		

Community_or_group	Description_long	Total number of plots	Proportion of plots with eucalypt cover >=5%	Proportion of plots >600m elev with membership >=0.5	Proportion of plots in modelled alluvium	Mean proportion of species in LORF assemblage list	Mean proportion of species in LRFP assemblage list	Mean proportion of species in LTRF assemblage list	Suballiance site with the highest mean proportion of species per plot	Mean proportion (col L) as a percentage of the maximum for the suballiance site	Suballiance site with the highest relative mean proportion of species per plot	Relative prop as a percentage of exp max	Assigned suballiance for community	TEC	notes
RF97	Acmena smithii-Blechnum cartilagineum-Lastreopsis microsora-Smilax australis-Cyathea australis	28	15			0.4	0.03	0.3	AF042-2	90	AF042-1	95	42		
RF98	Doodia aspera-Morinda jasminoides-Cissus hypoglauca-Marsdenia rostrata-Pseuderanthemum variabile	24				0.46	0.03	0.4	AF037-2	93	AF020-5	95	20/37	LTRFpossible	
RF99	Hedycarya angustifolia-Marsdenia rostrata-Microsorum scandens-Acmena smithii-Livistona australis	10				0.49	0.14	0.39	AF037-2	95	AF013-2	108	13/37		
S_FoW02	Gahnia clarkei-Glochidion ferdinandi var. pubens-Melaleuca linariifolia-Morinda jasminoides-Parsonsia straminea	3	100		33	0.28	0.04	0.36	AF033-1	58	AF026-1	61	na		eucalypt group
S_FoW23	Acmena smithii-Ficus coronata-Livistona australis-Melaleuca biconvexa-Melaleuca saligna	4	100			0.39	0.2	0.53	AF81-1	68	AF006-4	69	(6?)		eucalypt group
S_FoW31	Breynia oblongifolia-Eucalyptus robusta-Gahnia clarkei-Glochidion ferdinandi var. pubens-Livistona australis	5	67		67	0.37	0.05	0.46	AF033-1	61	AF88-2	65	na		eucalypt group
S_WSF45	Smilax australis-Dioscorea transversa-Syncarpia glomulifera-Blechnum cartilagineum-Geitonoplesium cymosum	80	100		10	0.35	0.02	0.38	AF037-2	78	AF021-5	67	(37)		eucalypt group

Community_or_group	Description_long	Total number of plots	Proportion of plots with eucalypt cover >=5%	Proportion of plots >600m elev with membership >=0.5	Proportion of plots in modelled alluvium	Mean proportion of species in LORF assemblage list	Mean proportion of species in LRFP assemblage list	Mean proportion of species in LTRF assemblage list	Suballiance site with the highest mean proportion of species per plot	Mean proportion (col L) as a percentage of the maximum for the suballiance site	Suballiance site with the highest relative mean proportion of species per plot	Relative prop as a percentage of exp max	Assigned suballiance for community	TEC	notes
S_WSF46	Acmena smithii-Pittosporum multiflorum-Smilax australis-Synoum glandulosum-Cissus antarctica	29	90	67		0.5	0.04	0.41	AF033-5	97	AF013-4	94	13/33		eucalypt group
S_WSF62	Dioscorea transversa-Lomandra longifolia-Smilax australis-Acmena smithii-Cissus antarctica	14	100		50	0.32	0.06	0.39	AF033-1	74	AF70-12	80	(33)		eucalypt group

Appendix 2

Plots in state forests assigned to lowland rainforest TEC with a high degree of confidence, based on floristic relationships

This list comprises all plots assessed as Lowland Rainforest TEC based on strong membership of a floristic group which we have assessed as belonging to the TEC. It excludes five plots with ambiguous membership. We have a relatively high degree of confidence that plots in groups RF6, RF16, RF44, RF71 and RF92 belong to LORF using our interpretation of the final determination. We are less confident of plots which belong to the other listed groups.

Floristic group	Plot	Membe rship	Latitude	Longitude	State Forest (SF)
RF13	MNE10F3S	1.00	-30.1500	153.1179	Wedding Bells
RF16	DLB31	1.00	-29.0205	152.6582	Sugarloaf
RF202	WLG14J7L	1.00	-30.0637	153.1098	Conglomerate
RF202	WLG13J3L	0.99	-30.0622	153.1097	Conglomerate
RF202	OraraW1	1.00	-30.2455	152.9864	Orara West
RF202	OraraW2	0.97	-30.2454	152.9907	Orara West
RF202	OraraW3	1.00	-30.2369	152.9665	Orara West
RF202	WLG17F5F	0.99	-30.0879	153.1517	Wedding Bells
RF202	WLG16F8F	1.00	-30.0851	153.1513	Wedding Bells
RF208	THC006	0.99	-30.6475	152.6207	Mistake
RF208	NUMIS018	0.96	-30.7213	152.6867	Mistake
RF44	CHERRY1	0.91	-28.9295	152.7572	Cherry Tree
RF44	DLB365	0.82	-28.9630	152.7467	Cherry Tree West
RF44	GBWS15	0.98	-28.9342	152.7430	Cherry Tree West
RF44	DLB400	0.99	-29.0544	152.7231	Mount Belmore
RF44	DLB45	0.99	-29.0536	152.7352	Mount Belmore
RF44	DLB25	1.00	-29.0639	152.7138	Mount Belmore
RF44	DLB376	1.00	-28.6313	152.7408	Richmond Range
RF44	DLB378	1.00	-28.6367	152.7363	Richmond Range
RF44	RICHR1	0.81	-28.6644	152.7515	Richmond Range

Floristic group	Plot	Membership	Latitude	Longitude	State Forest (SF)
RF44	GBWS02	0.75	-28.6661	152.7744	Richmond Range
RF44	DLB401	0.85	-29.0058	152.6456	Sugarloaf
RF44	DLB394	0.99	-28.3971	152.7101	Unumgar
RF44	GBWS67	0.87	-28.3884	152.7044	Unumgar
RF44	UNUMGAR1	1.00	-28.3888	152.6962	Unumgar
RF44	CUT21-2	0.68	-28.4231	152.6799	Unumgar
RF44	CUT22-2	0.98	-28.4191	152.6999	Unumgar
RF44	DLB395	1.00	-28.3900	152.6866	Unumgar
RF6	NAM-011	1.00	-30.5777	152.6267	Oakes
RF71	NCEWI004	0.83	-29.1268	152.4480	Ewingar
RF71	DLB353	1.00	-28.9877	152.3739	Girard
RF71	DLB349	1.00	-28.9896	152.3836	Girard
RF71	DLB350	1.00	-28.9809	152.3856	Girard
RF71	DLB351	1.00	-28.9819	152.3859	Girard
RF71	DLB390	0.93	-28.5425	152.7652	Toonumbar
RF71	NCWAS005	0.99	-29.2935	152.4330	Washpool
RF71	DLB384	0.99	-28.5184	152.5992	Yabbra
RF71	DLB385	0.96	-28.5070	152.6125	Yabbra
RF71	DLB388	0.84	-28.5104	152.6060	Yabbra
RF92	BMN09D1V	0.85	-35.4067	150.1372	Yadboro

Appendix 3

Summary of issues and TEC Panel review of rainforest TECs, meetings held 17th may and 14th June 2016

1. Lowland Rainforest

Final Determination	TEC Panel Principles	Our Project	TEC Panel Review
Occurs in NSW North Coast and Sydney Basin Bioregions	Accept Bioregional Qualifiers	Adopted, except that occurrences just outside Sydney Basin, in SEC bioregion, may be included.	Accepted
'Lowland Rainforest may be associated with a range of high-nutrient geological substrates, notably basalts and fine-grained sedimentary rocks, on coastal plains and plateaux, footslopes and foothills.'	Assess habitat descriptors and whether these constrain or define the limits of the TEC which otherwise may have a broader distribution	Not used due to vagueness of meaning.	Noted
'In the north of its range, Lowland Rainforest is found up to 600m above sea level, but in the Sydney Basin bioregion it is limited to elevations below 350 m.'	Assess habitat descriptors and whether these constrain or define the limits of the TEC which otherwise may have a broader distribution	Occurrences above these thresholds may be included if there are unambiguous floristic relationships with EEC or if the occurrence is part of a patch of consistent community composition which extends below the threshold elevation.	Accepted that TEC may be mapped above 600 m elevation if part of a patch which extends to lower elevations.
' Lowland Rainforest, in a relatively undisturbed state, has a closed canopy, characterised by a high diversity of trees whose leaves may be mesophyllous and encompass a wide variety of shapes and sizes. Typically, the trees form three major strata: emergents, canopy and sub-canopy which, combined with variations in crown shapes and sizes, give the canopy an irregular appearance (Floyd 1990). The trees are taxonomically diverse at the genus and family levels, and some may have buttressed roots. A range of plant growth forms are present in Lowland Rainforest, including palms, vines and vascular epiphytes.'	Assess vegetation structure descriptors that may constrain or allow a range of structural forms	Potentially useful as additional information to assess communities with floristically ambiguous relationships, but found to be too vague to be useful for this purpose.	Noted
'Scattered eucalypt emergents (e.g. *Eucalyptus grandis, E. saligna*) may occasionally be present.'	Assess statements regarding the characteristics of the floristic composition	Used as a guide, to exclude communities with frequent eucalypt occurrence or consistent dominance by eucalypts. We do not include *Lophostemon confertus* as a eucalypt.	Agreed that the thresholds of maximum 30% crown cover for eucalypts and 70% for *Lophostemon confertus* will be

Final Determination	TEC Panel Principles	Our Project	TEC Panel Review
		We have excluded eucalypt-dominated communities from the initial rainforest classification, but allowed eucalypt-dominated plots to group with rainforest communities where they are floristically similar. Our evidence suggests that candidate rainforest TEC clearly includes a eucalypt cover greater than 5% pfc but that very few plots have cover >25%. We propose to not apply a eucalypt cover threshold for modelling purposes but restrict the eucalypt threshold to less than 30% crown cover for operational mapping purposes. Our evidence suggests that *L.confertus* is more frequently present than eucalypts in candidate rainforest EEC. Our interpretation of the EEC does not regard *L. confertus* as a eucalypt and therefore there are no cover class thresholds applied to *L. confertus* for modelling purposes. However a *L. confertus* crown cover threshold of <70% will be applied to the operational map, consistent with the highest recorded cover in plots and the agreed API mapping criteria.	used for API mapping of potential rainforest TEC.
Characterised by the list of 108 plant taxa	Be guided by the species lists presented in the final determination	Compare species assemblage data drawn from source classifications, other existing classifications and new classifications developed by our project with that presented in the final determination. Preliminary analyses indicate there is generally a consistent relationship between communities defined by previous regional numerical classifications and our classification in our analyses, the assemblage list and Floyd suballiances cited in the final determination, but there are notable exceptions. We propose to assess as not TEC, communities which have a relatively high proportion of final determination species but are clearly most closely related to a suballiance which is excluded from TEC by the determination.	Agreed that where there is inconsistency between the cited Floyd Suballiance relationships and the final determination species list, the Floyd Suballiance assumes priority.
Primary Suballiances (1,5,6,14,15,21,22) **Related Suballiances (7,8,9,10,23,27,28,29,30,33,34,35)**	Assess references to existing vegetation classification sources in the final determination. The TEC Panel will note whether the existing classifications are "included within" are "part of" or "component of" the final determination. Classifications developed using traceable quantitative data will be recognised as primary data upon which to assess floristic, habitat and distributional characteristics. Where data has been sourced and used in alternate regional or local classification studies the results will be considered by the TEC Panel to assist in the development of the TEC definitional attributes.	There are no traceable primary quantitative data directly suitable for comparative analysis. We collected data from stands attributed to relevant suballiances by Floyd, to use as reference plots for comparative analysis. For suballiances with insufficient plot data, we used composite lists derived from Floyd's traverse data for comparison. We assess stands with eucalypts, *Lophostemon confertus* or *Syncarpia glomulifera* in the canopy based on relationships with other defined floristic communities. We may define new rainforest communities from additional plot data. We assess these based on their floristic relationship with listed suballiances and the final determination list. We initially defined 110 additional rainforest communities from an analysis of data across east coast NSW, many of which are segregates from broader, previously defined regional communities. These represent a finer-scale classification than existing vegetation classifications. This is necessary because there is sometimes a	Advised that assessment based on communities or floristic groups, rather than just reference patches, is the preferable alternative.

Final Determination	TEC Panel Principles	Our Project	TEC Panel Review
		close floristic relationship between TEC and non-TEC suballiances and broader classifications do not adequately distinguish these components. Reference sites located by our project within a Floyd suballiance relevant to this EEC often differ substantially and may be more similar floristically to other suballiances. This appears to be a result of Floyd suballiances being subjectively defined based primarily on canopy composition. Floristic plots located within a patch of vegetation previously attributed to a particular suballiance as a reference traverse in Floyd (1990) are not always most similar to the attributed suballiance. Where there is inconsistency, we have deferred to the original assessment on the basis that these patches are inferred to be TEC by the citation in the final determination. We then assess the community as a whole, including patches not described by Floyd, as TEC. An example is RF33, clearly related to SA 8 or 10 (not TEC) but including two reference plots for SA15 (TEC). The alternative is to assess only the reference patch as TEC.	
Includes stands of other suballiances (7, 8, 9, 10, 23, 27, 28, 29, 30, 33, 34, 35) where these occur 'in conjunction with' or 'in transitional zones with' the 'principal' suballiances.	Assess references to existing vegetation classification sources in the final determination. The Panel will note whether the existing classifications are "included within" are "part of" or "component of" the determination.	We include stands of the listed 'secondary' suballiances if they are contiguous with or part of a single rainforest patch of a principal suballiance. Where the listed secondary suballiance is extensive and the primary suballiance occupies a small proportion of a patch, we may limit the TEC to part of the more extensive occurrences of secondary suballiance depending on floristic, elevation and stand structure characteristics.	Agreed in principle that patch assessment is appropriate but could not offer explicit thresholds for limiting the extent of TEC where a secondary suballiance is very extensive; noted that the qualifying phrases may sometimes be interpreted in other than a strictly spatial context.

2. Lowland Rainforest on Flooplain

Determination	TEC Panel Principles	Our Project	TEC Panel Review
Occurs in NSW North Coast Bioregion	Accept Bioregional Qualifiers	Adopted	Accepted
'...in an undisturbed state, is a closed canopy forest characterised by its high species richness and structural complexity …'	Assess vegetation structure descriptors that may constrain or allow a range of structural forms	Vague descriptive terms used as a guide only.	Noted
Implies that the EEC occurs on floodplains	Assess habitat descriptors and whether these constrain or define the limits of the TEC which otherwise may have a broader distribution	Alluvial model based on 1m DEM used to assess extent of occurrence of relevant floristic communities on floodplains in a broad sense and to constrain EEC occurrence for widespread communities which are not wholly included by the determination. The determination does not explicitly state that the TEC occurs on floodplains. It is implicit only from the title. Even though it is only vaguely implied, we have used this as a broad constraint (accepting that our alluvial model area goes well beyond floodplains). The alternative is to include the full extent of widespread communities, such as those relating to suballiances 23 and 33, as TEC.	Agreed that the alluvial model be used to constrain the mapped extent of this TEC
Characterised by the list of 38 plant taxa	Be guided by the species lists presented in the Determination	Where there are sufficient data, compare species assemblage data drawn from source classifications, other existing classifications and	Agreed that other descriptors may be given precedence

Determination	TEC Panel Principles	Our Project	TEC Panel Review
		new classifications developed by our project with that presented in the Determination. The determination assemblage list is not closely correlated with any communities defined by our RF analysis. This is possibly because the Determination list was drawn from very few small remnants which have been very poorly sampled by floristic plots. Our data may thus not represent the core area of the TEC distribution.	
Cited vegetation sources relate solely to suballiances defined by Floyd. The EEC includes suballiance 3. 'Elements' of suballiances 1, 2, 4, 5, 6, 23, 24, 25, 26 and 33 'also occur'.	Assess references to existing vegetation classification sources in the Determination. The TEC Panel will note whether the existing classifications are "included within" are "part of" or "component of" the Determination. Classifications developed using traceable quantitative data will be recognised as primary data upon which to assess floristic, habitat and distributional characteristics. Where data has been sourced and used in alternate regional or local classification studies the results will be considered by the panel to assist in the development of the TEC definitional attributes.	There are no traceable primary quantitative data suitable for comparative analysis. We have collected quantitative data from stands attributed to relevant suballiances by Floyd for some of the suballiances most likely to occur in SF. There is no indication of what is meant by 'elements'. The implication is that it refers to occurrences on floodplains. Some suballiances are represented by very few, small remnants with insufficient data for quantitative analysis. We include all occurrences (if any) on SF of suballiances 4 and 24, based on their major characteristic dominants described by Floyd. Otherwise, we include all rainforest vegetation within, or substantially overlapping, our alluvial model, unless floristic data clearly shows a relationship with suballiances not cited in the determination. We assess stands with eucalypts, Lophostemon confertus or Syncarpia glomulifera in the canopy based on relationships with other defined floristic communities. Apart from SA3, the extent to which the cited suballiances are included as TEC is not clear in the determination. There is a clear inconsistency between suballiance relationships and the assemblage list, with some communities which belong to cited suballiances having a very low (<0.1) proportion of species listed. One option is to simply assess all rainforest within our alluvial model as Lowland rainforest on floodplain TEC. This requires an agreement on the threshold proportion of eucalypt canopy to define rainforest for this TEC. There are 18 plots with eucalypt cover >=5%, including 6 with cover 25-50% and one with 50-75%, out of 79 assessed as floristically similar to cited suballiances, and within our alluvial model. Most (13) of these belong to Hunter community MU 12 (related to SA26). However, the data doesn't help with setting a eucalypt threshold because of doubts over the meaning of the term 'elements' in the determination. A second option is to accept all of the cited suballiances, where they occur within our alluvial model, as TEC. This will result in the inclusion of some areas with relatively high eucalypt cover as TEC, mostly in narrow strips of riparian vegetation. A third option is to give priority to the assemblage list and exclude any consideration of suballiances other than SA3.	Agreed that all vegetation with rainforest canopy or subcanopy within the alluvial model area will be mapped as Lowland Rainforest on floodplains

Determination	TEC Panel Principles	Our Project	TEC Panel Review
	Other issue: Rainforest and related vegetation in floodplain habitats may be other rainforest EECs.	We assess rainforest vegetation in relation to all three rainforest EECs in the study area. There is substantial floristic overlap between this TEC and Lowland Rainforest and very little data for the main suballiance 3. We have assessed as Lowland Rainforest on Floodplain TEC all plots which belong to any of the suballiances cited in both lowland rainforest TECs which are within our alluvial model area.	

3. Littoral Rainforest

Determination	TEC Panel Principles	Our Project	TEC Panel Review
Occurs in NSW North Coast, Sydney Basin and South East Corner Bioregions	Accept Bioregional Qualifiers	Adopted.	Accepted
'...occurs on both sand dunes and on soils derived from underlying rocks... Most stands of Littoral Rainforest occur within 2 km of the sea, but may occasionally be found further inland, but within reach of maritime influence.'	Assess habitat descriptors and whether these constrain or define the limits of the TEC which otherwise may have a broader distribution	Used as a guide to assess relevance of floristic communities.	Agreed that, although a vague term, maritime influence be used to exclude areas which clearly do not match this descriptor
Characterised by the list of 117 plant taxa	Be guided by the species lists presented in the Determination	Compare species assemblage data drawn from source classifications, other existing classifications and new classifications developed by our project with that presented in the Determination. Communities defined by previous and our classification in our analyses, which have the highest proportion of assemblage species, are also closely related to the suballiances cited in the determination. However, there are additional communities related to the cited suballiances but with a relatively low proportion of assemblage species. We have included these in the TEC. There are no plots assigned to Littoral Rainforest EEC located on SF tenure.	Agreed that cited suballiances be given priority over similarity to determination assemblage list.
For the north coast study area, cited vegetation sources relate solely to suballiances defined by Floyd. The EEC 'comprises' the five suballiances of the *Cupaniopsis anacardioides - Acmena* spp. alliance.	Assess references to existing vegetation classification sources in the Determination. The TEC Panel will note whether the existing classifications are "included within" are "part of" or "component of" the Determination. Classifications developed using traceable quantitative data will be recognised as primary data upon which to assess floristic, habitat and distributional characteristics. Where data has been sourced and used in alternate regional or local classification studies the results will be considered by the TEC Panel to assist in the development of the TEC definitional attributes.	There are no traceable primary quantitative data directly suitable for comparative analysis. We used lists derived from Floyd's traverse data for comparison with communities defined from plot data. We assess stands with eucalypts, Lophostemon confertus or Syncarpia glomulifera in the canopy based on relationships with other defined floristic communities. We have defined new rainforest communities from additional plot data. We assess these based on their floristic relationship with listed suballiances and the determination list. 32 plots of 108 assessed as Littoral Rainforest TEC have a eucalypt cover of >=5%, 19 of these with cover >=25%. We have included these as TEC. The majority of these are on coastal headlands or coastal dunes. The determination indicates that 'scattered, emergent' sclerophyll species may occur in the TEC. It is not clear whether this is consistent with plot-scale covers of >=5%.	Agreed that eucalypt cover thresholds be guided by floristic relationships