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# Identification, Assessment and Protection of National Estate – Part A Natural Values

Lower North-Eastern NSW CRA Region

A report undertaken as part of the NSW Comprehensive Regional Assessments

February 1999

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# Identification, Assessment and Protection of Natural National Estate Values

Lower North-Eastern NSW CRA Region

**Environment Australia**

A project undertaken for the Joint Commonwealth NSW Regional  
Forest Agreement Steering Committee  
As part of the  
NSW Comprehensive Regional Assessments  
project numbers NA 59/EH, NA 65/EH

February 1999

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This project has been overseen and the methodology has been developed through the Environment and Heritage Technical Committee which includes representatives from the NSW and Commonwealth Governments and stakeholder groups.

The project has been overseen and the methodology has been developed by Environment Australia. NSW National Parks and Wildlife Service oversaw and developed the methodology for the identification and assessment of centres of endemism.

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## EXECUTIVE SUMMARY

This report has been prepared for the joint Commonwealth/State Senior Officials Committee, which oversees the comprehensive regional assessments of forests in New South Wales.

The comprehensive regional assessments (CRAs) provide the scientific basis on which the State and Commonwealth governments will sign regional forest agreements (RFAs) for the major forests of New South Wales. These agreements will determine the future of the State's forests, providing a balance between conservation and ecologically sustainable use of forest resources.

As defined in the *Australian Heritage Commission Act 1975*, the national estate comprises:

*those places, being components of the natural environment of Australia, or the cultural environment of Australia, that have aesthetic, historic, scientific or social significance or other special value for future generations as well as for the present community.*

This report was undertaken to document the methodology and rule-sets used to identify potential areas of natural national estate significance. The work was undertaken by Environment Australia (EA) and NSW National Parks and Wildlife Service (NPWS) in consultation with State Forests New South Wales (SFNSW).

The process of identifying potential national estate involved asking a series of expert panels to identify species, known areas or landscape features (such as rock outcrops for example) that met the requirements for national estate criteria. The outputs from these workshops were combined with the result of literature reviews and the experience of previous CRAs to create rule-sets. Where available, separate rule-sets were used for species based analysis and the identification of landscape features or areas. Rule-sets were then applied to data gathered during CRA assessments. The results of different rule-sets were cross-validated to generate the final set of layers. These are expressed in terms of relevant criteria. Areas identified in this report as having potential national estate value are indicative only and are not necessarily the delineated forested areas that will be listed in the Register of the National Estate.

The results of these analyses are presented here.

*Note: All area calculations contained in this report are based on grid analysis and are therefore have a minimum resolution, in most cases 100 m (one hectare) for localised values and 500 m (25 hectares) for extensive values. Consequently, all area figures should be regarded as indicative only.*

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## 1. INTRODUCTION

The development of the Regional Forest Agreement (RFA) between the New South Wales and Commonwealth Governments involves a number of stages. The comprehensive regional assessment (CRA) has involved both governments in a wide array of projects to provide the necessary information to identify forest associated values and determine possible approaches for an RFA. Later stages include the integration of social, economic, environment and heritage values in the region, public consultation and drafting of the RFA.

This report presents the results of the assessment of natural national estate values conducted as part of the CRA and identifies indicative areas of national estate value in the region. The work was conducted as part of the project: *JANIS Conservation Requirements and Natural National Estate Identification, Assessment and Protection for the Upper and Lower North East*. Conservation requirements will be reported on separately.

Under the National Forest Policy Statement (NFPS 1992), Commonwealth, State and Territory Governments agreed to the assessment of national estate values of forests. Attachment 1 of the NSW CRA/RFA Scoping Agreement requires the CRAs to 'identify, assess and document national estate values including natural and cultural heritage in NSW to satisfy Commonwealth obligations under the *Australian Heritage Commission Act 1975*.'

Key points from the Scoping Agreement include:

- Identification to be undertaken jointly by the Australian Heritage Commission (the Commission) and NSW in accordance with national estate criteria for identifying places of significance;
- Values identified and methodologies utilised to be jointly agreed between the Commission and NSW;
- Identification, delineation and mapping of national estate values and places;
- Assessment of current levels of protection of national estate values and places;
- Identification of conservation principles for the protection of national estate values and places;
- Documentation of agreed methodologies; and
- Documentation sufficient for interim listing in the Register of the National Estate (RNE) where appropriate.

As defined in the *Australian Heritage Commission Act 1975*, the national estate comprises:

*those places, being components of the natural environment of Australia, or the cultural environment of Australia, that have aesthetic, historic, scientific or social significance or other special value for future generations as well as for the present community.*

The Australian Heritage Commission's responsibility is to identify the national estate and under section 30 of the Act, to advise the Commonwealth Government on the protection of national estate places and the potential impact on national estate values of Commonwealth decision relating to those places. The Act also requires the establishment of the Register of the National Estate. The Register includes places of importance at a local, regional or national level. The identification and assessment of places for listing in the Register is guided by the national estate criteria.

The information documented in this report will be taken into account in delineating national estate places. Areas endorsed by the Australian Heritage Commission (AHC) will be interim listed in the Register of the National Estate. Interim listed areas will then be advertised and subject to a statutory period of three months (allowed for objections and public comment). Interim listing of areas identified through this process is expected to take place after the RFA for lower north-eastern NSW is signed.

## **2. PROCESS**

### **2.1 Criteria**

Natural values in the Lower North-East NSW CRA region were assessed against the national estate criteria. Identification and treatment of natural values follows three broad subdivisions:

- extensive natural values;
- localised biodiversity values;
- other natural values, including those relating to geology, geomorphology and soils.

In the regional context, assessment of the national estate requires a comparative appraisal of the significance of places having one or more attributes or values. The values are derived from the national estate criteria, which are reproduced in Appendix A.

Indicators of significance vary across the national estate natural values and include:

- rarity or threat;
- distribution pattern;
- condition and integrity;
- diversity or richness;
- outstanding example.
- representativeness

### **2.2 Thresholds**

In order to identify areas of potential and indicative significance for natural national estate values a threshold level is set. Areas that exceed this threshold are regarded as meeting the criteria required for national estate listing. Thresholds are set in relation to the significance indicators and are specific to each national estate value. The development of thresholds for national estate significance varies depending on the level of current knowledge about the nature and extent of the values and their distribution in the landscape at a local, regional or national level.

### **2.3 Data**

The area being assessed for natural national estate included all the forested public and private lands in the Lower North-East NSW CRA region. Adjacent areas in central, western and upper north-eastern NSW were used as context information, particularly where area thresholds were used in assessing criteria.

The major data sets used were:

- flora - flora data was provided by the NSW National Parks and Wildlife Service and comprises a subset of the total sum of flora data. This sub-set has had basic validation done including the removal of gross errors. For the purposes of the work conducted for national estate, the data set was assumed to have an average spatial reliability of 1 km. The use of point records was avoided wherever possible because of the problems of spatial uncertainty. This data-set was primarily used for richness analysis. The data-set was not comprehensive south of the Hunter River.
- fauna - fauna data was provided by the NSW National Parks and Wildlife Service and consisted of NSW Wildlife Atlas data with no reliability or accuracy work conducted on it. Rudimentary auditing on this data-set was conducted by Environment Australia and consisted of culling gross errors and spurious records. An additional CRA fauna data set for priority species was also provided. This data has had reliability and accuracy auditing done on it. Data-sets were taken to have an average spatial reliability of 1 km. The use of point records was avoided because of the problems of spatial uncertainty. These data-sets were primarily used for richness analysis.
- forest ecosystems - the CRA forest ecosystem data-set was used, the version being that provided to the environment and heritage technical committee. This data-set was used to provide forest ecosystem landscape information. The data-set was available in 100 m grid-cells and is the output of forest ecosystem modelling conducted for the CRA. This data set was not field validated at the time of report writing.
- disturbance and old growth forest - disturbance was derived from biophysical naturalness (generated for wilderness analysis according to the methodology of the National Wilderness Inventory). The biophysical naturalness data relies heavily on aerial photo interpretation done as part of the Broad Old Growth Mapping Project (BOGM) undertaken in 1993. Biophysical naturalness was used to generate undisturbed catchments, natural landscapes and was used to filter data in some other analyses. The BOGM data-set applies to public land only and does not assess the level of disturbance to rainforest. The old growth data used is known to contain errors including errors relating to post 1993 disturbance. The extent of these errors is uncertain and has not been fully field-validated.
- digital elevation model - 1:25,000 scale digital elevation model. The model was used to provide information on the escarpment, steep areas and general elevational information.

All mapped indicative national estate natural areas have been digitised and are held in ARC format on a Geographic Information System platform held by Environment Australia. Appendix E lists the data layers that have contributed to the lower north-eastern NSW national estate assessment, and the meta-data statements for each layer.

## **2.4 Methodology**

The lower north-eastern NSW methodology was developed using best available data. It may not necessarily form the basis for, or be similar to, the formulation of requirements for other CRA regions in NSW. The detail of the process by which each of the national estate values was assessed is provided in Section 3.

For extensive natural values, the methodology closely followed the approach adopted in other CRAs. Undisturbed catchments were derived from data provided by the Wild Rivers Database. Natural landscapes were derived from the biophysical naturalness layer used to generate NWI wilderness. Old-

growth forest was derived from the draft old-growth forest data provided to the data warehouse. These layers were driven entirely by data.

Areas of indicative potential national estate significance were delineated for local national estate values (ie not extensive natural values) for each criteria (see Attachment A) using the following information:

- Species point locality data based on information provided by experts and literature review (Appendix B);
- Landscape elements nominated by experts as being foci for the particular national estate criteria (Appendix C); and
- Particular sites nominated by experts as being important for criteria (Appendix D).

Experts were consulted during the Conservation Requirements and Response to Disturbance Workshops held between June 1<sup>st</sup> and 31<sup>st</sup> July 1998 and were given additional time to submit information outside these forums.

The three data sources were compared (where available) to cross-validate the approaches used and refine and increase confidence in the outcome. Where two or more of the information sources described were available and comparable, the composite of the information was taken (ie, point data was merged with areas nominated by experts and landscape elements nominated by experts).

For species with disjunct ranges, species at the limit of their range, species richness, vegetation community richness, remnant vegetation communities, rare vegetation communities and old-growth forest, no landscape elements were nominated and the analysis was based entirely on species or forest ecosystem data. In this case, data was used to delineate indicative areas and checked for coverage of specific areas identified by experts.

All three data sources were available for endemic species, rare species, primitive and relictual species, refugia, migratory species and important habitat. For rare species and migratory species, species data adequately covered sites nominated and remained the primary data source used. For primitive and relictual species and refugia, the composite of point data and landscape values was taken, subject to coverage of areas identified by experts.

Most species related values were thresholded by displaying species point location data as a richness map across the landscape. Areas that had concentrations of relevant species more than two standard deviations above the average number of species in the landscape were identified as above threshold. The choice of 2 standard deviations was based on the need to delineate areas of significance that are clearly above the average level of variance in the landscape.

Principle characteristics of class and successional stages were felt to be best represented through the JANIS criteria.

### 3. EXTENSIVE NATURAL VALUES

The two criteria of relevance to the assessment of extensive natural values are:

***National Estate Criterion A.2— ‘importance in maintaining existing processes or natural systems at the regional or national scale’, and***

***National Estate Criterion B.1— ‘importance for rare, endangered or uncommon flora, fauna, communities, ecosystems, natural landscapes or phenomena, or as a wilderness’.***

These are inclusive values, extending broadly across the landscape rather than being confined to single vegetation types, landforms or localities. The values considered in this aspect of the lower north-east assessment are:

- natural landscapes;
- undisturbed catchments;
- wilderness; and
- old-growth forest.

Assessment of these values resulted in the identification of indicative places of importance for the maintenance of natural processes (such as hydrological processes) at regional and national scales, and places that are of regional importance for maintaining specific natural systems (such as remnant vegetation).

#### 3.1 Wilderness

The assessment of wilderness in the Lower North-East comprehensive regional assessment region of New South Wales utilised the Commonwealth’s National Wilderness Inventory methodology, developed by the Australian Heritage Commission, as specified under JANIS. The NSW Wilderness Act was not used in the LNE CRA Wilderness Assessment.

The assessment, identification, declaration and management of wilderness in New South Wales (outside of the CRA process) are principally guided by the *New South Wales Wilderness Act 1997*. The criteria for identification of Wilderness under the Wilderness Act are consistent with the National Forest Policy Statement definition of wilderness. The National Forest Policy Statement does, however, define wilderness as being remote from the influences of European settlement whereas the Act uses recovery potential as a criterion.

##### 3.1.1 Method

The National Wilderness Inventory methodology is the adopted standard approach to the assessment of wilderness in Regional Forest Agreements throughout Australia. While a dual identification approach was undertaken in Upper North-East, protection requirements in the Regional Forest Agreement process are linked solely to the National Wilderness Inventory. The nationally agreed criteria stipulates that, *Ninety percent, or more if practicable, of the area of high quality wilderness that meets minimum area requirements should be protected in reserves* (JANIS 1997, p.15).

The National Wilderness Inventory is a geographic information system, which measures remote and natural values to produce a 'Wilderness Quality' continuum. The National Wilderness Inventory Wilderness Quality is produced from four disturbance indicators, each weighted equally:

- Remoteness from Access;
- Remoteness from Settlement;
- Apparent Naturalness; and
- Biophysical Naturalness.

Each of these indicators is individually updated with the best available data and then combined to measure the Wilderness Quality of an area (see Lesslie and Maslen 1995). The indicators are derived from the definition of wilderness quality as the extent to which a location is remote from and undisturbed by the influence of modern technological society. These indicators are:

- Remoteness from Settlement  
remoteness from places of permanent occupation;
- Remoteness from Access  
remoteness from established access routes;
- Apparent Naturalness  
the degree to which the landscape is free from the presence of permanent structures associated with modern technological society; and
- Biophysical Naturalness  
the degree to which the natural environment is free from biophysical disturbance caused by the influence of modern technological society.

For each of the three distance-based wilderness indicators, primary data is graded according to its associated impact. The Remoteness from Access and Remoteness from Settlement indicators utilise four categories or grades of impact, whilst three grades are used in determining Apparent Naturalness. Minimum standardised distances are classified to produce consistent Remoteness from Settlement, Remoteness from Access, and Apparent Naturalness classes, with values of 0 to 5.

#### *Biophysical naturalness*

The fourth indicator, Biophysical Naturalness (BN), is based upon the assumption that the degree of change sustained by an ecosystem is directly related to the intensity and duration of interference. For the National Wilderness Inventory, land use considerations are generally restricted to the grazing of stock and the harvesting of timber. However, where data that is more reliable is available, information on a range of other disturbances is also included. The types of disturbance data typically used to derive the BN layer includes information on:

- timber harvesting records;
- regional information on grazing;
- air photo interpretation;
- land tenure;
- grazing leases;
- vegetation communities; and
- mining sites.

In the biophysical naturalness rating scheme, wildfire is considered a natural process, so that areas affected by wildfire can still be given a high biophysical naturalness rating (ie. 5), unless other disturbances resulted in a lower rating. The rating scheme for BN used in the National Wilderness Inventory is outlined in Table 1. This rating system is for the 'baseline National Wilderness Inventory' and each region has its own rating system applied in consultation with stakeholders.

**TABLE 1: BIOPHYSICAL NATURALNESS RATING SCHEME**

Indicator Value	National Wilderness Inventory Description for Baseline National Wilderness Inventory
5 High	Unlogged and ungrazed
4	Unlogged and ungrazed for at least 60* years; excluding clear-felled and intensively grazed areas
3	Selective single logging; irregular grazing within preceding 60* years
2	Light / Moderate grazing; repeated selective logging within preceding 60* years
1 Low	Clear-fell logging operations and / or intensive grazing
0	Agricultural, urban and developed land, pine and other exotic plantations, reservoirs.

\* threshold period may vary between regions

The rating scheme adopted for upgrading the BN indicator to assess wilderness values, in the Upper North-East region is shown in Table 2 (Commonwealth and National Parks and Wildlife Service 1997).

**TABLE 2: BIOPHYSICAL NATURALNESS RATING SCHEME APPLIED TO LNE NSW**

Indicator Value	NWI Description for Lower North East regional update
5 High	No evident disturbance from grazing or logging; natural water bodies; API code of "nil disturbance".
4	Non-intensive disturbance in Rainforest *; unmapped logging events with no API evidence of disturbance; other forest management events considered to have made minimal impact.
3	Grazing lease (SF only) with pasture grasses present; weeds present, some evidence of logging from API and associated evidence from logging records.
2	Intensive record of disturbance in Rainforest *; some multiple logging records, evidence of logging from API.
1 Low	Multiple, recent and intensive logging records with evidence of disturbance in API.
0	Agricultural, urban and developed land, pine and other exotic plantations, reservoirs.

\* Re-evaluated at time of delineation.

### 3.1.2 Establishing the threshold

For the purposes of the Lower North-East comprehensive regional assessment, the threshold for indicative national estate wilderness was considered equivalent to JANIS Wilderness (JANIS 1997, 15). That is, areas with a minimum “High Wilderness Quality” rating of 12 and above, and a minimum size of 8,000 ha were considered to meet the national estate threshold.

### 3.1.3 Results

The National Wilderness Inventory upgrade revealed that 13 areas in the Lower North-East region meet the JANIS criteria for defining high quality wilderness (minimum National Wilderness Inventory rating of 12 and a minimum size of 8000 hectares). Spatial distribution of indicative national estate wilderness is represented at Map 2. The combined extent of the thirteen delineated wilderness areas in the LNE region is 302074 hectares, as shown in Table 6.

**TABLE 3: LAND TENURE OF SIGNIFICANT NATIONAL ESTATE WILDERNESS VALUES**

Polygon number	Place	Total Area (ha)	Area in Reserves (NP/NR only) (ha)	Proportion in Reserves (NP/NR only) (%)
1	New England NP	32648	31658	97
2	Oxley wild Rivers NP	105791	67291	63.6
3	Werrikimbe	16821	15664	93.1
4	Barrington Tops	55531	52437	94.4
5	Wollemi NP (NE)	247	247	100
6	Wollemi NP (NW)	159	159	100
7	Wollemi NP (N)	2803	2635	94
8	Wollemi NP (South)	144854	142127	98.1
9	Putty	15908	11	0.1
10	Yengo	99367	96187	96.8
11	Parr SRA	22867	22867	100
	<b>Total</b>	<b>496996</b>	<b>431283</b>	<b>86.8</b>

NB: figures are indicative only

## 3.2 Natural landscapes

Natural landscapes are large, relatively undisturbed areas with topographic and catchment integrity where natural processes continue largely unmodified by human intervention. Natural processes include:

- energy flows;
- nutrient cycling;
- hydrological processes;
- ecological processes such as succession; and
- evolutionary processes such as speciation and extinction.

At a national level, ‘natural landscapes’ are considered rare, and in those Regional Forest Agreement regions where they are found they have generally been assessed under national estate criterion B.1—*‘importance for rare, endangered or uncommon flora, fauna, communities, ecosystems, natural landscapes or phenomena, or as a wilderness’*.



### 3.2.1 Method

The following measures were used to identify areas of potential natural landscape value:

- naturalness (or level of disturbance indicated by the biophysical naturalness indicator);
- size and;
- integrity in the landscape.

The assessment of natural landscapes was largely based on the biophysical naturalness indicator of the National Wilderness Inventory (method described in section 2.2.1)

### 3.2.2 Establishing the threshold

Areas of high biophysical naturalness (BN equals 4 or 5) and with an area of 1,000 ha or greater were identified. Areas adjacent to the coast with high biophysical naturalness were identified if greater than 250 ha. The set threshold was chosen to be consistent with the process carried out in the other CRA regions. Older biophysical naturalness layers for areas adjacent to but outside the region were used to allow potential areas on the boundary of the region to be assessed within context. In order to rationalise the identification of areas, identified areas could contain fragmented but not significant areas of disturbance. Boundaries were permitted to include areas of disturbed forest, but not cleared land or substantially modified landscapes such as plantations.

### 3.2.3 Results

A large number of natural landscapes were identified in lower north-eastern NSW. Natural landscapes follow the general line of the escarpment from the edge of the Dorrigo plateau south-west through New England National Park and Styx River State Forest to Oxley Wild Rivers National Park and Doyles River State Forest. Additional large areas occur on Barrington Tops, Yengo and Wollemi National Parks. Along the coastal plain, significant landscapes were identified in the Myall Lakes area, Crowdy Bay National Park, Limeburners Creek National Park, and Yessabah and Ingalba State Forests. The areas delineated are above the threshold for nomination on the Register of the National Estate and use the best available data from the comprehensive regional assessment for lower north-eastern NSW. There is a strong correlation with places already listed on the Register of the National Estate. These areas cover 1,690,874 ha. Delineated areas of natural landscapes are shown at Map 3.

Over 50% of the total natural landscape area identified as having indicative national estate significance occurs in existing reserve, including national park or nature reserve. 21% of the total area is in state forest (Table 4).

**TABLE 4: LAND TENURE OF SIGNIFICANT NATIONAL ESTATE NATURAL LANDSCAPE VALUES**

Tenure	Approximate Area (ha)	Proportion of Total (%)
National Park, Nature Reserve or PMP 1.3*	837,875	50%
Private Land	Not Available	Not Available
State Forest	351,516	21%
Leasehold Crown Land	Not Available	Not Available
Other Crown Land	Not Available	Not Available

\*PMP 1.3 is the State Forests of NSW Preferred Management Priority Classification for areas reserved as Flora Reserves and Forest Preserves (Forestry Commission of NSW 1993)

### 3.3 Undisturbed catchments

‘Undisturbed catchments’ are catchments where natural hydrological processes remain essentially unmodified and unimpeded.

#### 3.3.1 Method

The identification of undisturbed catchments was based on an analysis of river flow impediments and the naturalness of the area within the catchment. The assessment is derived from the River Disturbance Index Database (Stein et al 1998) held by the Wilderness and Wild Rivers Group, Environment Australia. The River Disturbance Index is a measure of river/stream quality across sub-catchment areas based on two indicators: Naturalness of Flow Regime Index; and Sub-Catchment Naturalness Index.

##### *Delineation of catchments*

Sub-catchments were identified from the wild rivers database, compiled for the wild rivers assessment that formed part of the lower north east comprehensive regional assessment. These sub-catchments were used as the basis of the national estate analysis. The database delineates a separate modelled sub-catchment for each stream segment, as defined on the AUSLIG 1:250,000 scale hydrography theme database.

##### *Catchment Naturalness*

The River Disturbance Index Database was constructed by establishing a grid across a primary database and calculating scores for sub-catchment condition (Sub-Catchment Naturalness Index) and flow regime indicators (Naturalness of Flow Regime Index). The scores for Sub-Catchment Naturalness Index were combined and adjusted for sub-catchment area to produce a Catchment Naturalness Index. The final River Disturbance Index values combine the Naturalness of Flow Regime Index and the Catchment Naturalness Index.

The primary database is derived from geographical data derived from topographical map series and the National Wilderness Inventory primary database. The National Wilderness Inventory sources provide settlement and infrastructure features, the extent of non-natural land cover and an index of biophysical naturalness (Lesslie and Maslen 1995). Topographical map series provides watercourse data, built-up areas, infrastructure, reservoirs and canals.

The River Disturbance Index was created using guidelines established by an expert panel of government and non-government officials and stakeholders. Panel participants helped develop decision rules on quantifying disturbance and measuring catchment and river naturalness. From these discussions, the River Disturbance Index rates sub-catchment areas on a scale from undisturbed (0) to disturbed (1).

### **3.3.2 Establishing the threshold**

Selection of a threshold to capture intact and undisturbed catchments was made on the basis that highly undisturbed catchments occur in the River Disturbance Index range less than or equal to 0.01.

Using geographic information system, the data was filtered to capture all sub-catchments less than or equal to 0.01. Those places falling within these parameters were deemed to have indicative national estate value for undisturbed catchments.

Areas of high biophysical naturalness (BN equals 4 or 5) and with an area of 1,000 ha or greater were identified. The set threshold was chosen to be consistent with the process carried out in the other CRA regions.

Undisturbed catchments that were under 1000 ha along the boundary of the RFA region were investigated to see whether such units were part of a larger undisturbed catchment that extended beyond the region. Older biophysical naturalness layers for areas adjacent to but outside the region were used for this investigation. A lower area threshold of 250 ha was permitted for areas adjacent to the coast. No small boundary units matching either of the instances just specified were identified in lower north-eastern NSW.

In order to rationalise the identification of undisturbed catchment areas, boundaries were permitted to include areas of disturbed forest, but not cleared land or substantially modified landscapes such as plantations.

### **3.3.3 Results**

After applying the size threshold of 1,000 ha, significant indicative undisturbed catchments were identified with an area of approximately 1,138,869 ha (Table 5, Map 4). The areas identified are above threshold level to warrant national estate listing and have been delineated using best available data from the lower north-eastern CRA.

Areas delineated were mainly associated with the great escarpment from the edge of the Dorrigo plateau south-west through New England National Park and Styx River State Forest to Oxley Wild Rivers National Park and Doyles River State Forest. Additional large areas occur on Barrington Tops, Yengo and Wollemi National Parks. These areas have - at least in part - been previously listed on the Register of the National Estate.

**TABLE 5: INDICATIVE UNDISTURBED CATCHMENT AREAS**

Place	Area (ha)	Place	Area (ha)
Oxley Wild Rivers & Werrikimbe NP	258919	Heaton SF	1994
Wollemi NP & W Putty SF	230106	Mooral Creek S of Marsh SF	1856
Yengo & Dharug NP	224363	Area Between W Putty SF & Yengo NP	1794
Barrington Tops NP & SF	98531	Masseys Creek SF	1738
New England NP, Nulla-Five Day & Oakes SF's	98019	Gangat & Bucklebores Mountain area	1731
PT Heaton & Olney SF	13713	Nth West Oxley Rivers NP	1694
Camels Hunt NR & Surrounds	12650	Kalateenee SF	1688
E Putty SF	11450	NW Bulga SF	1675
Woko NP	10200	NE Wollemi NP	1594
Giro SF	10075	S Crowdy Bay NP	1481
Riamukka	9063	NW Yengo NP	1475
Dorrigo NP	8994	SW Doyles River SF	1444
Manobalai NR	8606	Crown Land NW of Mernot SF	1444
Enfield SF	8388	Briggsvale	1325
Cathedral Rock NP & Yooroonah SF	7306	Area S of SW Oxley Wild Rivers NP	1325
SE Tuggolo SF	6956	Crown Land Kurri Kurri	1313
Styx River SF	6675	Ben Halls Gap NP	1281
		Nundle SF	1275
Watagan & Corrabare SF	6169	W Pappinbarra SF	1181
Chichester SF	6125	SW Tuggolo SF	1144
NW Wollemi NP	5813	W Cairncross SF	1119
Knorrit SF	5688	Crown Land between Cochrane & Carrai SF	1100
SE Bulga SF	4963	Regatta, Wallis & Cockatoo Islands	1031
Mistake SF	4631	Doyles River SF	1006
Yessabah SF	4581	Serpentine NR	956
NW Wollemi NP	4569	Tuckers Knob SF	731
W Wollemi NP	3900	W Wollemi NP	588
Ingalba	3894	W Wollemi NP	319
Coneac & N Bowman SF	3888	W Wollemi NP	288
N Tuggolo SF	3769	W Wollemi NP	256
Trevor & Fosterton SF	3481	NW Wollemi NP	181
N Wollemi NP	3425	NW Wollemi NP	144
Cockspur SF	2644	NW Wollemi NP	25
SW Oxley Wild Rivers NP	2619	W Yengo NP	6
Dingo SF	2288	SW Yengo NP	6
Camden Haven SF & N Crowdy Bay NP	2181	W Wollemi NP	6
Area N of Cockspur SF	2019		

TABLE 6: Land Tenure of indicative national estate undisturbed catchment values

Tenure	Approximate Area (ha)	Proportion of Total (%)
National Park, PMP 1.3 or Nature Reserve	691,042	61%
State Forest	228,794	20%
Private Land	Not Available	Not Available
Leasehold Crown Land	Not Available	Not Available
Other Crown Land	Not Available	Not Available

\*PMP 1.3 is the State Forests of NSW Preferred Management Priority Classification for areas reserved as Flora Reserves and Forest Preserves (Forestry Commission of NSW 1993)

### 3.4 Old-growth forest

The importance of old-growth forests was assessed in terms of the maintenance of existing natural processes (Sub Criterion A.2)

The comprehensive regional assessment work is guided by the JANIS criteria which defines old-growth forest as 'ecologically mature forest where the effects of disturbances are now negligible' (JANIS 1997, p. 13). Old-growth forests in Australia are considered rare at the national level. Old-growth forests have intrinsic value as the oldest growth-stage of a given vegetation class or community as well as those characteristics, associated with those oldest age class-dominated forests. For example, senescent trees are important for providing nesting and roosting sites for large forest owls and arboreal mammals.

In the lower north-east comprehensive regional assessment region, comparatively large tracts of old-growth forest are to be found along the escarpment north of Doyles River State Forest and in the Wollemi and Yengo national parks. Most stands of old growth occur in complex mosaics of mature and younger forest on accessible parts of the adjacent ranges. Old growth is particularly uncommon on the coastal plain. The most extensive areas remaining on the coastal plain and ranges include large discrete areas in Ingalba, Kalateenee State Forests and Barrington Tops National Park and smaller areas in Myall River State Forest and Myall Lakes National Parks.

The assessment of old-growth forest of indicative national estate value is considered under sub-criterion B.1 (Natural rarity) and sub-criterion A.2 (Continuing processes). Sub-criterion B.1 focuses on examples of old-growth forest for particular forest communities that are rare or uncommon at a regional level, while sub-criterion A2 recognises the importance of old-growth forests for the maintenance of existing natural processes (Appendix A).

#### 3.4.1 Method

The old-growth forest identified according to the JANIS criteria was used as the primary data-set for identification of indicative national estate old-growth forest values in lower north-east. Detail on the processes used to delineate old-growth forest can be obtained from the CRA Old-growth forest Report. (NPWS 1998)

Areas of indicative national estate old-growth forest significant for ecological processes (under criteria A.2) are considered to be those that have high integrity and natural context (as identified by the National Wilderness Inventory biophysical naturalness index) and above a minimum size threshold to ensure the viability and quality of the forest stand.

### 3.4.2 Establishing the threshold

The old-growth forest layer was overlaid with the natural landscapes and undisturbed catchments layers. It was assumed that within these areas, all old-growth forest regardless of size possess a high level of integrity. Outside areas of natural landscapes and undisturbed catchments, a minimum viable forest patch size threshold of 100 ha was applied.

### 3.4.3 Results

The process outlined above delineated 838,219 ha of old-growth forest in the lower north-eastern CRA region as above threshold. Approximately 71% is in existing reserves and approximately 16% is in State Forest (Table 7). Areas of indicative national estate old-growth forest, identified under sub criterion A.2 are illustrated at Map 5.

**TABLE 7: LAND TENURE OF INDICATIVE NATIONAL ESTATE OLD-GROWTH FOREST**

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Tenure	Approximate Area (ha)	Proportion of Total (%)
National Park, PMP 1.3 or Nature Reserve	594,861	71%
State Forest	133,479	16%
Private Land	Not Available	Not Available
Leasehold Crown Land	Not Available	Not Available
Other Crown Land	Not Available	Not Available

\*PMP 1.3 is the State Forests of NSW Preferred Management Priority Classification for areas reserved as Flora Reserves and Forest Preserves (Forestry Commission of NSW 1993)

## 4. FLORA AND FAUNA VALUES

Flora and Fauna values in lower north east were assessed against national estate criteria A.1, A.2, A.3, B.1 and D.1 (Appendix A).

### Localised natural flora and fauna values

#### *Sub-Criterion A.1: Importance in the evolution of Australia's natural history*

Assessment for values under this sub-criterion involved the identification of places where the present distribution and ecology of flora and fauna of lower north-eastern NSW reflect the influence of past evolutionary, climatic and environmental processes. These included places important for:

- endemic flora and fauna;
- flora and fauna with disjunct distributions;
- flora and fauna at the limit of their range;
- flora and fauna refugia; and/or
- relictual and primitive flora and fauna.

#### 4.1 Flora and fauna species endemic to region

Endemic species provide an important insight into the process of evolution of flora and fauna (Sub-criterion A1). Heatwole (1987) noted two processes by which endemism could occur. The first is where a species becomes extinct over the bulk of its range except for small refugia. The second is a long period of isolation leading to the evolutionary divergence of species from a common ancestor (eg Gondwanic species in Australia). In some cases, biogeographic determinants such as the influence of terrestrial and oceanic climatic influences, soils and localised topographic variation may be the main controlling factors in the development of endemism. In other cases the role of climatic refugia in speciation during periods of climate change are important.

For the purposes of the current study, endemic species were regarded as those species with at least 75% of their distribution range confined to Upper and Lower North-Eastern NSW. The complex environment of northern NSW presents a diversity of habitats for endemic species. For example, Osborne (1991) postulated that the dry forests of the Timbara and Mann rivers and the Gibraltar granite forests may present barriers to movement for some bird species associated with wet forests of the Washpool area. Several authors have also commented on the importance of rainforest remnants in the region as centres for endemism. Monteith and Todd Davies (1991) in a study of invertebrate diversity in Queensland rainforests observed a high level of endemism between discrete rainforest areas. Main (1991) notes that even small isolates of rainforest in the landscape are significant for rainforest trapdoor spiders, which reach their greatest diversity in North-Eastern NSW. Heatwole (1987) summarised the findings of Kikkawa et al (1979) who studied the relationship of Australian heathlands with their fauna. Heath endemism was generally associated with specialised species more or less restricted to heathland because of speciation, the presence of specific habitat no longer available elsewhere or species isolated phylogenetically and geographically after heath retreated in past ages.

#### **4.1.1 Method**

Workshops were used to identify fauna species with endemic distributions to north NSW to provide a species list. Data was derived from surveys conducted for the comprehensive regional assessment and from the NSW NPWS wildlife atlas. 92 fauna species were identified as being endemic. Literature reviews were also carried out to supplement the workshop responses. For flora, the literature review conducted as part of the flora workshop was used to provide a species list. Data was derived from the validated flora data-set used for comprehensive regional assessments. 227 flora species were identified as being endemic.

Point location information for all identified species was plotted respectively for flora and fauna on a one kilometre square grid. An analysis was done which searched for all records of endemic species within a two kilometre radius around each grid cell. The resultant analysis showed concentrations of endemic species, for flora and fauna respectively, across the landscape. This methodology was used because the analysis could be extended south of the Hunter River. It was compared to the work done by NSW NPWS on endemics for Lower North-East using the same methodology as was used for Upper North-East and covered the important areas delineated by experts.

#### **4.1.2 Establishing the threshold**

Experts agreed that all areas shown in the non-target JANIS analysis of centres of endemism done by NPWS were above threshold. The methodology used covers these areas but extends the analysis south of the Hunter River.

#### **4.1.3 Results**

The Centres of Endemism identified as areas of indicative national estate significance are shown on Map 6. Each area depicted represents foci for endemic species using best available information to the lower north-east comprehensive regional assessment, and all areas identified are above the threshold level warranting national estate listing.

Some of the major localities delineated for endemic species were the Dorrigo plateau and the Macleay gorges including the Carrai plateau, Werrikimbe National Park, Dingo and Bulga State Forests, Barrington Tops, Chichester State Forest, and the Wallis Lake area including Wallingat State Forest. The endemic concentrations around Olney State Forest, Ourimbah State Forest and Brisbane Waters National Park are attributed to the influence of the endemic species of the Sydney Basin. The areas that were identified include several areas already listed on the Register of the National Estate including Barrington Tops, Woko, Myall Lakes, Crowdy Bay, Werrikimbe, Oxley Wild Rivers and New England National Parks.

Approximately 29% of the total area identified as centres of floristic endemism occurs in national park or nature reserve and 48% of the total area is on State Forest (Table 8).



**TABLE 8: LAND TENURE OF INDICATIVE NATIONAL ESTATE CENTRES OF ENDEMISM**

Tenure	Approximate Area (ha)	Proportion of Total (%)
National Park, PMP 1.3 or Nature Reserve	109,078	29%
State Forest	181,843	48%
Private Land	Not Available	Not Available
Leasehold Crown Land	Not Available	Not Available
Other Crown Land	Not Available	Not Available

\*PMP 1.3 is the State Forests of NSW Preferred Management Priority Classification for areas reserved as Flora Reserves and Forest Preserves (Forestry Commission of NSW 1993)

## 4.2 Flora and fauna with disjunct populations

Disjunct populations are those that have become physically separated, resulting in minimal or no gene flow between them. This separation could be caused by a break in a formerly continuous distribution or by long-distance dispersal (jump dispersal) over a barrier. Heatwole (1987) summarised features that could act as barriers including climate, topography, vegetation type and intra or inter-species competition. In North-Eastern NSW, the deeply incised topography, diversity of species, geology, altitudinal range and topography and the movement of tall forests across the Pleistocene landscape in response to climate change are all conducive to the development of disjunct populations (Covacevich 1991, Osborne 1991). Often, a disjunction takes the form of a larger parent or core population and a smaller outlier, or outliers, but in some instances, the disjunct populations are of about the same size. Species with disjunct populations can be regarded as being important elements in the evolution of Australian flora and fauna (Sub-criterion A1).

Disjunct species in Upper North-Eastern NSW were taken to be species with highly specific habitat preferences and low powers of dispersal such as frogs and reptiles, species with documented isolated populations within the region, and associated with fragmented habitat, primarily rainforest.

### 4.2.1 Method

For fauna, workshops were used to identify fauna species with disjunct distributions to provide a species list. Data was derived from surveys conducted for the comprehensive regional assessment and from the NSW NPWS wildlife atlas. 92 fauna species were identified as having disjunct distributions. Literature reviews were also carried out to supplement the workshop responses. For flora, the literature review conducted as part of the flora workshop was used to provide a species list. Data was derived from the validated flora data-set used for comprehensive regional assessments. 227 flora species were identified as having disjunct distributions.

Point location information for all identified species was plotted respectively for flora and fauna on a one kilometre square grid. An analysis was done which then searched for records of disjunct species within a two kilometre radius around each grid cell. The resultant analysis showed concentrations of disjunct species, for flora and fauna respectively, across the landscape.

### 4.2.2 Establishing the threshold

The above information was displayed as standard deviations above the mean number of species in the landscape. Two standard deviations above the mean number of species for both flora and fauna was taken to be above threshold.

### 4.2.3 Results

The areas identified as having indicative national estate significance for species with disjunct populations are delineated on Map 7 for fauna and Map 8 for flora. Areas shown represent concentrations of species with disjunct ranges using relevant best available information to the lower north east comprehensive regional assessment. All areas identified are significant concerning Australia's evolutionary history and are above the threshold warranted for national estate listing.

Some of the major areas delineated for species with disjunct populations were the rim of the Dorrigo plateau, running around the Macleay valley river gorges to Werrikimbee National Park for both flora and fauna. Additional concentrations were identified in Doyles River and Bulga State Forests (for fauna), Barrington Tops (for fauna and flora), and the area around Olney and Ourimbah State Forests (for fauna). On the coast, sites were found around Port Stephens for flora and fauna, Craven State Forest (for fauna), Booti Booti National Park (for fauna), Crowdy Bay National Park (for flora and fauna), Lake Innes Nature Reserve (for flora and fauna) and Limeburners Creek Nature Reserve (for flora and fauna).

323,900 ha were identified as above threshold for fauna with disjunct ranges. Nearly 21% of this was on existing reserves and 43% in state forest. 178,700 ha were identified above threshold for flora with disjunct ranges. Nearly 49% of this was on existing reserves and 28% in State Forest (Table 9). Places already listed on the Register of the National Estate were strongly associated with the areas delineated as having values associated with species that have disjunct distribution. The south-west extension of Oxley Wild Rivers National Park is the only major listed site that did not having values contained within it.

**TABLE 9: LAND TENURE OF INDICATIVE NATIONAL ESTATE SPECIES WITH DISJUNCT RANGES**

Tenure	Approximate Area (ha)	Proportion of Total (%)
National Park, PMP 1.3 or Nature Reserve		
For Fauna	68,700	21%
For Flora	87,100	49%
State Forest		
For Fauna	139,400	43%
For Flora	50,100	28%
Private Land	Not Available	Not Available
Leasehold Crown Land	Not Available	Not Available
Other Crown Land	Not Available	Not Available

\*PMP 1.3 is the State Forests of NSW Preferred Management Priority Classification for areas reserved as Flora Reserves and Forest Preserves (Forestry Commission of NSW 1993)

### **4.3 Flora and Fauna at the end of their distribution range**

Flora and fauna species at the end of their range are those species whose known distribution range terminates within or near the RFA region. The value can reflect broad biogeographic boundaries or past species population movements. Within the context of north-eastern NSW, species at the limit of their range tend to be those species from tropical or sub-tropical Australia whose southern distribution limit occurs in the region, or those species from temperate Australia who reach their northern distribution range limit in the region. There are also some inland species whose distribution extends down onto the coastal plain through the Hunter Valley. Distributions and range limits can yield important information relating to past population movements and evolutionary history and species at the end of their range are importance in the evolution of Australian fauna and flora (Sub-criterion A1).

#### **4.3.1 Method**

For fauna, workshops were used to identify fauna and flora species that reach the limit of their range within the region. Literature reviews were also carried out to supplement the workshop responses. Data was derived from surveys conducted for the comprehensive regional assessment, from literature reviews and from the NSW NPWS wildlife atlas. 180 fauna species and 998 flora species were identified as reaching their distribution limit within or in close proximity to the RFA region.

Point location information for all identified species was plotted respectively for flora and fauna on a one kilometre square grid. An analysis was done which then searched for all records within a two kilometre radius around each grid cell. The resultant analysis showed concentrations of species at the limit of their range for fauna and flora respectively, across the landscape.

#### **4.3.2 Establishing the threshold**

The above information was displayed as standard deviations above the mean number of species in the landscape. Two standard deviations above the mean number of species for both flora and fauna was taken to be above threshold.

#### **4.3.3 Results**

The areas identified as having indicative national estate significance for species at the limit of their range are delineated on Map 9 for fauna and Map 10 for flora. Areas shown represent concentrations of species at the end of their range using best information available to the lower north-east comprehensive regional assessment. All areas identified are significant concerning Australia's evolutionary history and are above the threshold warranted for national estate listing.

Some of the major areas delineated for species with disjunct populations were the rim of the Dorrigo plateau, running around the Macleay valley river gorges to Werrikimbee National Park for both flora and fauna. Additional concentrations were identified in Doyles River and Bulga State Forests (for fauna), Barrington Tops (for fauna and flora), and the area around Olney and Ourimbah State Forests (for fauna). On the coast, sites were found around Port Stephens for flora and fauna, Craven State Forest (for fauna), Booti Booti National Park (for fauna), Crowdy Bay National Park (for flora and fauna), Lake Innes Nature Reserve (for flora and fauna) and Limeburners Creek Nature Reserve (for flora and fauna).

286,000 ha were identified as above threshold for fauna at the limit of their range. 21% of this was on existing reserves and 48% in state forest. 295,000 ha were identified above threshold for flora at the end of their range. 33% of this was on existing reserves and 41% in State Forest (Table 10). Places already listed on the Register of the National Estate were strongly associated with the areas delineated as having values associated with species reaching the limit of their range. The south-west extension of Oxley Wild Rivers National Park is the only major listed site that did not having values contained within it.

**TABLE 10: LAND TENURE OF INDICATIVE NATIONAL ESTATE SPECIES AT THE LIMIT OF THEIR RANGE**

Tenure	Approximate Area (ha)	Proportion of Total (%)
National Park, PMP 1.3 or Nature Reserve		
For Fauna	60,021	21%
For Flora	97,627	33%
State Forest		
For Fauna	137,713	48%
For Flora	120,044	41%
Private Land	Not Available	Not Available
Leasehold Crown Land	Not Available	Not Available
Other Crown Land	Not Available	Not Available

\*PMP 1.3 is the State Forests of NSW Preferred Management Priority Classification for areas reserved as Flora Reserves and Forest Preserves (Forestry Commission of NSW 1993)

#### 4.4 Flora and fauna refuges

The sharply incised landscape and variable environments of Upper North-Eastern NSW provide a diverse array of potential refugia. Heatwole (1987) noted the cyclic nature of climate in Australian geological history causing a series of long term wetter and drier periods that result in mesic and xeric species respectively radiating and contracting in the landscape. At the extremes of these cycles, species are restricted to small, favourable microhabitats in the landscape (refugia). Refugia are areas where physical and biological attributes combine to provide an environment that is more resilient to climatic variation, severe fire events and drought, than surrounding areas, and are important centres for the conservation of environmentally sensitive species. Consequently, refugia also constitute important sources of genetic variation and are regarded as important centres for species radiation when conditions become more favourable. For example, Horton (1984) regarded far northern NSW as refugia of long term significance to speciation in birds.

Refugia can be identified both as short term refuges from current perturbations such as fire, and long term evolutionary refuges. In the later case, the size of the refugia becomes significant. For example, it has been suggested that landscapes in which rainforests are extensive enough for a core areas to have remained comparatively stable during adverse climatic periods are highly likely to have primitive species or

concentrations of narrow range endemic species that have disappeared from smaller rainforest areas in the landscape that shrink or disappear all together (Covacevich 1991).

Nix (1982) identified a number of areas down the east coast with high growth indices for species with thermal optimums in the range of 10-12°C and threshold temperatures around 0°C, including the edge of the Dorrigo plateau and the high parts of Barrington Tops. These disjunct areas support cool temperate rainforests, are similar to South-West Tasmania and high altitudes in New Guinea, and can be regarded as potential refugia (Nix 1982, Commonwealth 1992). A range of other environments has already been discussed under endemic species and will be discussed under primitive and relictual species.

In summary, refugia are important for maintaining flexibility and adaptability in times of climatic change, as well as providing an insight into the vegetation of a past period, and the biogeographic and evolutionary processes, which have shaped the present biota. These areas are generally also important for many species now uncommon elsewhere (Sub-criterion B1, A1, A2 and D1).

#### **4.4.1 Method**

The national estate refugia coverage was derived using data from the lower north east RFA forest ecosystem coverage, a digital elevation model and the Broad Old Growth Mapping project (BOGM). Experts were asked to nominate environments important as refugia. These were then validated against the areas identified as important for primitive and relictual species and known locations that experts identified as being important for refugia.

Environments delineated included the following:

- riparian, alpine, mallee, rock outcrops, native grasslands, subalpine, heath, banksia, wetlands, swamps, banksia, paperbark, casuarina, sedgelands, and coastal complex.
- all rainforest polygons.
- coastal occurrences of scribbly gum, swamp mahogany or cypress pine.
- all ecosystems described as alpine or subalpine including ecosystems with black sallee or snow gum present.
- Roundleaf Gum with wet heath understorey.
- a richness map of forest ecosystems showing the number of forest ecosystems within two kilometres of each 100m grid cell was used to identify areas of steep environmental gradient.

Geology was not available for LNE.

#### **4.4.2 Establishing the threshold**

Based on expert opinion, all refugia at any scale were important. No threshold was applied.

#### 4.4.3 Results

Areas delineated as refugia are shown on map 11. Areas shown represent habitats nominated by experts as refugia, validated by comparison with the distribution of primitive and relictual species using best information available to the lower north east comprehensive regional assessment. All areas identified are significant concerning Australia's evolutionary history, rare, endangered or uncommon flora and fauna and existing natural systems. The areas shown demonstrate principle characteristics of the range of Australia's environments including wetlands, rainforests and coastal environments and are above the threshold warranted for national estate listing.

Refugia were found across the landscape of North-Eastern NSW. There were, however, concentrations of refugia along the rim of the Dorrigo Plateau and through the Macleay gorges to Werrikimbee National Park. Additional major concentrations occurred in Barrington Tops, Wollemi National Park and Brisbane Waters National Park. On the coastal plain foci for refugia occurred in Myall Lakes and Crowdy Bay National Parks, Lake Innes Nature Reserve, Limeburners Creek Nature Reserve and Hat Head National Park.

528,902 ha were identified as having potential indicative significance as refugia. Approximately 42% of the total area identified as refugia occurs in national park, flora reserve or nature reserve and 27% occurs on state forest (see table 11). Places already listed on the Register of the National Estate were strongly associated with the areas delineated as having values associated with species reaching the limit of their range.

**TABLE 11: LAND TENURE OF INDICATIVE NATIONAL ESTATE REFUGIA**

Tenure	Approximate Area (ha)	Proportion of Total (%)
National Park, PMP 1.3 or Nature Reserve	221,736	42%
State Forest	142,615	27%
Private Land	Not Available	Not Available
Leasehold Crown Land	Not Available	Not Available
Other Crown Land	Not Available	Not Available

\*PMP 1.3 is the State Forests of NSW Preferred Management Priority Classification for areas reserved as Flora Reserves and Forest Preserves (Forestry Commission of NSW 1993)

#### 4.5 Primitive, relictual, and phylogenetically distinct species

Relictual, phylogenetically distinct and/or Gondwanic flora and fauna species are generally regarded as those that meet one or more of the following criteria:

- species that appear to possess primitive features;
- species that exhibit features that appear to be different or remote from related species; and
- species that appear to be populations left isolated in the landscape by later climatic or environmental changes.

The Rufous Scrub-bird (*Atrichornis rufescens*) is an example of a species generally agreed to have primitive taxonomic features and ancient origins within Australia. (Heatwole 1987). Phylogenetically distinct species were taken to be those species whose taxonomic affinities were unknown or unclear such as the Swamp Wallaby (*Wallabia bicolor*) which does not appear to be closely related to any of the other extant groups in the Macropodidae (Merchant 1995). The sphagnum frogs (Genus *Kyarranus*) are an example of a primitive group with ancient origins which, based on finds from Riversleigh fossil deposits, were once much more widespread but are now restricted to moist environments along the ranges (Barker et al 1995). Fletcher's Frog (*Lechriodus fletcheri*) and the Southern Angle-headed Dragon (*Hypsilurus spinipes*) are examples of species with possible New Guinean or south-east Asian origins with relictual populations on the east coast, though recent genetic work suggests that *Hypsilurus* may actually have much older African origins (Hutchinson and Donnellan 1993, Tyler 1994).

North-Eastern NSW provides a variety of habitats suited to the persistence of primitive, relictual and phylogenetically distinct species. The diverse range of habitats, large altitudinal gradient and the presence of long-term stable landscapes such as mangroves, heath and rainforests all contribute to the likelihood of persistence of primitive, phylogenetically distinct and relictual species. The wide array of protected microhabitats such as sheltered gullies and rock outcrops provide contemporary refugia. Floyd (1985) noted that Australian rainforests possessed the greatest concentration of primitive families in the world. Of the 98 primitive angiosperm and gymnosperm genera in Australia, 42 genera are in North-Eastern NSW. Greenslade (1994) noted that Gondwanian relict species and taxa occupying geographically discrete sites such as mountain-tops were a high priority for national estate listing. Covacevich (1991) discussed the common Gondwanic origins of heaths and rainforest and related this to the modern similarities between the herpetofauna of heaths and rainforests in north-eastern NSW.

Primitive, relictual or phylogenetically distinct species are important as indicators of evolutionary history, past or current population movements, evidence of past or current speciation and for evidence of past or current decline (sub-criterion A1, A2).

#### **4.5.1 Method**

For fauna, workshops were used to identify fauna species with primitive, relictual or phylogenetically distinct characteristics to provide a species list. Literature reviews were also carried out to supplement the workshop responses. Data from the NSW NPWS wildlife atlas and data collected from CRA surveys were used. 19 primitive species and 25 relictual fauna species were identified. This was only done for fauna as experts did not nominate primitive or relictual flora species.

For flora and invertebrates, environments and known sites were identified through expert workshops and literature review. A coverage was derived using data from the UNE RFA forest ecosystem coverage, the geology sheet covering northern NSW (1:250,000 scale), and the results of the UNE CRAFTI API project. The environments identified were common to those nominated as refugia (see the sub-section on Refugia).

Point location information for all identified species was plotted for fauna on a one kilometre square grid. An analysis was done which then searched for all records within a two kilometre radius around each grid cell. The resultant analysis showed concentrations of primitive, relictual and phylogenetically distinct species across the landscape. This was combined with the landscape analysis conducted for flora and invertebrates to produce the final layer.

### 4.5.2 Establishing the threshold

The point location data was displayed as standard deviations above the mean number of species in the landscape. Two standard deviations above the mean number of species for fauna was taken to be above threshold.

Based on expert opinion, the primitive and relictual species habitat was thresholded to only show areas greater than 100 ha in area in the landscape. It was felt that the refugia layer was adequate to show the distribution of smaller units in the landscape.

### 4.5.3 Results

The areas identified as having indicative national estate significance for primitive, relictual and phylogenetically distinct species are delineated on Map 12. Areas shown represent an amalgamation of sites known to be rich in species with primitive, relictual or phylogenetically distinct fauna. These have been cross-referenced with habitats nominated by experts as important for fauna, flora or invertebrates, using the best information available to the lower north east comprehensive regional assessment. All areas identified are significant with regard to Australia's evolutionary history and existing natural systems and are above the threshold warranted for national estate listing.

The areas delineated for this value were generally associated with protected wet environments such as the escarpment and Macleay gorges south of Dorrigo, Werrikimbee National Park, Wingham, Barrington Tops and Mount Royal and the deep gullies of the Watagans. Areas on the coastal plain tended to be associated with well-protected or particular environments. Examples include the tall wet flooded gum (*Eucalyptus grandis*) forests with Cabbage Tree Palm (*Livistona australis*) understoreys in Wallingat State Forest or the wet environs of Marsh State Forest.

348,500 ha were identified as above threshold for primitive, relictual and phylogenetically distinct species. 24% of this was on existing reserves and 41% in state forest. (Table 12). Areas already listed on the Register of the National Estate that were identified in this study as having values for primitive and relictual species tended to be those occurring along the great escarpment.

**TABLE 12: LAND TENURE OF INDICATIVE NATIONAL ESTATE PRIMITIVE, RELICTUAL AND PHYLOGENETICALLY DISTINCT SPECIES**

Tenure	Approximate Area (ha)	Proportion of Total (%)
National Park, PMP 1.3 or Nature Reserve	83,400	24%
State Forest	143,900	41%
Private Land	Not Available	Not Available
Leasehold Crown Land	Not Available	Not Available
Other Crown Land	Not Available	Not Available

\*PMP 1.3 is the State Forests of NSW Preferred Management Priority Classification for areas reserved as Flora Reserves and Forest Preserves (Forestry Commission of NSW 1993)



***Sub-Criterion A.2: Importance in maintaining existing processes or natural systems at the regional or national scale***

The identification of areas of indicative national estate significance under this sub-criterion involves assessment of places important for the maintenance of natural ecosystem processes. These include abiotic processes (eg: those related to hydrological and nutrient cycles) and biotic processes (those related to the life cycles and interdependence of plant and animal species in the forests, woodlands, heathlands, sedgeland, swamps and wetlands of the region). Values that may be considered include:

- habitat for migratory species
- important wildlife habitat;
- refuges for fauna (see refugia under Sub-criterion A1 above);
- remnant vegetation; and
- places important for vegetation succession.

Places important for undisturbed catchments and old-growth forest are addressed in extensive natural values.

## **4.6 Migratory species**

Migratory species were regarded as those species which undertake a regular migration for breeding or feeding purposes at a regional, interregional, continental or intercontinental scale. In the context of northern NSW, this included bird species listed as JAMBA or CAMBA species as well as inter-regional migrants such as the dollarbird and forest migrants such as the grey-headed flying fox. Such species are important in maintaining existing processes and natural systems and help to delineate significant wetlands (Sub-criterion A2 and D1).

### **4.6.1 Method**

Workshops were used to identify fauna species that were known to be migratory and which occurred within the region. Literature reviews were also carried out to supplement the workshop responses, including the inclusion of all species listed under JAMBA and CAMBA. The NSW NPWS wildlife atlas and data from the CRA surveys were used as the primary data source. 146 species were identified as migrants occurring within or visiting the RFA region.

Point location information for all identified species was plotted respectively for flora and fauna on a one kilometre square grid across the region. An analysis was done which then searched for all records within a two kilometre radius around each grid cell. The resultant analysis showed concentrations of migratory species across the landscape.

The site location for the only RAMSAR wetland in the region, Kooragang Island Nature Reserve was also included.

#### 4.6.2 Establishing the threshold

The above information was displayed as standard deviations above the mean number of species in the landscape. Two standard deviations above the mean number of species was taken to be above threshold. The boundary of Kooragang Island Nature Reserve was added to the layer.

#### 4.6.3 Results

The areas identified as having indicative national estate significance for migratory species is delineated on Map 13. Areas shown represent sites known to be rich in migratory species, using the best information available to the lower north-east comprehensive regional assessment. All areas identified are significant with regard to existing natural systems and are above the threshold warranted for national estate listing.

Areas delineated for migratory species were strongly associated with the coastal plain, noticeably, in coastal areas between Urunga and Port Macquarie, around Forster and between Newcastle and Gosford.

226,000 ha were identified as above threshold for migratory species. 21% of this was on existing reserves and 20% in state forest. (Table 13). The coastal parks and nature reserves including Crowdy Bay and Booti Booti National Parks, and Lake Innes and Kooragang Island Nature Reserves are indicative of the places identified in the current work that are places already listed in the Register of the National Estate.

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**TABLE 13: LAND TENURE OF INDICATIVE NATIONAL ESTATE MIGRATORY SPECIES**

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Tenure	Approximate Area (ha)	Proportion of Total (%)
National Park, PMP 1.3 or Nature Reserve	46,791	21%
State Forest	45,782	20%
Private Land	Not Available	Not Available
Leasehold Crown Land	Not Available	Not Available
Other Crown Land	Not Available	Not Available

\*PMP 1.3 is the State Forests of NSW Preferred Management Priority Classification for areas reserved as Flora Reserves and Forest Preserves (Forestry Commission of NSW 1993)

## 4.7 Important habitat

Important fauna habitat is generally regarded as values such as important feeding, breeding or nursery sites or known breeding sites for rare or uncommon fauna. In Lower North-East, important habitat was used to define a number of environments that experts felt were of national estate significance or else that were identified for a wide range of species values. The Macleay River gorges, the forested parts of the Hunter valley, the bat foraging habitat around the major maternity roosts at Willi Willi and the Carrai plateau and the escarpment of the great dividing range were regarded as potentially significant. The Macleay river gorges, the Hunter valley and the great escarpment are major, long term corridors in the landscape, a view supported by Heatwole's (1987) discussion on significant corridors and barriers in the landscape. Heatwole (1987) listed the evidence to suggested that the great dividing range has, over geological history, acted as a corridor for mesic-adapted species along the east coast, and as a significant barrier to the radiation of xeric-adapted species during drier periods from inland Australia. Worboys (1996) also identified the great escarpment as a major, continental-scale conservation feature. The Macleay and the Hunter valleys, however, represent some of the few corridors for xeric inland species to radiate onto the east coast during favourable climatic periods. Horton (1984) also identified south-eastern Queensland and northern NSW as a significant focus for bird speciation in Australia by acting as a major refuge.

The value is important for rare, vulnerable or endangered species, Australia's evolutionary history, demonstrating the principle characteristics of forested landscapes and ecosystems and is related to maintaining existing processes (Sub-criterion A1, A2, B1 and D1).

### 4.7.1 Method

Expert opinion was used to identify environmental features that constituted important habitat, and to nominate areas known to be important. A map of the nominated environmental features meeting the expert opinion was generated and validated against areas identified as important habitat. The layer consists of the following:

- all rainforest under 300 m above sea level.
- forested areas of the great escarpment and around Carrai and Willi Willi (between 300 and 900 m ASL, using biophysical naturalness 2, 3, 4 and 5 to delineate approximate areas of woody vegetation).
- areas with concentrations of winter flowering eucalypts (taken to be eucalypts with more than 50% of their flowering between June and September on average) based on a forest ecosystem analysis and area/richness across a 100m grid.

### 4.7.2 Establishing the threshold

The layer was cut to remove areas that have been cleared or substantially modified using biophysical naturalness values 0 and 1. A 100 ha minimum size was applied to all identified areas with the exception of rainforest, for which there was no minimum size threshold applied because of the importance of lowland remnants.

### 4.7.3 Results

The areas identified as having indicative national estate significance for important habitat is delineated on Map 14. The areas delineated in this layer are those environments nominated by experts for an array of values relating to important habitat including migratory species, evolutionary processes in the landscape and the diversity of small mammals. Areas shown were delineated using the best information available to the lower north east comprehensive regional assessment. All areas identified are significant with regard to Australia's evolutionary history, existing natural systems, principle characteristics of forested landscapes and rare or uncommon species and are above the threshold warranted for national estate listing.

The areas delineated for important habitat describe a broad band of forested landscapes from the Dorrigo Plateau southwards around the catchment of the Macleay, Hastings and Manning Rivers to Barrington Tops. The layer is broken by the intrusion of the cleared landscape of the Hunter Valley and commences again in Wollemi and Yengo National Parks. Coastal areas delineated include the Watagans, the Wallaroo group of State Forests, Myall River State Forest, Myall Lakes National Park, the Kendall group of State Forests, Yesabah State Forest and Ingalba State Forest. These coastal areas were generally above threshold for concentrations of winter flowering species, maternity roost foraging habitat for bats or significance as habitat for small mammals. The areas identified as above threshold generally reflect the significance of the coastal plain as a whole for migratory or nomadic nectivorous species.

1,626,000 ha were identified as above threshold for important habitat. 34% of this was on existing reserves and 30% in state forest. (Table 14). Areas already listed on the Register of the National Estate that were identified in this study as having values for important habitat species tended to be those occurring along the great escarpment.

**TABLE 14: LAND TENURE OF INDICATIVE NATIONAL ESTATE IMPORTANT HABITAT**

Tenure	Approximate Area (ha)	Proportion of Total (%)
National Park, PMP 1.3 or Nature Reserve	556874	34%
State Forest	481,753	30%
Private Land	Not Available	Not Available
Leasehold Crown Land	Not Available	Not Available
Other Crown Land	Not Available	Not Available

\*PMP 1.3 is the State Forests of NSW Preferred Management Priority Classification for areas reserved as Flora Reserves and Forest Preserves (Forestry Commission of NSW 1993)

### 4.8 Remnant vegetation and rare old-growth forest

Remnant vegetation provides important refuge and recruitment areas for both flora and fauna, and is important in maintaining existing natural systems within disturbed landscapes. Large-scale clearing for agriculture on the coastal plain and west of the Great Dividing Range has removed native vegetation from extensive areas of the region. Much of the remaining forest is fragmented and significant proportions have a long history of commercial forestry operations.

Rare old-growth forest was assessed together with remnant vegetation as many of the conservation issues are closely related. Rare old-growth forest are those old-growth forest communities that are rare or uncommon nationally or within the lower north east region. They also include common forest communities where the levels of disturbance are such that all remaining old-growth forest areas are potentially of national estate significance. Rare, endangered or uncommon old-growth forest communities were identified in lower north east as being vegetation communities where old-growth forest as a proportion of the forest community is generally less than 20 per cent (derived from the JANIS criteria and expert advice).

Remnant vegetation is important for demonstrating the principle characteristics of forested landscapes and ecosystems, rare or uncommon species and is related to maintaining existing processes (Sub-criterion A2, B1 and D1).

#### **4.8.1 Method**

Remnant vegetation and rare old-growth forest was derived using the following:

- Forest ecosystems whose extant coverage was 10% or less of the estimated pre-1750 area based on data presented by NSW NPWS to the environment heritage and technical committee (EHTC); and
- Forest ecosystems intersected with biophysical naturalness 4 and 5. Forest ecosystems that had less than 20% of their area covered by undisturbed forest compared with their pre-1750 area were regarded as rare old-growth forest. The forest ecosystems used were those listed in the forest ecosystem table presented as the final data-set at EHTC.

#### **4.8.2 Establishing the threshold**

Areas that met the above criteria were identified as above threshold.

#### **4.8.3 Results**

The areas identified as having indicative national estate significance for remnant vegetation and rare old-growth forest are delineated on Map 15. The areas delineated in this layer are those identified as significant with regard to existing natural systems, principle characteristics of forested landscapes and rare or uncommon species and are above the threshold warranted for national estate listing.

Remnant vegetation occurs as scattered small units across most of the region, with the greatest concentrations in undisturbed areas along the escarpment and in the coastal national parks and nature reserves. Particularly significant areas included Barrington Tops, Bulga and Doyles River State Forests, Werrikimbee National Park and the edge of the Dorrigo plateau.

296,426 ha were identified as above threshold for remnant vegetation and rare old-growth forest. 45% of this was on existing reserves and 40% in state forest. (Table 15). The major landscapes in the layer included all of the significant sites already nominated on the Register of the National Estate north of the Hunter River.

**TABLE 15: LAND TENURE OF INDICATIVE NATIONAL ESTATE REMNANT VEGETATION AND RARE OLD-GROWTH FOREST**

Tenure	Approximate Area (ha)	Proportion of Total (%)
National Park, PMP 1.3 or Nature Reserve	133,665	45%
State Forest	117,704	40%
Private Land	Not Available	Not Available
Leasehold Crown Land	Not Available	Not Available
Other Crown Land	Not Available	Not Available

\*PMP 1.3 is the State Forests of NSW Preferred Management Priority Classification for areas reserved as Flora Reserves and Forest Preserves (Forestry Commission of NSW 1993)

#### 4.9 Vegetation succession

Places that are important for vegetation succession are forest communities that have dynamic examples of succession occurring within them, areas affected by fire (halting primary succession processes), and forest communities recovering from major wildfires. Although it was recognised that specific examples may exist in the region, time and data constraints precluded any specific analysis of vegetation succession for lower north east.

#### ***Sub-Criterion A.3: Importance in exhibiting unusual richness or diversity of flora***

The identification of areas of indicative national estate significance under this sub-criterion involves assessment of places important for diversity and or richness of natural values. The national estate assessment of this value sought to identify areas of particular richness and diversity in the region for:

- species richness (alpha diversity);
- flora community (beta) diversity;
- habitat richness.

#### 4.10 Flora and fauna species richness

Flora and fauna species richness, also known as alpha diversity, is measured as the number of species occurring within an area of a given size. Upper North-Eastern NSW comprises an area of diverse habitats from sub-alpine environments to coastal complexes and sub-tropical rainforest and the region has been widely recognised as an area important for biodiversity. Areas of high species richness can be indicative of sites where repeated species radiation and contraction has occurred, identifying centres for refugia and major long-term evolutionary centres for speciation (Heatwole 1987, Pianka (1981), Kitching 1981, Cogger and Heatwole, 1981, 1984). Species richness is considered under sub-criterion A3 for exhibiting unusual richness or diversity of fauna or flora.

#### **4.10.1 Method**

The fauna layer was derived using fauna point data provided by the NPWS wildlife atlas and CRA survey work. 655 species were included in the analysis, excluding introduced species only. The flora layer was derived using flora point data provided by the NPWS derived from atlas, literature review and CRA survey. 1713 species were used in analysis.

Point location information for all identified species was plotted respectively for flora and fauna on a one kilometre square grid. An analysis was done which then searched for all records within a two kilometre radius around each grid cell. The resultant analysis showed concentrations of species richness for fauna and flora respectively, across the landscape.

This layer was validated by comparing the areas depicted in the layer with areas that experts identified as being important for species richness.

#### **4.10.2 Establishing the threshold**

The above information was displayed as standard deviations above the mean number of species in the landscape. Two standard deviations above the mean number of species for both flora and fauna was taken to be above threshold.

#### **4.10.3 Results**

The areas identified as having indicative national estate significance for species richness are delineated on Map 16 for fauna and Map 17 for flora. The areas delineated in this layer are areas with high concentrations of species in the landscape, delineated using the best information available to the lower north east comprehensive regional assessment. All areas identified are significant with regard to exhibiting unusual richness or diversity of fauna or flora and are above the threshold warranted for national estate listing.

Areas that were delineated for species richness were broadly similar for fauna and flora. The delineated areas identified a number of core hot-spots in the landscape. These were: the rim of the Dorrigo plateau, the Carrai plateau, Werrikimbee National Park and Mount Boss State Forest, Doyles River, Bulga and Dingo Tops State Forests, Barrington Tops, Lake Innes Nature Reserve, Crowdy Bay and Booti Booti National Parks, Tomaree National Park and the Watagans - Ourimbah forest area including Brisbane Waters National Park.

381,100 ha were identified as above threshold for fauna species richness. 23% of this was on existing reserves and 38% in state forest. 360,000 ha were identified above threshold for flora species richness. 30% of this was on existing reserves and 43% in State Forest (Table 16). Places already listed on the Register of the National Estate were strongly associated with the areas delineated as having values associated with species richness.

**TABLE 16: LAND TENURE OF INDICATIVE NATIONAL ESTATE SPECIES RICHNESS**

Tenure	Approximate Area (ha)	Proportion of Total (%)
National Park, PMP 1.3 or Nature Reserve		
For Fauna	85,900	23%
For Flora	107,00	30%
State Forest		
For Fauna	144,200	38%
For Flora	154,100	43%
Private Land	Not Available	Not Available
Leasehold Crown Land	Not Available	Not Available
Other Crown Land	Not Available	Not Available

\*PMP 1.3 is the State Forests of NSW Preferred Management Priority Classification for areas reserved as Flora Reserves and Forest Preserves (Forestry Commission of NSW 1993)

#### **4.11 Vegetation community richness**

Significant plant community richness, or high beta diversity, is often seen in places where, because of sharp environmental gradients or marked changes in soils, drainage or other variables, there are unusually diverse conjunctions or rapid transitions of forest community types. In North-Eastern NSW these environments are typified by the elevation gradient of the great escarpment and associated river gorges, where vegetation communities vary over a comparatively small distance. This value is important for sub-criterion A3, exhibiting unusual richness or diversity of flora.

##### **4.11.1 Method**

The CRA forest ecosystem map was used to assess and identify areas above threshold. A 100m grid was laid across the whole of lower north-eastern NSW and then the number of forest ecosystems within a radius of two kilometres of each grid cell was calculated. This produced a map of the richness of forest ecosystems across the landscape.

##### **4.11.2 Establishing the threshold**

Areas were regarded as being above threshold for vegetation community richness where the number of forest ecosystems in a 100m cell were more than 2 standard deviations above the mean number of forest ecosystems in any cell.



### 4.11.3 Results

The areas identified as having indicative national estate significance for vegetation community richness are delineated on Map 18. The areas delineated in this layer are areas with high concentrations of vegetation communities in the landscape, delineated using the best information available to the lower north east comprehensive regional assessment. All areas identified are significant with regard to exhibiting unusual richness or diversity of flora and are above the threshold warranted for national estate listing.

The areas delineated as above threshold for vegetation community richness are strongly associated with the escarpment of the northern part of the Great Dividing Range from the Manning valley north and associated river gorges where the greatest altitudinal range exists.

277,868 ha were identified as above threshold for vegetation community richness. 32% of this was on existing reserves and 12% in state forest. (Table 17). Dorrig National Park, Oxley Wild Rivers National Park, and Woko National Park are indicative of the places identified in the current work that are places already listed in the Register of the National Estate.

**TABLE 17: LAND TENURE OF INDICATIVE NATIONAL ESTATE VEGETATION COMMUNITY RICHNESS**

Tenure	Approximate Area (ha)	Proportion of Total (%)
National Park, PMP 1.3 or Nature Reserve	89,751	12%
State Forest	32,219	32%
Private Land	Not Available	Not Available
Leasehold Crown Land	Not Available	Not Available
Other Crown Land	Not Available	Not Available

\*PMP 1.3 is the State Forests of NSW Preferred Management Priority Classification for areas reserved as Flora Reserves and Forest Preserves (Forestry Commission of NSW 1993)

### 4.12 Habitat richness

Habitat richness has been defined as areas where, because of environmental gradients, there is an unusual increase in the variety of habitats available. This was taken to involve an interaction between vegetation community richness, fauna species richness and flora species richness and is important as an indicator for areas of potential high biodiversity (Sub-criterion A3).

#### 4.12.1 Method

Habitat richness is a grid coverage derived by adding the areas identified as above threshold for flora and fauna species richness together into a single layer. This combined layer was then combined with the vegetation community richness layer. The areas identified as possessing either a combination of flora and fauna richness or vegetation community richness were regarded as having habitat richness.

#### 4.12.2 Establishing the threshold

Areas that met the above criteria were regarded as being above threshold.

### 4.12.3 Results

The areas identified as having indicative national estate significance for habitat richness are delineated on Map 19. The areas delineated in this layer are areas with high concentrations of potential habitat richness in the landscape, delineated using the best information available to the lower north east comprehensive regional assessment. All areas identified are significant with regard to exhibiting unusual richness or diversity of fauna, flora or vegetation community richness and are above the threshold warranted for national estate listing.

Areas delineated as above threshold were concentrated on along the escarpment and adjacent ranges in a series of units from the Macleay gorges to Barrington Tops. Coastal pockets included Crowdy Bay National Park, Booti Booti National Park and Tomaree National Park

426,300 ha were identified as above threshold for habitat richness. 32% of this was on existing reserves and 20% in state forest. (Table 17). The area delineated included areas of existing National Estate, the major areas being Oxley Wild Rivers National Park, Werrikimbee National Park, Crowdy Bay National Park and Woko National Park.

**TABLE 17: LAND TENURE OF INDICATIVE NATIONAL ESTATE HABITAT RICHNESS**

Tenure	Approximate Area (ha)	Proportion of Total (%)
National Park, PMP 1.3 or Nature Reserve	135,138	32%
State Forest	85,451	20%
Private Land	Not Available	Not Available
Leasehold Crown Land	Not Available	Not Available
Other Crown Land	Not Available	Not Available

\*PMP 1.3 is the State Forests of NSW Preferred Management Priority Classification for areas reserved as Flora Reserves and Forest Preserves (Forestry Commission of NSW 1993)

***Sub-Criterion B1: Importance for rare, endangered or uncommon flora, fauna, communities, ecosystems, natural landscapes or phenomena, or as a wilderness***

This sub-criterion recognises the importance of biotic elements which are rare or uncommon, or have become so through the effects of disturbances or threatening processes. The following values relate to this sub-criterion:

- rare old-growth forest;
- rare and threatened flora and fauna species, and
- rare, threatened or uncommon plant communities.

#### **4.13 Rare old-growth forest**

Rare old-growth forest has been dealt with as part of the remnant vegetation layer (see section on sub-criterion A2).

#### **4.14 Rare, threatened or uncommon flora and fauna species and their habitats**

For the purposes of this layer, rare species were regarded as species listed on state or commonwealth legislation as rare, vulnerable or endangered. This layer identifies areas of importance to rare, endangered or uncommon species and which are of significance in maintaining existing processes. (Sub-criterion B1, A2)

##### **4.14.1 Method**

The rare species layers for fauna and flora respectively was produced from two separate analysis:

- All Commonwealth and state listed species were used in a neighbourhood analysis. This produces a grid coverage where each 1 kilometre grid cell is given a value equating to the total number of species recorded within a 2 kilometre radius of the cell. The resulting 1 kilometre grid provides a map of the concentration of rare species across the landscape.
- The point localities of Commonwealth and state listed endangered species were intersected with forest ecosystem polygons within 500m of their point location.

The two layers were merged and the final data set was intersected with biophysical naturalness value 0 and 1 to remove values in cleared and extensively modified landscapes. The final layer was validated against areas suggested by experts, a selection of species locality points and the results of modelling conducted by NSW NPWS.

##### **4.14.2 Establishing the threshold**

One kilometre grid cells with a total number of species greater than or equal to 2 standard deviation above the mean number of species were regarded as above threshold. All point localities of endangered species in a forested or uncleared natural locality were regarded as above threshold.

##### **4.14.3 Results**

The areas identified as having indicative national estate significance for rare species are delineated on Map 20 for fauna and Map 21 for flora. This layer delineates areas that are important for endangered species and areas with concentrations of rare and uncommon species. The layer uses the best information available to the lower north east comprehensive regional assessment. All areas identified are significant with regard to importance for rare, endangered or uncommon species and maintaining existing natural processes.

The layers for fauna and flora delineated similar (but not identical) areas in the landscape as being above threshold. Flora and fauna values were identified along the edge of the Dorriggo plateau and fauna values

were identified in the Macleay catchment, Carrai Plateau and Werrikimbee National Park. Rare fauna values were concentrated in Doyles River, Dingo Tops, and Bulga State Forests and flora and fauna values were concentrated in the Barrington Tops. Rare fauna were found to be concentrated in a number of locations on the coastal plains including Ingalba State Forest, Limeburners Creek Nature Reserve, Coopernook State Forest, Craven, Myall River and Wang Wauk State Forests and Putty State Forests.

421,000 ha were identified as above threshold for rare fauna. 29% of this was on existing reserves and 49% in state forest. 37,400 ha were identified above threshold for rare flora. 59% of this was on existing reserves and 19% in State Forest. (Table 18). The analysis identified most significant existing places on the Register of the National Estate as having values associated with this criterion.

**TABLE 18: LAND TENURE OF INDICATIVE NATIONAL ESTATE RARE SPECIES**

Tenure	Approximate Area (ha)	Proportion of Total (%)
National Park, PMP 1.3 or Nature Reserve		
For Fauna	123,798	29%
For Flora	22,002	59%
State Forest		
For Fauna	204,760	49%
For Flora	7,037	19%
Private Land	Not Available	Not Available
Leasehold Crown Land	Not Available	Not Available
Other Crown Land	Not Available	Not Available

\*PMP 1.3 is the State Forests of NSW Preferred Management Priority Classification for areas reserved as Flora Reserves and Forest Preserves (Forestry Commission of NSW 1993)

#### 4.15 Rare, threatened or uncommon vegetation communities

In the lower north east comprehensive regional assessment 'forest ecosystems', 'plant communities' and 'forest vegetation types' are all considered to refer to the same vegetation units and are used interchangeably. Rare vegetation communities are important for demonstrating the principle characteristics of forested landscapes and ecosystems, and endangered, rare or uncommon species and is related to maintaining existing processes (Sub-criterion A2, B1 and D1).

##### 4.15.1 Method

The expert workshop that considered the results of the forest ecosystem project identified that all vegetation communities that required a 100% target under JANIS were above threshold for national estate. The distribution of these communities was mapped from the forest ecosystem layer. All occurrences of these ecosystems were regarded as above threshold.

##### 4.16.2 Establishing the threshold

Thresholds were established as discussed above.

### 4.16.3 Results

The areas identified as having indicative national estate significance for rare vegetation communities are delineated on Map 22. The areas delineated in this layer are rare vegetation communities, identified using the best information available to the lower north east comprehensive regional assessment. All areas identified are significant with regard to endangered, rare or uncommon species, demonstrating the principle characteristics of some extremely uncommon vegetation communities and maintaining existing processes. These areas are above the threshold warranted for national estate listing.

The areas above threshold for rare vegetation communities are broadly distributed across the landscape of lower north-eastern NSW, with the strongest concentration along the escarpment and adjacent coastal ranges. Major focal points include the edge of the Dorrigo plateau and Macleay gorges, Carrai Plateau, Werrikimbee National Park, Doyles River and Bulga State Forests, Woko National Park and Barrington Tops.

281,916 ha were identified as above threshold for rare vegetation communities. 43% of this was on existing reserves and 42% in state forest. (Table 19). The areas identified as above threshold correlated strongly with places registered on the Register of the National Estate along the escarpment to Barrington Tops.

**TABLE 19: LAND TENURE OF INDICATIVE NATIONAL ESTATE RARE VEGETATION COMMUNITIES**

Tenure	Approximate Area (ha)	Proportion of Total (%)
National Park, PMP 1.3 or Nature Reserve	120,063	43%
State Forest	119,237	42%
Private Land	Not Available	Not Available
Leasehold Crown Land	Not Available	Not Available
Other Crown Land	Not Available	Not Available

\*PMP 1.3 is the State Forests of NSW Preferred Management Priority Classification for areas reserved as Flora Reserves and Forest Preserves (Forestry Commission of NSW 1993)

***Sub-Criterion D.1: Importance in demonstrating the principal characteristics of the range of landscapes, environments or ecosystems, the attributes of which identify them as being characteristic of their class.***

This sub-criterion recognises the significance of identifying and conserving ‘representative examples’ of the range of features of the Australian environment. The following value was assessed under this sub-criterion.

- flora communities characteristic of their class.

#### **4.16 Principal characteristics of class**

Principle characteristics of class recognises the significance of identifying and conserving “representative examples” of the range of landscapes, environments or ecosystems. Although some vegetation communities were considered and it was recognised that representative examples may exist in the region, time and data constraints precluded any comprehensive analysis of principle characteristic of class for environments or ecosystems. It should be noted that the work conducted for refugia, migratory species, remnant vegetation, rare vegetation communities, and important habitat identified particular landscape features such as wetlands or rainforest and broader features such as forested landscapes along the great escarpment that should be regarded as some of the best examples in temperate Australia and that the sub-sections dealing with these values have been noted as dealing with D1.

## **5. OTHER NATURAL VALUES**

### **5.1 Geological and geomorphological and soil values**

The identification and assessment of sites of indicative national estate geoheritage significance in the lower north east comprehensive regional assessment forest region was undertaken as part of a state-wide assessment by Osborne et al (1998).

Areas that may be identified as having geoheritage value (National Estate Criteria A.1, A.2, A.3, B.1, C.1 and D.1) include places important:

- in the evolution of Australian landscapes or climate (A.1);
- in maintaining existing processes or natural systems at the regional or national scale (A.2);
- in exhibiting unusual richness or diversity of landscapes (A.3);
- for rare, endangered or uncommon natural landscapes or phenomena (B.1);
- for information contributing to a wider understanding of Australian natural history by virtue of its use as a research site, teaching site, type locality, reference or benchmark site (C.1);
- in demonstrating the principal characteristics of the range of landscapes, environments or ecosystems, the attributes of which identify them as being characteristic of their class (D.1).

#### **5.1.1 Method**

The methodology being undertaken for the project includes:

- the development and application of thresholds for national estate assessment purposes based on a review of the significance of the identified sites;
- documentation of potential national estate geoheritage sites;
- sensitivity analysis of all potential national estate geoheritage sites; and
- development of conservation management guidelines for those sites identified

The consultant assessed scientific journals and other published material for place-related information that was likely to identify potential places of geoheritage significance. Published geological maps and topographic maps were examined and potential features of geological significance identified. Other sources of data included contact with various institutions, and contact with numerous experts.

#### **5.1.2 Establishing the threshold**

Potential places were listed against the relevant national estate criteria identified in regional reviews undertaken by the consultant. Places were classified into three groups depending on the quality of data on values and location:-

- 1 - The values and location of the place can be determined from the available data.
- 2 - There is insufficient data available at this time to the values at the place.
- 3 - There is insufficient data available as to the location of the place.

The consultant has recommended that because of limitations in the data, including poorly defined locality information and a lack of ground truthing, that it would not be appropriate to threshold the sites. Accordingly, the data will be used as an informing-type layer which can be used to enhance documentation of national estate places identified from other assessments, and as a contextual layer for reserve design.

A lack of suitable data did not mean that these places lack significance or that with more detailed literature or field investigation, that their status could not be satisfactorily established in the future. However, it was not possible to undertake this further work within the constraints of the CRA assessments.

### **5.1.3 Results**

Of the sites where spatial information was available, 120 Geoheritage sites (unthresholded) were delineated for the lower north east CRA region, 35 occurring in National Parks, 12 in State Forests, 64 on private land, 7 on vacant crown land, and 2 on leasehold land (See Appendix H). There were some additional sites identified where spatial information was not available. The areas identified as a result of this process are yet to be delineated spatially.

The conservation management guidelines were limited to a ‘fragility’ ranking. A four step scale was applied to each place, where spatial information was available, corresponding to the extreme ends of the scale used by Dixon et al (1997) to classify sensitivity of sites identified, 1 being highly sensitive to 4 being highly robust for each place report.

## **5.2 Natural history values**

The identification and assessment of sites of indicative national estate natural history significance in the UNE comprehensive regional assessment forest region was undertaken as part of a state-wide assessment by Denny (1998).

Areas which may be identified as having natural history value (National Estate Criteria C.1) include places important ‘...*for information to contributing to the wider understanding of Australian natural history, by virtue of its use as a research site, teaching site, type locality, reference or benchmark site*’.

### **5.2.1 Method**

Data sources included literature searches of established journals, conference proceedings, contact with various institutions including natural history societies, and contact with numerous experts. The consultant assessed the national estate values of identified places against the national estate criteria by ranking the importance of each site, in terms of its contribution to Australian Natural History. The sites were ranked as having high, moderate or low value as a C1 site of national estate importance.



### 5.2.2 Establishing the threshold

Various factors were used to derive threshold values for each site type including such elements as the rigour of methodology, accuracy of location, the availability of information and overall reliability of the data sources used. By applying the elements described above, the consultant ranked each site as having high, moderate or low value as a C1 site of national estate importance. On this basis, it was recommended that rejected sites, ie those with a low ranking, were not included in the assessment.

### 5.2.3 Results

79 Natural History sites (unthresholded) were delineated for the lower north east CRA region, 24 occurring in National Parks, 10 in State Forests, 43 on private land, and 2 on vacant crown land. 52 of the 79 sites indicated above were identified as being above threshold (See Appendix I). The areas identified as a result of this process are yet to be delineated spatially.

## 6. PROTECTING NATURAL HERITAGE VALUES AND PLACES IN NSW FORESTS

The existing protective mechanisms for natural heritage values and places in NSW forests is summarised in a table at Appendix F. The table lists the existing off-reserve protective mechanisms and their sensitivity to disturbance.

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## 8. GLOSSARY

### **Aerial Photo Interpretation (API)**

the delineation and identification of landscape features using photos taken from the air that are viewed in pairs using a stereoscope to create a three-dimensional image.

### **Arboreal**

tree-dwelling

### **ARC/INFO**

software used to display and analyse spatially represented data.

### **assemblages**

collections of populations of different species that live in the same area.

### **biodiversity**

see biological diversity.

### **biogeography**

the interaction between the biotic (living), and a-biotic (non-living) elements of the world, including climate, topography, geology etc.

### **biological diversity**

the variety of all life forms: the different plants, animals and micro-organisms, the genes they contain, and the ecosystems they form. Biological diversity is usually considered at three levels: genetic diversity, species diversity, and ecosystem diversity. It is sometimes considered at the level of landscape diversity.

### **biophysical**

a combination of physical features, such as climate, soils, geology and landforms, and biological features, such as flora and fauna.

### **biophysical naturalness (BN)**

An indicator used in the national wilderness inventory related to the intensity and duration of interference with an ecosystems.

### **bioregion**

a region defined by a combination of biological, social and geographic criteria rather than geopolitical criteria; generally, a system of related, interconnected ecosystems.

### **bryophytes**

liverworts, mosses and hornworts: green, non-vascular land plants without seeds, numbering at least 18 000 species. They are among the simplest of the terrestrial plants but occupy a variety of habitats and show considerable diversity.

### **CAMBA**

China-Australia Migratory Bird Agreement

**comprehensive, adequate and representative reserve system**

a reserve system displaying the features of comprehensiveness, adequacy and representativeness.

comprehensiveness - the degree to which the full range of ecological communities and their biological diversity is incorporated in the reserve system.

adequacy - the reserve system's ability to maintain the ecological viability and integrity of populations, species and communities.

representativeness - the extent to which areas selected for inclusion in the reserve system are capable of reflecting the known biological diversity and ecological patterns and processes of the ecological community or ecosystem concerned.

**clear-felling**

a logging system that results in the felling of all standing trees.

**comprehensive regional assessment**

a joint Commonwealth–State assessment of all forest values - environmental, heritage, economic and social - leading to the establishment of a comprehensive, adequate and representative reserve system, agreements on forest management, and the signing of a regional forest agreement.

**conservation**

the protection, maintenance, management, sustainable use, restoration and enhancement of the natural environment.

**conservation advice and principles**

the Australian Heritage Commission has a statutory obligation to provide advice on the protection of the National Estate. The advice is based on conservation principles that are aimed at protecting and maintaining National estate places and values. Advice is available for land management agencies and individuals who own places that have been identified as having National estate value.

**context**

the position of a feature or area in the landscape relative to the rest of the landscape or topographic features, other vegetation or disturbance. For example, some values such as old-growth forest need to be considered in context; that is, in terms of their relationship to disturbance, other vegetation and the landscape in general.

**criteria**

used by the Australian Heritage Commission to determine whether places meet the requirements for listing on the Register of the National Estate. The criteria are stipulated in the Australian Heritage Commission Act 1975.

**disjunct**

populations physically separated from one another; that is, there is no or minimal gene flow between the populations. They are formed over time as a result of the appearance of a barrier in a formerly continuous distribution. Disjunct populations often have features that are distinctive in an evolutionary sense from those of the 'parent' population and in time may become separate species.

**disturbance**

encompasses a range of factors that affect the condition of natural areas. Disturbance may be natural or

human induced. Natural disturbance includes wildfires and rainstorms and is part of natural ecological processes. Human-induced, or 'unnatural', disturbance includes timber harvesting, agricultural clearing, mining and grazing. The factors that are important when considering disturbance are the origin, duration and intensity of the disturbance and its impact on the environment.

**disturbance data**

records of disturbances such as clearing, grazing, fire or timber harvesting that may affect themes, species or assemblages being assessed.

**diversity**

a measure of the physical or biological complexity of a system. It refers to a range of features, from artifact scatters to species presence.

**ecosystem**

a set of normally co-occurring and interacting species associated with a particular setting in the physical environment.

the aggregate of plants, animals and other organisms, and the non-living parts of the environment with which these organisms interact.

a dynamic complex of plant, animal, fungal, and micro-organism communities and the associated non-living environment interacting as an ecological unit.

**endemic species**

species confined to a specific region or locality.

**environmental gradient**

a description of the proximity of different environments. For example, a steep environmental gradient might describe the changes from coastal sands through heath to tall forest over a comparatively short distance.

**forest**

in the context of the New South Wales–Commonwealth Regional Forest Agreement, an area, incorporating all living and non-living components, that is dominated by trees having usually a single stem and a mature or potential mature stand height exceeding 8 metres and with existing or potential projective cover of overstorey strata about equal to or greater than 5 per cent.

**forest associations**

a method of classifying forest types based on associations of the dominant tree species in the canopy.

**forest community**

a vegetation classification that subdivides a forest type by either structure or understorey floristic composition.

**forest type**

a vegetation classification defined by the dominant overstorey species.

**genetic diversity**

the variety of genetic information contained in all individual plants, animals and micro-organisms. It occurs



within and between populations of species as well as between species.

**geoconservation**

the identification and protective management of geological, geomorphological and soil features, assemblages, systems and processes (geodiversity) for their intrinsic, ecological or heritage values.

**geodiversity**

the natural range (diversity) of geological (bedrock), geomorphological (landform) and soil features, assemblages, systems and processes. Geodiversity includes evidence for the history of the earth (evidence of past life, ecosystems and environments) and a range of processes (biological, hydrological and atmospheric) currently acting on rocks, landforms and soils.

**geographic information system (GIS)**

a system displaying spatially represented data; for example, Idrisi for Windows and ARC/INFO.

**geoheritage**

those components of geodiversity that are important to humans for purposes other than destructive exploitation; things we would wish to retain for present and future generations.

**geology**

the scientific study of the bedrock composition of the earth, including its origin, structure, composition, history, and past and present processes. Geological features contribute to geodiversity.

**geological characteristics**

features and structures associated with the formation of the earth's crust as well as major landform units such as mountains.

**geomorphology**

the scientific study of landforms - the surface morphology of bedrock substrates - and the past and present processes responsible for landform development. Geomorphological features contribute to geodiversity.

**Gondwanan**

refers to those characteristics or features relating to an ancient phase of the earth's development, when the land masses of the Southern Hemisphere were joined together. This agglomeration of the southern continents is termed Gondwana.

**great escarpment**

the eastern fall of the great dividing range which forms a more or less continuous series of ranges that divides the RFA region into eastern coastal areas and western ranges and associated tablelands.

**habitat**

the place or environment in which an organism naturally occurs.

**heritage**

encompasses all those things we have inherited from previous generations. Heritage includes places (including national estate places), things (moveable objects) and folklore (customs, songs and sayings).

**Interim Biogeographic Regionalisation of Australia (IBRA)**

a bioregional framework delineating natural regions in each State and Territory based on biophysical, environmental and vegetation considerations - for example, climate, soils, landform, vegetation, flora and fauna, and land use - that allow cross-border regionalisation.

**interim list**

the Australian Heritage Commission enters places on the interim National estate list by announcing, in the press and in the Commonwealth Government Gazette, its intention to register those places. Once a place is on the interim list, and before it can be entered on the Register of the National Estate, there is a minimum statutory period of three months during which any person can object to the proposal in writing. If objections are received they must be given due consideration by the Commission, but uppermost consideration must be given to the National estate significance of the place.

**isopleth**

a line drawn on a map connecting points having the same numerical value of a given variable, analogous to a contour line on a topographic map.

**JAMBA**

Japan-Australia Migratory Bird Agreement.

**JANIS**

The national agreed criteria for the establishment of a comprehensive, adequate and representative reserve system for forests in Australia, prepared by the joint ANZECC/MCFFA national forest policy statement implementation sub-committee.

**karst**

environments with distinctive landforms and drainage characteristics resulting from the relatively high solubility of some rock types, notably limestones and dolomites, in natural waters.

**lithology**

the general characteristics of rock formations, such as composition and texture, and the sequence in which the formations were laid down.

**macropod**

the group of marsupials including kangaroos and wallabies.

**maintenance**

the continuous protective care of the fabric, contents or setting of a place, as distinct from repair. Repair involves restoration or reconstruction.

**metadata**

information about the content, quality, condition and other characteristics of datasets.

**microclimate**

the suite of climatic variables (temperature, humidity etc) associated with a small part of an environment such as a river bank, the base of a tree or under a small stand of trees.

**national estate**

is a collection of places - components of the natural or cultural environment of Australia - that have

aesthetic, historic, scientific or social significance or other special value for future generations and for the present community.

**national estate values**

the aesthetic, historic, scientific or social values attributed to places by the Australian Heritage Commission.

**national forest policy statement**

The statement that outlines the jointly agreed Commonwealth and State objectives and policies for the future of Australia's public and private forests.

**old-growth forest**

the National Forest Policy Statement defined old-growth forest as 'forest that is ecologically mature and has been subjected to negligible unnatural disturbance such as logging, roading and clearing'. For the purposes of this assessment, the proposed operational interpretation from JANIS (1996) was used; that is, 'old-growth forest is ecologically mature forest where the effects of disturbances are now negligible'.

**paleoclimatic**

The climatic conditions (moist, dry, glacial, etc) considered to be associated with a defined area at any point in prehistory.

**phylogenetic**

referring to the evolutionary line of descent of an individual taxon or groups of taxa.

**Pleistocene**

a period (epoch) of geological history covering the period from approximately 1.6 million years before present up to 10, 000 years before the present day.

**primitiveness**

used taxonomically to describe species that have features associated with the evolutionary past of a group. For example, the salamander fish has features rarely found in fish of the southern hemisphere and is regarded as therefore being primitive.

**Quaternary**

a period of geological history covering the period from approximately 1.6 million years before present up to and including the present day.

**RAMSAR**

The convention on wetlands of international importance, commonly known as the RAMSAR convention.

**rare species**

species with small world populations that are not at present endangered or vulnerable but are at risk.

**recovery plan**

a comprehensive plan that details, schedules and costs all actions deemed necessary to support the recovery of a threatened species or ecological community.

**refugia, refuges**

biological communities or geographic entities that, because of their moderating structural characteristics or physical isolation, or both, provide a sanctuary to which species or groups of species have retreated or

have been confined in response to threatening processes, including climatic change.

**regional forest agreement**

an agreement, between the Commonwealth and a State or Territory government, for the long-term management and use of forests in a particular region. The purpose is to reduce uncertainty, duplication and fragmentation in government decision making by establishing a durable agreement on the management and use of forests.

**Register of the National Estate**

the national inventory of places of natural, historic and Aboriginal heritage significance that have been rigorously assessed by the Australian Heritage Commission and deemed worth conserving for present and future generations. The Register serves to notify all Australians, and particularly planners and decision makers, of places of National estate significance.

**relictual**

used to describe species associated with former ecosystems that have disappeared or have retracted to small pockets. For example, tingle forest contains a number of relictual species that appear to relictual species from Gondwanic rainforests.

**richness**

a measure of the abundance of individual elements within a particular place. For instance, the species richness of an ecological vegetation class is the number of species that occur within that class. The concept is closely related to diversity.

**riparian**

associated with river banks.

**scoping agreement**

an agreement, between the Commonwealth and a State or Territory government, that establishes the broad parameters for regional forest agreements.

**selective logging**

the logging of a selected portion of a stand of timber, usually according to pre-determined criteria relating to the intensity of the logging and the nature of the stand remaining after logging.

**speciation**

where a species evolves into a series of new species, normally in response to selection pressures such as changing environment.

**species**

a group of organisms capable of interbreeding freely with each other.

**species diversity**

refers to the variety of living species.

**succession**

the change in vegetation composition over time, one community ‘succeeding’ over the other. For example, wet forests in areas such as gullies that are protected from fire and other disturbance may eventually become rainforest. This occurs over a long period, in which rainforest species first colonize the understorey and, as the emergent eucalypts die out, rainforest species become the dominant species in the canopy.

**taxon (pl. taxa)**

the named classification unit to which individuals or species are assigned.

**terrestrial**

ground-dwelling.

**Tertiary**

a period (or era) of geological history from about 66 million years before present to 1.6 million years before present.

**threshold**

the level at which a value is considered acceptable for entry on the Register of the National Estate. Thresholds are developed through scientific assessment or expertise and an analysis of data within a regional context.

**type specimen (biological/geological)**

the original specimen from which a new species (biological or geological) is scientifically described. The type location is the place where the original type specimen was found.

**value**

refers to the particulars of a place that have worth, merit or significance.

**vascular plant**

a plant that possesses a vascular system, the conducting tissue that enables the transport of water, minerals and synthesized food materials throughout the plant and provides mechanical support.

**vulnerable species or ecosystems**

species or ecosystems that are approaching a reduction in range of 70 per cent or are subject to threatening processes that may cause their loss at the bioregional level.

**wet sclerophyll forest**

open eucalypt forest with tall trees and a relatively complex understorey of ferns, cycads and shrubs. Replaces dry sclerophyll forest in wetter areas with more fertile soils. Generally in areas with annual rainfall greater than 1000 millimeters.

**wilderness**

land that, together with its plant and animal communities, is in a state that has not been substantially modified by, and is remote from, the influences of European settlement or is capable of being restored to such a state, is of sufficient size to make its maintenance in such a state feasible, and is capable of providing opportunities for solitude and self-reliant recreation.

**wilderness quality**

a measure of differing levels of human impact on the natural environment, as part of a continuum of remote and natural conditions varying from pristine to urban. Wilderness quality is measured in terms of four variables: remoteness from settlement, remoteness from access, apparent naturalness, and biophysical naturalness.

**woodland**

a vegetation type dominated by woody vegetation having a mature or potential mature stand height exceeding 5 metres, with an overstorey canopy cover of less than 20 per cent.

## **APPENDIX A – AUSTRALIAN HERITAGE COMMISSION CRITERIA FOR THE REGISTER OF THE NATIONAL ESTATE**

Without limiting the generality of sub-section (1) of the *Australian Heritage Commission Act 1975*, a place that is a component of the natural or cultural environment of Australia is to be taken to be a place included in the national estate if it has significance or other special value for future generations as well as for the present community because of:

Criterion A: Its importance in the course, or pattern, of Australia's natural or cultural history.

A.1 Importance in the evolution of Australian flora, fauna, landscapes or climate.

A.2 Importance in maintaining existing processes or natural systems at the regional or national scale.

A.3 Importance in exhibiting unusual richness or diversity of flora, fauna, landscapes or cultural features.

A.4 Importance for association with events, developments or cultural phases which have had a significant role in the human occupation and evolution of the nation, State, region or community.

Criterion B: Its possession of uncommon, rare or endangered aspects of Australia's natural or cultural history.

B.1 Importance for rare, endangered or uncommon flora, fauna, communities, ecosystems, natural landscapes or phenomena, or as a wilderness.

B.2 Importance in demonstrating a distinctive way of life, custom, process, land-use, function or design no longer practised, in danger of being lost, or of exceptional interest.

Criterion C: Its potential to yield information that will contribute to an understanding of Australia's natural or cultural history.

C.1 Importance for information contributing to a wider understanding of Australian natural history, by virtue of its use as a research site, teaching site, type locality, reference or benchmark site.

C.2 Importance for information contributing to a wider understanding of the history of human occupation of Australia.

Criterion D: Its importance in demonstrating the principal characteristics of:

- (i) a class of Australia's natural or cultural places; or
- (ii) a class of Australia's natural or cultural environments.

D.1 Importance in demonstrating the principal characteristics of the range of landscapes, environments or ecosystems, the attributes of which identify them as being characteristic of their class.

D.2 Importance in demonstrating the principal characteristics of the range of human activities in the Australian environment (including way of life, custom, process, land-use, function, design or technique).

Criterion E: Its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group.

E.1 Importance for a community for aesthetic characteristics held in high esteem or otherwise valued by the community.

Criterion F: Its importance in demonstrating a high degree of creative or technical achievement at a particular period.

F.1 Importance for its technical, creative, design or artistic excellence, innovation or achievement.

Criterion G: Its strong or special associations with a particular community or cultural group for social, cultural or spiritual reasons.

G.1 Importance as a place highly valued by a community for reasons of religious, spiritual, symbolic, cultural, educational, or social associations.

Criterion H: Its special association with the life or works of a person, or group of persons, of importance in Australia's natural or cultural history.

H.1 Importance for close associations with individuals whose activities have been significant within the history of the nation, State or region.



# APPENDIX B – FAUNA AND FLORA LISTS USED IN NATIONAL ESTATE ASSESSMENTS -

Species	Disjunct Range	migratory	Endemic	Range Limit	Primitive Species	Relictual
Australian Brush-turkey				1	1	1
Australasian Grebe						
Oceanites oceanicus		1				
Puffinus pacificus		1				
Puffinus griseus		1				
Puffinus tenuirostris		1				
Puffinus carneipes		1				
Diomedea exulans		1				
Fregata minor		1				
Fregata ariel		1				
Sula leucogaster		1				
Sula sula		1				
Sula dactylatra		1				
Phaethon lepturus		1				
Chlidonias leucoptera		1				
Hydroprogne caspia		1				
Sterna bengalensis		1				
Sterna albifrons		1				
Sterna sumatrana		1				
Sterna anaethetus		1				
Anous stolidus		1				
Stercorarius parasiticus		1				
Arenaria interpres		1				
Pluvialis squatarola		1				
Pluvialis dominica		1				
Charadrius mongolus		1				
Charadrius leschenaultii		1				
Charadrius veredus		1				
Numenius madagascariensis		1				

Species	Disjunct Range	migratory	Endemic	Range Limit	Primitive Species	Relictual
Numenius phaeopus		1				
Numenius minutus		1				
Limosa limosa		1				
Limosa lapponica		1				
Tringa glareola		1				
Tringa incana		1				
Tringa hypoleucos		1				
Tringa nebularia		1				
Tringa stagnatilis		1				
Tringa terek		1				
Xenus cinereus		1				
Calidris ferruginea		1				
Calidris ruficollis		1				
Calidris acuminata		1				
Calidris canutus		1				
Calidris tenuirostris		1				
Calidris alba		1				
Limicola falcinellus		1				
Gallinago hardwickii		1				
Gallinago megala		1				
Rostratula benghalensis		1				
Glareola maldivarum		1				
Plegadis falcinellus		1				
Egretta alba		1				
Egretta sacra		1				
Anas querquedula		1				
Haliaeetus leucogaster		1				
Merops ornatus		1				
Hirundapus caudacutus		1				
Apus pacificus		1				
Cuculus saturatus		1				

Species	Disjunct Range	migratory	Endemic	Range Limit	Primitive Species	Relictual
Phylloscopus borealis		1				
Phalaropus fulicarius		1				
Charadrius dubius		1				
Gallinago stenura		1				
Calonectris leucomelas		1				
Motacilla alba		1				
Motacilla cinerea		1				
Motacilla citreola		1				
Motacilla flava		1				
Hirundo rustica		1				
Chlidonias niger		1				
Tryngites subruficollis		1				
Calidris alpina		1				
Calidris mauri		1				
Calidris bairdii		1				
Tringa totanus		1				
Numenius arquata		1				
Charadrius asiaticus		1				
Hydrophasianus chirurgus		1				
Grus antigone		1				
Crex crex		1				
Rallina fasciata		1				
Anas clypeata		1				
Ixobrychus sinensis		1				
Fregata andrewsi		1				
Oceanodroma leucorhoa		1				
Phalaropus lobatus		1				
Stercorarius longicauda		1				
Philomachus pugnax		1				
Limnodromus semipalmatus		1				
Stercorarius pomarinus		1				

Species	Disjunct Range	migratory	Endemic	Range Limit	Primitive Species	Relictual
<i>Sterna hirundo</i>		1				
<i>Calidris subminuta</i>		1				
<i>Pterodroma solandri</i>		1				
<i>Ardeola ibis</i>		1				
<i>Calidris melanotos</i>		1				
<i>Stercorarius maccormicki</i>		1				
<i>Antechinus flavipes</i>	1			1		
<i>Antechinus stuartii</i>						
<i>Antechinus swansonii</i>						
<i>Aepyprymnus rufescens</i>	1			1	1	1
<i>Charadrius hiaticula</i>		1				
<i>Anomalopus leuckartii</i>	1			1		
<i>Amphibolurus muricatus</i>	1					
<i>Amphibolurus nobbi</i>	1					
<i>Anomalopus verreauxii</i>	1			1		
<i>Austrelaps ramsayi</i>						
<i>Acanthophis antarcticus</i>						
<i>Adelotus brevis</i>	1			1		
<i>Assa darlingtoni</i>	1			1		1
<i>Acrocephalus arundinaceus</i>		1				
<i>Ninox boobook</i>						
<i>Ninox connivens</i>						
<i>Ninox strenua</i>						
<i>Tyto alba</i>						
Emu						
Little Pied Cormorant						
<i>Ornithorhynchus anatinus</i>					1	1
<i>Tachyglossus aculeatus</i>					1	
<i>Dasyurus maculatus</i>						
<i>Dasyurus viverrinus</i>						
Darter						

Species	Disjunct Range	migratory	Endemic	Range Limit	Primitive Species	Relictual
Phascogale tapoatafa	1					
Vespadelus darlingtoni						
Vespadelus troughtoni				1		
Planigale maculata				1		
Pseudocheirus peregrinus pulcher			1	1		
Australian Pelican						
Sminthopsis murina			1			
Isodon macrourus				1		
Perameles nasuta						
Brown Quail						
Trichosurus vulpecula						
Trichosurus caninus						
Petauroides volans						
Petaurus australis						
Petaurus norfolcensis						
Petaurus breviceps						
Feathertail Glider						
Cercartetus nanus						
Phascogale cinerea	1					
Vombatus ursinus	1			1		
Potorous tridactylus	1				1	1
King Quail						
Petrogale penicillata	1					
Thylogale stigmatica	1			1		
Thylogale thetis			1	1		
Wallabia bicolor					1	1
Macropus parma	1		1	1		
Macropus parryi				1		
Macropus dorsalis				1		
Macropus rufogriseus						
Macropus giganteus						

Species	Disjunct Range	migratory	Endemic	Range Limit	Primitive Species	Relictual
Macropus robustus						
Pteropus poliocephalus		1	1			
Pteropus scapulatus		1				
Pteropus alecto		1	1	1		
Nyctimene robinsoni			1	1		1
Syconycteris australis			1			1
Red-backed Button-quail				1		
Rhinolophus megaphyllus						
Saccolaimus flaviventris		1				
Nyctinomus australis						
Mormopterus planiceps						
Mormopterus norfolkensis						
Masked Lapwing						
Mormopterus beccarii						
Nyctophilus timoriensis				1		
Nyctophilus gouldi						
Nyctophilus geoffroyi						
Nyctophilus bifax				1		
Miniopterus schreibersii		1				
Miniopterus australis		1				
Chalinolobus gouldii						
Banded Lapwing						
Chalinolobus morio						
Chalinolobus dwyeri						
Chalinolobus nigrogriseus				1		
Myotis adversus						
Grey Plover		1				
Scotoeanax rueppellii						
Scotorepens greyii						
Scotorepens balstoni						
Scotorepens orion						

Species	Disjunct Range	migratory	Endemic	Range Limit	Primitive Species	Relictual
Kerivoula papuensis						1
Falsistrellus tasmaniensis						
Vespadelus pumilus			1	1		
Vespadelus regulus						
Vespadelus vulturinus						
Rattus fuscipes						
Rattus lutreolis				1		
Painted Button-quail						
Pale Field-rat						
Oriental Plover		1				
Water Rat						
Red-capped Plover						
Mastacomys fuscus						
Pseudomys novaeholliandae	1					
Pseudomys oralis	1		1	1		1
Pseudomys gracilicaudatus	1			1		
Melomys cervinipes	1			1		
Melomys burtoni				1		
Little Curlew	1	1				
Grey-tailed Tattler		1				
Marsh Sandpiper	1	1				
Pale-headed Rosella				1		
Latham's Snipe		1				
Black-breasted Button-quail				1		1
Painted Snipe	1	1				
Comb-crested Jacana	1			1		
Oriental Pratincole		1				
Bush Stone-curlew						
Beach Stone-curlew	1			1		
Brolga				1		
Glossy Ibis		1				

Species	Disjunct Range	migratory	Endemic	Range Limit	Primitive Species	Relictual
Australian White Ibis						
Little Button-quail						
Straw-necked Ibis						
Royal Spoonbill						
Yellow-billed Spoonbill		1				
Black-necked Stork				1		
Little Egret						
Intermediate Egret	1	1				
Great Egret		1				
White-faced Heron						
Pacific Heron		1				
Red-chested Button-quail						
Eastern Reef Egret		1				
Nankeen Night Heron						
Striated Heron	1					
Little Bittern	1					
Black Bittern						
Australasian Bittern	1			1		
Magpie Goose	1			1		
Chelodina longicollis						
Maned Duck						
Elseya latisternum				1		
Black Swan						
Calypotis ruficauda			1	1		
Emydura signata				1		
Wandering Whistling-Duck	1	1				
Plumed Whistling-Duck						
Australian Shelduck						
Diplodactylus vittatus						
Pacific Black Duck						
Rose-crowned Fruit-dove		1				



Species	Disjunct Range	migratory	Endemic	Range Limit	Primitive Species	Relictual
Chestnut Teal	1			1		
Grey Teal						
Oedura lesueurii	1					
Australasian Shoveler	1					
Oedura robusta				1		
Oedura tryoni	1			1		
Pink-eared Duck	1					
Underwoodisaurus milii						
Underwoodisaurus sphyrurus			1	1		
Freckled Duck	1					
Hardhead						
Blue-billed Duck	1	1				
Delma plebeia				1	1	
Musk Duck						
Lialis burtonis					1	
Pygopus lepidopodus					1	
Pogona barbata						
Spotted Harrier						
Tympanocryptis diemensis						
Swamp Harrier						
Grey Goshawk						
Brown Goshawk						
Eulamprus heatwolei	1			1		
Collared Sparrowhawk						
Diporiphora australis				1		
Red Goshawk				1		
Wedge-tailed Eagle						
Hypsilurus spinipes	1		1	1		1
Little Eagle						
Physignathus lesueurii						
Paradise Riflebird				1		1

Species	Disjunct Range	migratory	Endemic	Range Limit	Primitive Species	Relictual
White-bellied Sea-Eagle		1				
Brahminy Kite						
Varanus gouldii						
Whistling Kite						
Varanus varius						
Varanus rosenbergi	1			1		
Black Kite				1		
Coeranoscincus reticulatus			1	1		
Ophioscincus truncatus			1	1		
Superb Fruit-dove		1		1		
Square-tailed Kite						
Lygisaurus foliorum				1		
Black-breasted Buzzard				1		
Carlia tetradactyla						
Black-shouldered Kite						
Carlia vivax				1		
Channel-billed Cuckoo	1	1				
Cryptoblepharus carnabyi				1		
Letter-winged Kite						
Cryptoblepharus virgatus						
Pacific Baza				1		
Australian Hobby						
Grey Falcon						
Peregrine Falcon						
Ctenotus robustus						
Black Falcon				1		
Ctenotus taeniolatus						
Brown Falcon						
Australian Kestrel						
Egernia cunninghami				1		
Egernia frerei				1		

Species	Disjunct Range	migratory	Endemic	Range Limit	Primitive Species	Relictual
Egernia major				1		
Egernia modesta				1		
Egernia striolata				1		
Egernia whitii	1					
Hemiergis decresiensis				1		
Lampropholis amacula			1	1		
Saproscincus challengeri	1			1		1
Lampropholis delicata						
Lampropholis guichenoti						
Saproscincus mustelinus	1			1		
Lampropholis caligula			1	1		
Pseudemoia entrecasteauxii	1			1		
Bassiana platynota				1		
Cautula zia			1	1		
Ctenotus eurydice			1	1		
Lerista muelleri				1		
Wompoo Fruit-dove		1		1		
Tyto novaehollandiae						
Menetia greyii				1		
Morethia boulengeri				1		
Tyto tenebricosa						
Rainbow Lorikeet						
Saiphos equalis			1	1		
Eulamprus kosciuskoi	1		1	1		
Eulamprus murrayi			1	1		
Eulamprus quoyii						
Calypotis scutirostrum	1			1		
Eulamprus tenuis						
Scaly-breasted Lorikeet						
Cyclodomorphus casuarinae	1			1		
Hemisphaeriodon gerrardii	1			1		

Species	Disjunct Range	migratory	Endemic	Range Limit	Primitive Species	Relictual
Musk Lorikeet		1				
Tiliqua scincoides						
Trachydosaurus rugosus				1		
Ramphotyphlops nigrescens					1	
Little Lorikeet						
Ramphotyphlops proximus				1	1	
Ramphotyphlops wiedii				1	1	
Double-eyed Fig-parrot		1		1		
Morelia spilota						
Tropidonophis mairii				1		
Boiga irregularis						
Dendrelaphis punctulata						
Red-tailed Black-Cockatoo				1		
Cacophis harriettae				1		
Cacophis krefftii			1	1		
Cacophis squamulosus						
Glossy Black-Cockatoo						
Rhinoplocephalus nigrescens						
Demansia psammophis						
Drysdalia coronoides						
Furina diadema						
Yellow-tailed Black-Cockatoo						
Hemiaspis signata						
Hoplocephalus bitorquatus						
Hoplocephalus bungaroides						
Hoplocephalus stephensii			1	1		
Gang-gang Cockatoo				1		
Notechis scutatus				1		
Saltuarius swaini						
Sulphur-crested Cockatoo						
Pseudechis guttatus				1		

Species	Disjunct Range	migratory	Endemic	Range Limit	Primitive Species	Relictual
<i>Pseudechis porphyriacus</i>						
<i>Pseudonaja textilis</i>						
Topknot Pigeon	1	1				
Little Corella						
<i>Simoselaps australis</i>				1		
<i>Eulamprus martini</i>						
<i>Tropidechis carinatus</i>			1	1		
Galah						
<i>Vermicella annulata</i>						
Cockatiel						
<i>Saproscincus galli</i>			1	1		
<i>Saproscincus rosei</i>			1	1		
<i>Pelamis platurus</i>						
White-headed Pigeon	1	1				
Red-winged Parrot						
Australian King-Parrot						
<i>Liasis maculosus</i>				1	1	
Crimson Rosella						
Eastern Rosella						
Brown Cuckoo-Dove	1					
Mallee Ringneck						
Red-rumped Parrot						
<i>Egernia mcpheeii</i>				1		
<i>Aegotheles cristatus</i>						
<i>Litoria pearsoniana</i>				1		
<i>Mixophyes fleayi</i>	1			1		
Turquoise Parrot						
<i>Uperoleia fusca</i>				1		
<i>Litoria littlejohni</i>	1			1		
<i>Heleioporus australiacus</i>			1	1		
<i>Lechriodus fletcheri</i>	1		1	1	1	1

Species	Disjunct Range	migratory	Endemic	Range Limit	Primitive Species	Relictual
<i>Limnodynastes dumerilii</i>					1	
<i>Limnodynastes peronii</i>					1	
<i>Limnodynastes tasmaniensis</i>					1	
<i>Limnodynastes terraereginae</i>					1	
<i>Mixophyes balbus</i>	1			1		
<i>Mixophyes fasciolatus</i>						
<i>Mixophyes iteratus</i>	1			1		
<i>Neobatrachus sudelli</i>	1			1		
Swift Parrot		1				
<i>Paracrinia haswelli</i>	1			1		
<i>Phyloria kundagungan</i>	1		1	1	1	1
<i>Phyloria loveridgei</i>	1		1	1	1	1
<i>Phyloria sphagnicolus</i>			1		1	1
Ground Parrot						
<i>Limnodynastes ornatus</i>				1	1	1
<i>Pseudophryne australis</i>			1	1		
<i>Pseudophryne bibronii</i>						
<i>Pseudophryne coriacea</i>				1		
Tawny Frogmouth						
<i>Crinia parinsignifera</i>				1		
<i>Crinia signifera</i>						
<i>Crinia tinnula</i>	1			1		
<i>Podargus ocellatus</i>				1		
<i>Uperoleia laevigata</i>						
<i>Litoria aurea</i>	1					
<i>Litoria booroolongensis</i>	1					
<i>Litoria brevipalmata</i>	1		1	1		
<i>Litoria caerulea</i>						
<i>Litoria castanea</i>	1		1			
<i>Litoria chloris</i>				1		
Dollarbird		1				

Species	Disjunct Range	migratory	Endemic	Range Limit	Primitive Species	Relictual
Litoria dentata						
Litoria fallax						
Litoria freycineti						
Litoria subglandulosa			1	1		
Litoria gracilentia				1		
Azure Kingfisher						
Litoria jervisiensis	1			1		
Litoria latopalmata						
Litoria lesueuri						
Litoria nasuta				1		
Bar-shouldered Dove				1		
Litoria olongburensis	1			1		
Litoria peronii						
Litoria phyllochroa				1		
Litoria tyleri						
Litoria verreauxii				1		
Litoria piperata			1			
Litoria revelata	1			1		
Laughing Kookaburra						
Forest Kingfisher				1		
Red-backed Kingfisher		1		1		
Sacred Kingfisher						
Collared Kingfisher				1		
Rainbow Bee-eater		1				
Emerald Dove						
White-throated Nightjar						
White-rumped Swiftlet				1		
White-throated Needletail		1				
Fork-tailed Swift		1				
Oriental Cuckoo		1		1		
Pallid Cuckoo		1				

Species	Disjunct Range	migratory	Endemic	Range Limit	Primitive Species	Relictual
Fan-tailed Cuckoo		1				
Brush Cuckoo		1				
Common Bronzewing						
Black-eared Cuckoo		1		1		
Horsfield's Bronze-Cuckoo		1				
Shining Bronze-Cuckoo		1				
Little Bronze-Cuckoo	1	1		1		
Common Koel		1				
Pheasant Coucal				1		
Brush Bronzewing						
Superb Lyrebird				1	1	
Albert's Lyrebird			1		1	
Noisy Pitta	1			1		
Rufous Scrub-bird	1		1		1	1
Welcome Swallow		1				
White-backed Swallow						
Tree Martin		1				
Fairy Martin		1				
Grey Fantail						
Rufous Fantail						
Willie Wagtail						
Leaden Flycatcher		1				
Satin Flycatcher		1				
Restless Flycatcher		1				
Shining Flycatcher	1					
Black-faced Monarch		1				
Spectacled Monarch		1		1		
White-eared Monarch				1		
Jacky Winter						
Scarlet Robin						
Flame Robin				1		



Species	Disjunct Range	migratory	Endemic	Range Limit	Primitive Species	Relictual
Rose Robin						
Hooded Robin						
Eastern Yellow Robin						
Pale-yellow Robin	1		1	1		
Golden Whistler						
Rufous Whistler						
Olive Whistler (ssp macphersonianus)	1					
Grey Shrike-thrush						
Little Shrike-thrush	1			1		
Magpie Lark						
Crested Shrike-tit						
Crested Bellbird				1		
Eastern Whipbird						
Black-faced Cuckoo-shrike						
White-bellied Cuckoo-shrike						
Barred Cuckoo-shrike		1				
Cicadabird						
Crested Pigeon						
White-winged Triller						
Varied Triller						
Figbird						
Logrunner	1		1	1		
Spotted Quail-thrush						
Wonga Pigeon						
Grey-crowned Babbler						
Lewin's Rail	1					
White-throated Gerygone						
Brown Gerygone	1					
Olive-backed Oriole	1					
Large-billed Gerygone						
Buff-banded Rail	1					

Species	Disjunct Range	migratory	Endemic	Range Limit	Primitive Species	Relictual
Mangrove Gerygone				1		
Western Gerygone						
Weebill						
Southern Whiteface				1		
Striated Thornbill						
Yellow Thornbill						
Brown Thornbill						
Buff-rumped Thornbill						
Yellow-rumped Thornbill						
White-browed Scrubwren						
Australian Crake	1			1		
Yellow-throated Scrubwren						
Large-billed Scrubwren						
Chestnut-rumped Heathwren				1		
Baillon's Crake	1					
Speckled Warbler						
Brown Songlark						
Rufous Songlark						
Spotless Crake	1					
Eastern Bristlebird	1					1
Little Grassbird						
Tawny Grassbird						
Clamorous Reed Warbler				1		
Golden-headed Cisticola						
Southern Emu-wren						
Superb Fairy-wren						
Bush-hen	1			1		
Variegated Fairy-wren						
Red-backed Fairy-wren				1		
White-breasted Woodswallow		1				
Masked Woodswallow						

Species	Disjunct Range	migratory	Endemic	Range Limit	Primitive Species	Relictual
White-browed Woodswallow		1				
Dusky Woodswallow		1				
Varied Sittella						
Brown Treecreeper						
White-throated Treecreeper						
Dusky Moorhen						
Red-browed Treecreeper						
Mistletoebird						
Spotted Pardalote						
Silvereye						
White-naped Honeyeater						
White-throated Honeyeater				1		
Purple Swamphen						
Black-chinned Honeyeater				1		
Brown-headed Honeyeater						
Striped Honeyeater						
Scarlet Honeyeater						
Eurasian Coot	1					
Eastern Spinebill						
Tawny-crowned Honeyeater				1		
Brown Honeyeater				1		
Painted Honeyeater		1				
Great Crested Grebe						
Pied Oystercatcher						
Regent Honeyeater	1	1		1		
Lewin's Honeyeater						
Mangrove Honeyeater	1			1		
Fuscous Honeyeater						
Yellow-faced Honeyeater						
White-eared Honeyeater						
Yellow-tufted Honeyeater						

Species	Disjunct Range	migratory	Endemic	Range Limit	Primitive Species	Relictual
Hoary-headed Grebe						
White-plumed Honeyeater						
New Holland Honeyeater						
White-cheeked Honeyeater						
Bell Miner	1			1		
Noisy Miner						
Yellow-throated Miner						
Little Wattlebird						
Red Wattlebird						
Spiny-cheeked Honeyeater						
Blue-faced Honeyeater						
Noisy Friarbird		1				
Little Friarbird	1	1				
Richard's Pipit						
Singing Bushlark						
Diamond Firetail						
Zebra Finch						
Double-barred Finch						
Chestnut-breasted Mannikin	1					
Plum-headed Finch						
Red-browed Finch						
Black-throated Finch				1		
Ornithorhynchus anatinus					1	1
Spangled Drongo						
Green Catbird						
Satin Bowerbird						
Regent Bowerbird			1	1		
Little Crow						
Torresian Crow				1		
White-winged Chough						
Pied Currawong						

Species	Disjunct Range	migratory	Endemic	Range Limit	Primitive Species	Relictual
Pied Butcherbird						
Grey Butcherbird						
Australian Magpie						
Eastern Grass Owl	1					
Bassian Thrush	1			1		
Russet-tailed Thrush	1			1		
Pacific Golden Plover	1	1				
Forest Raven						
Ringed Plover		1				
Stubble Quail						
Philoria sp 1 (undescribed)	1		1	1	1	1
Philoria sp 2 (undescribed)	1		1	1	1	1
Philoria sp 3 (undescribed)	1		1	1	1	1
Mormopterus sp 1						
Scotorepens sp 1						
Elseya georgesi			1	1		
Elseya purvisi			1	1		
Emydura sp1			1	1		
Tympanocryptis lineata pinguicollis						
Elseya sp2 (Gwydir & Namoi Rivers)			1	1		
Emydura sp (Bellingen River)			1	1		
Australian Raven						
Ruff	1	1				
Little Raven						
Great Cormorant						
Little Black Cormorant						
Striated Pardalote						
Cattle Egret		1				
Pied Cormorant						
Black-fronted Plover						
Eulamprus tryoni			1	1		

Species	Disjunct Range	migratory	Endemic	Range Limit	Primitive Species	Relictual
Lampropholis elongata			1	1		
Litoria barringtonensis			1			
Litoria daviesi						
Saltuarius wyberba			1	1		
Saproscincus oriarus "North Coast sp"			1	1		

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Taxon	endemic	disjunct	range limit
<b>Abildgaardia vaginata</b>			1
<b>Acacia acrionastes</b>			
<b>Acacia adunca</b>			1
<b>Acacia amoena</b>			
<b>Acacia aulacocarpa var aulacocarpa</b>			1
<b>Acacia baeuerlenii</b>			1
<b>Acacia bakeri</b>			1
<b>Acacia barringtonensis</b>		1	1
<b>Acacia betchei</b>			1
<b>Acacia binervia</b>			1
<b>Acacia blakei</b>			1
<b>Acacia brownii</b>			1
<b>Acacia brunioides ssp brunioides</b>		1	1
<b>Acacia brunioides ssp granitica</b>		1	1
<b>Acacia bulgaensis</b>			
<b>Acacia burbridgeae</b>			
<b>Acacia bynoeana</b>			
<b>Acacia cangaiensis</b>	1		
<b>Acacia cheelii</b>			1
<b>Acacia chrysotricha</b>	1		
<b>Acacia cognata</b>			1
<b>Acacia complanata</b>			1
<b>Acacia courtii</b>	1		
<b>Acacia cultriformis</b>			
<b>Acacia dangarensis</b>			
<b>Acacia dawsonii</b>		1	
<b>Acacia dealbata</b>			1
<b>Acacia decora</b>			
<b>Acacia decurrens</b>			1
<b>Acacia diphylla</b>			1

Acacia eborensis ms.			1
Taxon	endemic	disjunct	range limit
Acacia echinula			1
Acacia elata			1
Acacia elongata			1
Acacia farnesiana			
Acacia flocktoniae			
Acacia floydii			1
Acacia fulva			
Acacia granitica		1	1
Acacia hispidula		1	
Acacia ingramii			1
Acacia irrorata ssp velutinella	1		
Acacia ixiophylla			
Acacia jonesii			
Acacia juncifolia ssp serpentinicola	1		
Acacia lanigera			1
Acacia latisepala			
Acacia leucoclada ssp argentifolia			
Acacia linearifolia			
Acacia longifolia			1
Acacia macnuttiana			
Acacia matthewii			
Acacia mitchellii		1	1
Acacia montana		1	
Acacia orites (Demon NR metapopulation unit)			1
Acacia orites (northeast metapopulation unit)			
Acacia parramattensis			1
Acacia parvipinnula			1
Acacia pendula			
Acacia podalyriifolia			1
Acacia pruinosa			1
Acacia pubescens			
Acacia pubifolia			
Acacia pycnostachya			
Acacia ruppii	1		
Acacia schinoides			1
Acacia siculiformis		1	1
Acacia tessellata	1		
Acacia torringtonensis			
Acacia viscidula		1	
Acacia williamsiana J. T. Hunter ms.			

<b>Acaena agnipila</b>			
<b>Taxon</b>	<b>endemic</b>	<b>disjunct</b>	<b>range limit</b>
<b>Acalypha capillipes</b>			1
<b>Acalypha eremorum</b>			1
<b>Acianthus amplexicaulis</b>		1	
<b>Acianthus apprimus</b>			1
<b>Acianthus caudatus</b>			1
<b>Acianthus exiguus</b>		1	
<b>Acmena hemilampira</b>			1
<b>Acmena ingens</b>			1
<b>Acomis acoma</b>			
<b>Acradenia euodiiformis</b>			1
<b>Acronychia baeuerlenii</b>			1
<b>Acronychia imperforata</b>			1
<b>Acronychia laevis</b>			1
<b>Acronychia littoralis</b>			1
<b>Acronychia octandra</b>			1
<b>Acronychia pauciflora</b>			1
<b>Acronychia pubescens</b>			1
<b>Acronychia suberosa</b>			1
<b>Acrostichum speciosum</b>			1
<b>Acrotriche serrulata</b>			1
<b>Actinotus gibbonsii</b>			
<b>Actinotus helianthi</b>			
<b>Adenochilus nortonii</b>			1
<b>Adenostemma lavenia</b>			
<b>Adiantum aethiopicum</b>			
<b>Adiantum diaphanum</b>			
<b>Adiantum formosum</b>			
<b>Adiantum hispidulum</b>			
<b>Adiantum silvaticum</b>			
<b>Adiantum silvaticum var glabrum</b>			
<b>Adiantum silvaticum var silvaticum</b>			
<b>Aegiceras corniculatum</b>			
<b>Aeschynomene indica</b>		1	
<b>Agrostis aemula</b>			
<b>Agrostis billardieri</b>			1
<b>Agrostis sp. A</b>			1
<b>Ailanthus triphysa</b>			1
<b>Akania bidwillii</b>			1
<b>Aldrovanda vesiculosa</b>			1
<b>Alectryon diversifolius</b>		1	1



<b>Alectryon forsythii</b>			1
<b>Taxon</b>	<b>endemic</b>	<b>disjunct</b>	<b>range limit</b>
<b>Alectryon subdentatus forma subdentatus</b>			1
<b>Alectryon tomentosus</b>			1
<b>Alexfloydia repens</b>	1		
<b>Alisma plantago-aquatica</b>			1
<b>Allocasuarina defungens</b>	1		
<b>Allocasuarina ophiolitica</b>			
<b>Allocasuarina rupicola</b>			1
<b>Allocasuarina simulans</b>			
<b>Alloteropsis semialata</b>			1
<b>Alloxylon pinnatum</b>		1	1
<b>Almaleea cambagei</b>			
<b>Almaleea paludosa</b>			1
<b>Alphitonia petriei</b>			1
<b>Alstonia constricta</b>			1
<b>Alternanthera nana</b>			
<b>Alternanthera sp. A</b>			
<b>Amorphospermum antilogum</b>			1
<b>Amorphospermum whitei</b>			
<b>Amphibromus pithogastrus</b>			
<b>Amphibromus sinuatus</b>		1	1
<b>Amphipogon strictus</b>			
<b>Amyema bifurcatum var bifurcatum</b>			1
<b>Amyema conspicuum</b>			1
<b>Amyema gaudichaudii</b>			
<b>Amyema quandang</b>			
<b>Amyema scandens</b>			
<b>Ancana stenopetala</b>			1
<b>Angiopteris evecta</b>			1
<b>Angophora costata</b>			1
<b>Angophora exul</b>			
<b>Angophora inopina</b>			
<b>Angophora paludosa</b>			1
<b>Angophora robur</b>			
<b>Angophora woodsiana</b>			1
<b>Anopterus macleayanus</b>			1
<b>Anthocarapa nitidula</b>			1
<b>Aotus lanigera</b>			1
<b>Aotus subglauca var filiformis</b>			
<b>Aotus subglauca var subglauca</b>			1
<b>Apatophyllum constablei</b>			

<i>Aphananthe philippinensis</i>			1
Taxon	endemic	disjunct	range limit
<i>Aponogeton elongatus</i>			1
<i>Archidendron hendersonii</i>			1
<i>Archidendron muellerianum</i>			1
<i>Archirhodomertus beckeri</i>			1
<i>Archontophoenix cunninghamiana</i>			
<i>Ardisia bakeri</i>			1
<i>Argophyllum nullumense</i>			1
<i>Aristida acuta</i>			1
<i>Aristida gracilipes</i>			1
<i>Aristida jerichoensis</i>			
<i>Aristida lignosa</i>			
<i>Aristida queenslandica</i> var <i>queenslandica</i>			1
<i>Aristolochia deltantha</i> var <i>laheyana</i>		1	1
<i>Aristolochia praevenosa</i>			
<i>Arrhenechthites mixta</i>			1
<i>Artanema fimbriatum</i>			
<i>Arthraxon hispidus</i>			1
<i>Arthrochilus prolixus</i>			
<i>Arthropodium minus</i>			
<i>Arthropteris palisotii</i>			
<i>Arundinella nepalensis</i>			
<i>Arytera distylis</i>			1
<i>Asperula asthenes</i>	1		
<i>Asperula charophyton</i>			
<i>Asperula gunnii</i>			1
<i>Asperula scoparia</i>			1
<i>Asplenium aethiopicum</i>			
<i>Asplenium harmanii</i>			1
<i>Asplenium trichomanes</i> ssp <i>quadrivalens</i>			1
<i>Asterolasia elegans</i>			
<i>Astroloma humifusum</i>			1
<i>Astroloma pinifolium</i>			1
<i>Astrotricha cordata</i>		1	1
<i>Astrotricha</i> sp. nov. (Mt Boss)			
<i>Atalaya multiflora</i>			1
<i>Atalaya salicifolia</i>			1
<i>Atherosperma moschatum</i>			1
<i>Atriplex semibaccata</i>			
<i>Austrobuxus swainii</i>			
<i>Austrofestuca eriopoda</i>			1

<b>Austrofestuca littoralis</b>			1
<b>Taxon</b>	<b>endemic</b>	<b>disjunct</b>	<b>range limit</b>
<b>Austromyrtus bidwillii</b>			1
<b>Austromyrtus dulcis</b>			1
<b>Austromyrtus fragrantissima</b>			1
<b>Austromyrtus hillii</b>			1
<b>Austromyrtus sp. A</b>			1
<b>Austromyrtus sp.B</b>			1
<b>Austrosteenisia blackii</b>			1
<b>Austrosteenisia glabristyla</b>			1
<b>Avicennia marina</b>			
<b>Babingtonia odontocalyx</b>			
<b>Babingtonia prominens</b>			
<b>Babingtonia silvestris</b>			
<b>Backhousia anisata</b>		1	
<b>Backhousia sciadophora</b>			1
<b>Baeckea gunniana</b>		1	1
<b>Baeckea ramosissima ssp ramosissima</b>			1
<b>Baeckea species C</b>		1	
<b>Baeckea sp. Pyramids (Babingtonia granitica??)</b>			
<b>Baeckea stenophylla</b>			1
<b>Baeckea utilis</b>			1
<b>Baloghia marmorata</b>			1
<b>Banksia cunninghamii ssp A</b>			1
<b>Banksia ericifolia var macrantha</b>			1
<b>Banksia marginata</b>			1
<b>Banksia robur</b>		1	
<b>Bauera rubioides</b>			1
<b>Baumea acuta</b>			
<b>Baumea gunnii</b>		1	
<b>Beilschmiedia elliptica</b>			1
<b>Beilschmiedia obtusifolia</b>			1
<b>Belvisia mucronata</b>			1
<b>Benthamina alyxifolia</b>			1
<b>Berberidopsis beckleri</b>			1
<b>Bertya brownii</b>		1	1
<b>Bertya ingramii</b>	1		
<b>Bertya rosmarinifolia</b>			
<b>Bertya sp. A Cobar-Coolabah</b>			
<b>Beyeria lasiocarpa</b>		1	
<b>Billardiera longiflora</b>			1
<b>Blandfordia grandiflora</b>		1	

<b>Blandfordia nobilis</b>			
<b>Taxon</b>	<b>endemic</b>	<b>disjunct</b>	<b>range limit</b>
<b>Blechnum ambiguum</b>		1	
<b>Blechnum fluviatile</b>		1	1
<b>Blumea lacera</b>			1
<b>Blumea mollis</b>			1
<b>Boehmeria platyphylla var austroqueenslandica</b>			1
<b>Boerhavia dominii</b>			
<b>Bolboschoenus caldwellii</b>			
<b>Bolboschoenus fluviatilis</b>			
<b>Boronia algida</b>			1
<b>Boronia anemonifolia var anemonifolia</b>			1
<b>Boronia chartacea</b>		1	
<b>Boronia falcifolia</b>			1
<b>Boronia fraseri</b>			
<b>Boronia granitica</b>			
<b>Boronia mollis</b>			1
<b>Boronia repanda</b>			1
<b>Boronia rosmarinifolia</b>			1
<b>Boronia rubiginosa</b>		1	1
<b>Boronia saffrolifera</b>			1
<b>Boronia serrulata</b>			
<b>Boronia sp. aff. bipinnata Torrington</b>			
<b>Boronia sp. aff. Bolivia Hill</b>			
<b>Boronia sp. aff. microphylla Torrington</b>			
<b>Boronia umbellata</b>	1		1
<b>Bosistoa floydii</b>			
<b>Bosistoa pentacocca</b>			1
<b>Bosistoa selwynii</b>			1
<b>Bosistoa transversa</b>			1
<b>Bossiaea obcordata</b>			
<b>Bossiaea prostrata</b>			
<b>Bossiaea rupicola</b>			1
<b>Bothriochloa biloba</b>			
<b>Bothriochloa bladhii ssp bladhii</b>			
<b>Bouchardatia neurococca</b>			1
<b>Brachycome ascendens</b>			1
<b>Brachycome dissectifolia</b>			1
<b>Brachycome heterodonta var A</b>			
<b>Brachycome multifida var dilatata</b>			1
<b>Brachycome nova-anglica</b>			1
<b>Brachycome radicans</b>		1	1

Brachycome spathulata			1
Taxon	endemic	disjunct	range limit
Brachycome tenuiscapa var pubescens			
Brachyloma saxicola			
Brachyloma scortechinii			1
Bracteantha viscosa			
Brasenia schreberi			
Bridelia exaltata			1
Bruguiera gymnorhiza			1
Brunoniella pumilio			1
Brunoniella spiciflora			
Buchnera gracilis			
Bulbine vagans			1
Bulbophyllum argyropus			1
Bulbophyllum bracteatum			1
Bulbophyllum globuliforme			1
Bulbophyllum lamingtonense (B. caldericola)			1
Bulbophyllum schillerianum			1
Bulbophyllum weinthalii			1
Bulbostylis densa			1
Bulbostylis pyriformis			
Cadellia pentastylis			
Caesalpinia bonduc			1
Caesalpinia scortechinii			1
Caesia alpina			1
Caesia calliantha			1
Caesia parviflora var minor			
Caladenia alata			
Caladenia arenaria - Bald Rock - prob. C. atroclavia		1	1
Caladenia filamentosa var filamentosa			
Caladenia gracilis			1
Caladenia picta			1
Caladenia quadrifaria		1	1
Caladenia sp. C		1	1
Caladenia tessellata			
Caladenia testacea			1
Calamus muelleri			1
Calandrinia eremaea			
Calanthe triplicata			
Callicarpa pedunculata			1
Callistemon acuminatus		1	1
Callistemon comboynensis			1

Callistemon flavovirens			
Taxon	endemic	disjunct	range limit
Callistemon linearis		1	
Callistemon montanus			
Callistemon pachyphyllus			1
Callistemon pungens			
Callistemon rigidus			
Callistemon shiressii			
Callitriche muelleri			
Callitris baileyi			1
Callitris columellaris			1
Callitris endlicheri			
Callitris macleayana			1
Callitris monticola		1	1
Callitris oblonga			1
Callitris rhomboidea			
Calocephalus citreus			
Calochilus grandiflorus			1
Calochilus paludosus			
Calophanoides hygrophiloides			1
Calotis lappulacea			
Calystegia soldanella		1	
Canarium australasicum			1
Canthium lamprophyllum			1
Capparis sarmentosa			
Cardamine gunnii			1
Cardamine lilacina			1
Cardamine sp. Y			1
Carex bichenoviana			1
Carex brownii			
Carex brunnea			
Carex capillacea			
Carex chlorantha			1
Carex echinata		1	1
Carex hubbardii			1
Carex inomitata			1
Carex lophocarpa			1
Carex tereticaulis			1
Carissa ovata			1
Carronia multisepalea			1
Casearia multinervosa			1
Cassia brewsteri var marksiana			1

Cassinia aculeata			1
Taxon	endemic	disjunct	range limit
Cassinia arcuata			1
Cassinia aureonitens		1	1
Cassinia longifolia			
Cassinia sp. B		1	1
Cassinia sp.C	1		
Cassinia sp. D			1
Cassinia subtropica			1
Cassinia trinerva			1
Cassinia uncata			
Cassytha filiformis			1
Cassytha racemosa var muelleri		1	
Castanospermum australe			1
Castanospora alphanthii			1
Casuarina cunninghamiana			
Casuarina equisetifolia			1
Caustis blakei			1
Cayratia acris			1
Cayratia eurynema			1
Cenchrus sp. A	1		
Centipeda cunninghamii			
Centranthera cochinchinensis		1	1
Centratherum punctatum ssp australianum			1
Centrolepis strigosa ssp strigosa		1	
Ceratopetalum gummiferum			1
Ceratopteris thalictroides			1
Chamaesyce macgillivrayi			1
Cheilanthes sieberi ssp pseudovellea			
Chenopodium erosum			1
Chiloglottis anaticeps	1		
Chiloglottis diphylla			1
Chiloglottis formicifera			
Chiloglottis palachila			
Chiloglottis platyptera			1
Chiloglottis pluricallata			1
Chiloglottis sp. aff. formicifera (Bald Rock)			
Chiloglottis sp. aff. sphyrnoides (Barrington Tops)			
Chiloglottis sphyrnoides			
Chiloglottis trilabra			1
Chionochoa pallida			1
Chionogentias barringtonensis	1		

<i>Chloanthes stoechadis</i>		1	1
Taxon	endemic	disjunct	range limit
<i>Choretrum</i> sp. A		1	
<i>Choricarpia subargentea</i>			1
<i>Christella hispidula</i>			
<i>Christella parasitica</i>			1
<i>Chrysopogon fallax</i>			
<i>Chrysopogon sylvaticus</i>			1
<i>Cinnamomum virens</i>			1
<i>Citriobatus lancifolius</i>			1
<i>Cladium procerum</i>			
<i>Clematis fawcettii</i>			1
<i>Clematis microphylla</i>			
<i>Cleome viscosa</i>			
<i>Clerodendrum floribundum</i>			1
<i>Clerodendrum inerme</i>			1
<i>Coelospermum paniculatum</i>			1
<i>Coleocarya gracilis</i>			1
<i>Comesperma sphaerocarpum</i>			1
<i>Comesperma sylvestre</i>			1
<i>Commersonia bartramia</i>			1
<i>Conospermum burgessiorum</i>		1	1
<i>Conospermum ellipticum</i>			1
<i>Cooperhooikia barbata</i>		1	1
<i>Cooperhooikia chisholmii</i>			1
<i>Coprosma hirtella</i>		1	1
<i>Coprosma nitida</i>			1
<i>Coprosma quadrifida</i>			1
<i>Corchorus cunninghamii</i>			1
<i>Cordyline congesta</i>		1	
<i>Cordyline petiolaris</i>			1
<i>Cordyline rubra</i>			1
<i>Corokia whiteana</i>	1	1	
<i>Correa alba</i>			1
<i>Correa lawrenciana</i> var <i>glandulifera</i>			1
<i>Correa lawrenciana</i> var <i>macrocalyx</i>			
<i>Corybas barbarae</i>			
<i>Corybas fordhamii</i>		1	
<i>Corybas</i> sp. aff. <i>dilatatus</i> (Barrington Tops)			
<i>Corybas undulatus</i>			
<i>Corymbia henryi</i>			1
<i>Corymbia intermedia</i>			1



<b>Corynocarpus rupestris ssp arborescens</b>			1
<b>Taxon</b>	<b>endemic</b>	<b>disjunct</b>	<b>range limit</b>
<b>Corynocarpus rupestris ssp rupestris</b>	1		
<b>Corynotheca licrota</b>			
<b>Craspedia canens</b>			
<b>Crassula colorata</b>			
<b>Crassula decumbens</b>			1
<b>Crassula helmsii</b>			1
<b>Crepidomanes walleri</b>			
<b>Crinum pedunculatum</b>			
<b>Crotalaria medicaginea</b>			
<b>Crotalaria mitchellii ssp laevis</b>		1	
<b>Crotalaria mitchellii ssp mitchellii</b>			
<b>Crotalaria montana</b>			1
<b>Croton acronychioides</b>			1
<b>Croton stigmatosus</b>			1
<b>Crowea exalata</b>			
<b>Cryptandra buxifolia</b>			1
<b>Cryptandra lanosiflora</b>			
<b>Cryptandra longistaminea</b>			1
<b>Cryptandra propinqua</b>			
<b>Cryptandra spinescens</b>			1
<b>Cryptocarya bidwillii</b>			1
<b>Cryptocarya dorrigoensis</b>			
<b>Cryptocarya erythroxylon</b>			1
<b>Cryptocarya floydii</b>		1	
<b>Cryptocarya foetida</b>			1
<b>Cryptocarya foveolata</b>			1
<b>Cryptocarya laevigata</b>			1
<b>Cryptocarya meissneriana</b>			1
<b>Cryptocarya nova-anglica</b>		1	
<b>Cryptocarya triplinervis</b>			1
<b>Cryptocarya williwilliana</b>	1		
<b>Cryptostylis hunteriana</b>			
<b>Cupaniopsis flagelliformis var australis</b>			1
<b>Cupaniopsis foveolata</b>			1
<b>Cupaniopsis newmanii</b>			1
<b>Cupaniopsis parvifolia</b>			1
<b>Cupaniopsis serrata</b>			1
<b>Cuttsia viburnea</b>			1
<b>Cyathea cunninghamii</b>			
<b>Cymbidium canaliculatum</b>		1	

<b>Cymbidium madidum</b>			1
<b>Taxon</b>	<b>endemic</b>	<b>disjunct</b>	<b>range limit</b>
<b>Cynanchum carnosum</b>			1
<b>Cynanchum elegans</b>			1
<b>Cynoglossum suaveolens</b>			
<b>Cyperus aquatilis</b>			1
<b>Cyperus dietrichiae var brevibracteatus</b>			1
<b>Cyperus eglobosus</b>			1
<b>Cyperus filipes</b>			1
<b>Cyperus gunnii ssp gunnii</b>			
<b>Cyperus haspan juncooides</b>			1
<b>Cyperus laevis</b>			1
<b>Cyperus nutans ssp eleusinoides</b>			1
<b>Cyperus odoratus</b>			
<b>Cyperus pilosus</b>			1
<b>Cyperus platystylis</b>			
<b>Cyperus rupicola</b>		1	1
<b>Cyperus scaber</b>			1
<b>Cyperus sculptus</b>			1
<b>Cyperus stradbrokeensis</b>			1
<b>Cyperus subulatus</b>			1
<b>Cyperus vaginatus</b>			
<b>Cyphanthera albicans ssp albicans</b>			
<b>Dactyloctenium radulans</b>			
<b>Damasonium minus</b>			
<b>Dampiera lanceolata</b>			
<b>Dampiera sylvestris</b>			
<b>Danthonia carphoides</b>			
<b>Danthonia induta</b>			
<b>Danthonia monticola</b>			1
<b>Danthonia penicillata</b>			
<b>Daphnandra tenuipes</b>	1		
<b>Darwinia biflora</b>			
<b>Darwinia glaucophylla</b>			
<b>Darwinia leptantha</b>			1
<b>Darwinia peduncularis</b>			
<b>Darwinia procera</b>			
<b>Davallia pyxidata</b>			
<b>Davidsonia pruriens var jerseyana</b>			1
<b>Davidsonia sp. A</b>			1
<b>Daviesia arborea</b>			1
<b>Daviesia corymbosa</b>			1

Daviesia elliptica			1
Taxon	endemic	disjunct	range limit
Daviesia mimosoides ssp mimosoides			
Daviesia nova-anglica			1
Daviesia squarrosa			1
Daviesia villifera			1
Daviesia wyattiana		1	
Dendrobium bowmanii			1
Dendrobium dolichophyllum			1
Dendrobium falcorostrum			1
Dendrobium kingianum			1
Dendrobium melaleucaphilum			
Dendrobium monophyllum			1
Dendrobium mortii			1
Dendrobium schneiderae			1
Dendrobium schoeninum			1
Dendrobium speciosum			1
Dendrocide moroides			1
Dendrophthoe glabrescens			
Denhamia celastroides			1
Denhamia moorei			1
Denhamia pittosporoides ssp pittosporoides			1
Derris involuta			1
Derwentia arenaria			
Derwentia derwentiana ssp derwentiana		1	
Desmodium acanthocladum	1		
Desmodium gangeticum			1
Desmodium heterocarpon var heterocarpon			
Desmodium nemorosum			1
Deyeuxia acuminata		1	
Deyeuxia carinata			1
Deyeuxia decipiens			1
Deyeuxia mckiei			1
Deyeuxia monticola var monticola			1
Deyeuxia quadriseta			1
Dianella crinoides			
Dianella nervosa			1
Dianella tasmanica			1
Dichanthium setosum			
Dichanthium tenue			
Dichelachne sieberiana			
Dichrocephala integrifolia			1

Dicksonia youngiae			1
Taxon	endemic	disjunct	range limit
Dicranopteris linearis			
Digitaria brownii			
Digitaria divaricatissima			
Digitaria leucostachya			1
Dillwynia sieberi			
Dillwynia sp. A			
Dillwynia tenuifolia			
Diospyros fasciculosa			1
Diospyros mabacea	1		
Diospyros major var ebenus			
Diplazium assimile			1
Diplazium dilatatum			1
Diplocyclos palmatus			1
Diploglottis campbellii			1
Dipodium atropurpureum			
Dipodium pulchellum			
Dipodium roseum			
Discaria pubescens			
Diuris abbreviata			1
Diuris aurea			1
Diuris chrysantha			1
Diuris dendrobioides			1
Diuris disposita	1		
Diuris flavescens	1		
Diuris lanceolata			1
Diuris maculata			1
Diuris pedunculata			
Diuris praecox			
Diuris secundiflora ?=D. tricolor	1		
Diuris sp. aff. ochroma (New England)			
Diuris venosa			
Dodonaea boroniifolia			
Dodonaea hirsuta		1	1
Dodonaea lanceolata var subsessilifolia			1
Dodonaea megazyga			
Dodonaea rhombifolia			1
Dodonaea serratifolia			
Dodonaea sinuolata ssp sinuolata			1
Dodonaea stenophylla			
Doodia maxima			1

<i>Doodia media</i> ssp <i>australis</i>			1
Taxon	endemic	disjunct	range limit
<i>Doryanthes excelsa</i>		1	1
<i>Doryanthes palmeri</i>			1
<i>Dracophyllum secundum</i>		1	1
<i>Drymaria cordata</i> ssp <i>diandra</i>			1
<i>Drymophila moorei</i>			1
<i>Drynaria rigidula</i>			1
<i>Dryopoa dives</i>			
<i>Durringtonia paludosa</i>		1	
<i>Dysoxylum mollissimum</i>			1
<i>Dysoxylum rufum</i>			1
<i>Echinochloa colona</i>			
<i>Echinopogon cheelii</i>			1
<i>Echinopogon mckiei</i>			1
<i>Eclipta prostrata</i>			1
<i>Einadia polygonoides</i>			
<i>Elaeocarpus eumundi</i>			1
<i>Elaeocarpus grandis</i>			1
<i>Elaeocarpus holopetalus</i>			1
<i>Elaeocarpus</i> sp. <i>Minyon</i>			
<i>Elaeocarpus williamsianus</i>	1		
<i>Elatine gratioloides</i>			
<i>Elattostachys nervosa</i>			1
<i>Elattostachys xylocarpa</i>			1
<i>Eleocharis atricha</i>			
<i>Eleocharis dulcis</i>			1
<i>Eleocharis equisetina</i>			
<i>Eleocharis pallens</i>			
<i>Eleocharis tetraquetra</i>			
<i>Elyonurus citreus</i>		1	1
<i>Emilia sonchifolia</i>			1
<i>Endiandra compressa</i>			1
<i>Endiandra crassiflora</i>			1
<i>Endiandra floydii</i>			1
<i>Endiandra globosa</i>			1
<i>Endiandra hayesii</i>			1
<i>Endiandra introrsa</i>		1	
<i>Endiandra muelleri</i> ssp <i>bracteata</i>			1
<i>Endiandra muelleri</i> ssp <i>muelleri</i>			1
<i>Endiandra pubens</i>			1
<i>Endiandra virens</i>			1

<b>Enneapogon nigricans</b>			
<b>Taxon</b>	<b>endemic</b>	<b>disjunct</b>	<b>range limit</b>
<b>Enteropogon unispiceus</b>			1
<b>Epacris breviflora</b>			
<b>Epacris calvertiana var calvertiana</b>			1
<b>Epacris coriacea</b>			
<b>Epacris muelleri</b>			
<b>Epacris petrophila</b>		1	1
<b>Epacris purpurascens var purpurascens</b>			
<b>Epilobium gunnianum</b>			1
<b>Epilobium hirtigerum</b>			
<b>Epipogon roseum</b>			
<b>Eragrostis interrupta</b>			1
<b>Eragrostis lacunaria</b>			
<b>Eragrostis leptocarpa</b>			
<b>Eragrostis microcarpa</b>			1
<b>Eragrostis molybdea</b>			
<b>Eragrostis pubescens</b>			1
<b>Eragrostis trachycarpa</b>			
<b>Eremophila deserti</b>			
<b>Eriachne glabrata</b>			
<b>Eriachne pallescens</b>			1
<b>Eriachne rara</b>			1
<b>Eriocaulon australe</b>			
<b>Eriochilus autumnalis</b>			
<b>Eriochloa pseudoacrotricha</b>			
<b>Eriostemon difformis ssp smithianus</b>			1
<b>Eriostemon ericifolius</b>			
<b>Eriostemon myoporoides ssp conduplicatus</b>		1	1
<b>Eriostemon myoporoides ssp epilosus</b>			
<b>Eriostemon myoporoides ssp myoporoides</b>			
<b>Eriostemon obovalis</b>			
<b>Erodium crinitum</b>			
<b>Eryngium expansum</b>			1
<b>Erythrina vespertilio</b>			1
<b>Erythroxylum australe</b>			1
<b>Eucalyptus acaciiformis</b>			1
<b>Eucalyptus aenea</b>			
<b>Eucalyptus agglomerata</b>			1
<b>Eucalyptus ancophila</b>	1		
<b>Eucalyptus approximans</b>		1	1
<b>Eucalyptus baileyana</b>			1

<b>Eucalyptus bancroftii</b>			1
<b>Taxon</b>	<b>endemic</b>	<b>disjunct</b>	<b>range limit</b>
<b>Eucalyptus banksii</b>			1
<b>Eucalyptus bensonii</b>			
<b>Eucalyptus bicostata</b>			1
<b>Eucalyptus biturbinata</b>			1
<b>Eucalyptus caleyi ssp ovoidenii</b>			
<b>Eucalyptus caliginosa</b>			1
<b>Eucalyptus cameronii</b>			1
<b>Eucalyptus camfieldii</b>			
<b>Eucalyptus campanulata</b>			1
<b>Eucalyptus camphora ssp relictata</b>		1	1
<b>Eucalyptus canaliculata</b>	1		
<b>Eucalyptus capitellata</b>			1
<b>Eucalyptus carnea</b>			1
<b>Eucalyptus codonocarpa</b>			1
<b>Eucalyptus conjuncta</b>			
<b>Eucalyptus cypellocarpa</b>			1
<b>Eucalyptus dalrympleana</b>			1
<b>Eucalyptus dissita</b>		1	1
<b>Eucalyptus dives</b>			1
<b>Eucalyptus dorrigoensis</b>			
<b>Eucalyptus dunnii</b>			1
<b>Eucalyptus elliptica</b>			1
<b>Eucalyptus fastigata</b>			1
<b>Eucalyptus fergusonii ssp dorsiventralis</b>			
<b>Eucalyptus fergusonii ssp fergusonii</b>			1
<b>Eucalyptus fracta</b>			
<b>Eucalyptus fusiformis</b>			
<b>Eucalyptus glaucina</b>		1	1
<b>Eucalyptus globoidea</b>			1
<b>Eucalyptus hypostomatica</b>			
<b>Eucalyptus largeana</b>			1
<b>Eucalyptus ligustrina</b>		1	1
<b>Eucalyptus luehmanniana</b>			
<b>Eucalyptus macrorhyncha</b>			
<b>Eucalyptus magnificata</b>			1
<b>Eucalyptus malacoxylon</b>			
<b>Eucalyptus mckieana</b>			1
<b>Eucalyptus melanophloia</b>		1	
<b>Eucalyptus michaeliana</b>		1	
<b>Eucalyptus nicholii</b>			

<b>Eucalyptus nitens</b>			1
<b>Taxon</b>	<b>endemic</b>	<b>disjunct</b>	<b>range limit</b>
<b>Eucalyptus nortonii</b>		1	1
<b>Eucalyptus nova-anglica</b>			1
<b>Eucalyptus olida</b>	1		
<b>Eucalyptus ophitica</b>	1		
<b>Eucalyptus oresbia ms</b>			
<b>Eucalyptus pachycalyx ssp banyabba</b>			
<b>Eucalyptus paniculata ssp matutina</b>	1		
<b>Eucalyptus paniculata ssp paniculata</b>			1
<b>Eucalyptus parramattensis ssp decadens</b>			
<b>Eucalyptus piperita</b>			1
<b>Eucalyptus placita</b>			1
<b>Eucalyptus planchoniana</b>			1
<b>Eucalyptus prominula</b>			
<b>Eucalyptus psammitica</b>	1		
<b>Eucalyptus pumila</b>			
<b>Eucalyptus punctata</b>			1
<b>Eucalyptus pyrocarpa</b>	1		1
<b>Eucalyptus resinifera ssp hemilampra</b>			1
<b>Eucalyptus retinens</b>			1
<b>Eucalyptus rossii</b>			1
<b>Eucalyptus rubida ssp barbigerorum</b>			1
<b>Eucalyptus rudderi</b>	1		
<b>Eucalyptus rummeryi</b>			1
<b>Eucalyptus scias ssp apoda</b>		1	1
<b>Eucalyptus scoparia</b>			1
<b>Eucalyptus scopulorum</b>			
<b>Eucalyptus seeana</b>			1
<b>Eucalyptus serpentinicola</b>	1		
<b>Eucalyptus sp. aff. cypellocarpa (Hillgrove)</b>			
<b>Eucalyptus sp. aff. cypellocarpa (Long Point)</b>			
<b>Eucalyptus stellulata</b>		1	1
<b>Eucalyptus subcaerulea</b>			
<b>Eucalyptus tessellaris</b>			1
<b>Eucalyptus tetrapleura</b>	1		
<b>Eucalyptus tindaliae</b>			1
<b>Eucalyptus williamsiana</b>			1
<b>Eucalyptus youmanii</b>			
<b>Euphorbia psammogeton</b>			
<b>Euphrasia arguta</b>			1
<b>Euphrasia bella</b>		1	1



<b>Euphrasia ciliolata</b>			1
<b>Taxon</b>	<b>endemic</b>	<b>disjunct</b>	<b>range limit</b>
<b>Euphrasia collina ssp muelleri</b>			1
<b>Euphrasia collina ssp paludosa</b>		1	
<b>Euphrasia orthocheila ssp peraspera</b>			
<b>Euphrasia ramulosa</b>			1
<b>Euphrasia ruptura (E. sp. Tamworth)</b>			
<b>Eupomatia bennettii</b>			1
<b>Evolvulus alsinoides</b>			
<b>Excoecaria agallocha</b>			1
<b>Excoecaria dallachyana</b>			1
<b>Exocarpos latifolius</b>			
<b>Exocarya sclerioides</b>			1
<b>Festuca asperula</b>			1
<b>Festuca muelleri</b>			1
<b>Ficus virens var sublaceolata</b>			1
<b>Ficus watkinsiana</b>			1
<b>Fimbristylis bisumbellata</b>			
<b>Fimbristylis cinnamometorum</b>			1
<b>Fimbristylis polytrichoides</b>			
<b>Fimbristylis tristachya</b>			1
<b>Flindersia australis</b>			1
<b>Flindersia bennettiana</b>			1
<b>Flindersia schottiana</b>			1
<b>Flindersia xanthoxyla</b>			1
<b>Floydia praealta</b>			1
<b>Fontainea australis</b>			1
<b>Fontainea oraria</b>	1		
<b>Freycinetia excelsa</b>			1
<b>Fuirena incrassata</b>		1	1
<b>Gahnia insignis</b>		1	1
<b>Gahnia microstachya</b>		1	1
<b>Gahnia radula</b>			1
<b>Gahnia subaequiglumis</b>		1	
<b>Galactia species A</b>			1
<b>Galactia species B</b>			1
<b>Galium binifolium</b>			1
<b>Galium curvihirtum</b>		1	1
<b>Galium liratum</b>			1
<b>Gastrodia sesamoides</b>			
<b>Gaultheria appressa</b>		1	1
<b>Gaultheria viridicarpa ssp merinoensis</b>			1

Gaultheria viridicarpa ssp viridicarpa			
Taxon	endemic	disjunct	range limit
Geijera paniculata			1
Geijera salicifolia			1
Geissois benthamii			1
Genoplesium acuminatum			1
Genoplesium baueri			1
Genoplesium fimbriatum			1
Genoplesium nudiscapum		1	
Genoplesium nudum			1
Genoplesium pumilum			
Genoplesium rufum			
Genoplesium sp. aff. sigmoideum (Gib. Range)			
Gentiana wissmannii			1
Geodorum densiflorum			1
Geranium potentilloides			1
Geranium retrorsum			1
Gingidia harveyana		1	1
Gingidia montana			1
Gleichenia mendellii		1	1
Glinus oppositifolius			1
Glochidion sumatranum			1
Glossostigma diandrum			
Glossostigma elatinoides			1
Glyceria latispicea			1
Glycine canescens		1	
Glycine cyrtoloba		1	1
Glycine latifolia			1
Glycine sp.A		1	1
Gnaphalium gymnocephalum			1
Gompholobium foliolosum		1	
Gompholobium glabratum			1
Gompholobium minus			1
Gompholobium sp.B		1	1
Gonocarpus chinensis ssp verrucosus			
Gonocarpus longifolius			
Gonocarpus salsoloides			1
Gonocormus saxifragoides			1
Goodenia bellidifolia ssp bellidifolia			
Goodenia fordiana			1
Goodenia glabra			
Goodenia macbarronii			

<b>Goodenia rotundifolia</b>			1
<b>Taxon</b>	<b>endemic</b>	<b>disjunct</b>	<b>range limit</b>
<b>Grammitis stenophylla</b>			
<b>Gratiola pubescens</b>			1
<b>Grevillea acanthifolia ssp stenomera</b>		1	1
<b>Grevillea acerata</b>	1		
<b>Grevillea banyabba</b>	1		
<b>Grevillea beadleana</b>		1	
<b>Grevillea evansiana</b>			
<b>Grevillea granulifera</b>	1		
<b>Grevillea guthrieana - Booral Metapopulation.</b>			
<b>Grevillea guthrieana - Carrai Metapopulation</b>			
<b>Grevillea hilliania</b>			1
<b>Grevillea johnsonii</b>			
<b>Grevillea linsmithii</b>		1	1
<b>Grevillea longifolia</b>			
<b>Grevillea masonii</b>	1		
<b>Grevillea mollis</b>	1		
<b>Grevillea montana</b>			
<b>Grevillea obtusiflora ssp fecunda</b>			
<b>Grevillea obtusiflora ssp obtusiflora</b>			
<b>Grevillea oldei</b>			
<b>Grevillea parviflora ssp parviflora (previously Grevillea linearifolia form D)</b>			
<b>Grevillea quadricauda</b>	1		
<b>Grevillea rhizomatosa</b>	1		
<b>Grevillea scortechinii ssp sarmentosa</b>			
<b>Grevillea shiressii</b>			
<b>Grewia latifolia</b>			1
<b>Guilfoylia monostylis</b>			1
<b>Gymnema pleiadenium</b>			1
<b>Gymnoschoenus sphaerocephalus</b>			1
<b>Gynura drymophila var drymophila (and var glabrifolia)</b>			1
<b>Haemodorum tenuifolium</b>			1
<b>Hakea bakeriana</b>			1
<b>Hakea florulenta</b>			1
<b>Hakea fraseri</b>		1	1
<b>Hakea macrorrhyncha</b>			
<b>Hakea ochroptera</b>		1	1
<b>Hakea sericea</b>			1
<b>Hakea sp. aff. trineura</b>		1	1
<b>Hakea teretifolia</b>			1
<b>Halfordia kendack</b>			1

<b>Haloragis exalata ssp exalata</b>			
<b>Taxon</b>	<b>endemic</b>	<b>disjunct</b>	<b>range limit</b>
<b>Haloragis exalata ssp velutina</b>			
<b>Haloragis serra</b>			1
<b>Harpullia alata</b>			1
<b>Harpullia hillii</b>			1
<b>Harpullia pendula</b>			1
<b>Hedraianthera porphyropetala</b>			1
<b>Hedyotis galioides</b>			
<b>Helichrysum boormanii</b>			1
<b>Helichrysum rutidolepis</b>			1
<b>Helichrysum sp.1 Mt Merino</b>			
<b>Helichrysum sp.2 Point Lookout</b>			
<b>Helicia ferruginea</b>			1
<b>Helmholtzia glaberrima</b>			1
<b>Hemisteptia lyrata</b>			
<b>Hibbertia acuminata</b>	1		
<b>Hibbertia cistoidea</b>			
<b>Hibbertia elata</b>		1	
<b>Hibbertia hermanniifolia</b>			
<b>Hibbertia hexandra</b>		1	1
<b>Hibbertia marginata</b>	1		
<b>Hibbertia procumbens</b>			
<b>Hibbertia rufa</b>			1
<b>Hibbertia villosa</b>			
<b>Hicksbeachia pinnatifolia</b>		1	
<b>Hierochloe rariflora</b>			
<b>Hodgkinsonia ovatiflora</b>			1
<b>Homopholis proluta</b>			
<b>Homoranthus biflorus</b>			
<b>Homoranthus cernuus</b>			
<b>Homoranthus croftianus ms. (JTH)</b>			
<b>Homoranthus darwinioides</b>			
<b>Homoranthus floydii</b>	1		
<b>Homoranthus lunatus</b>	1	1	
<b>Homoranthus prolixus</b>			
<b>Homoranthus virgatus</b>			1
<b>Hovea beckeri</b>			1
<b>Hovea longipes</b>			1
<b>Howittia trilocularis</b>			1
<b>Hoya australis ssp australis</b>			1
<b>Hybanthus vernonii ssp scaber</b>			1

Hybanthus vernonii ssp vernonii		1	1
Taxon	endemic	disjunct	range limit
Hydrocharis dubia			1
Hydrocotyle pedicellosa			1
Hygrophila angustifolia			1
Hymenophyllum rarum			1
Hypoestes floribunda var pubescens			1
Hypolepis elegans			1
Hypoxis pratensis			
Hypserpa decumbens			1
Indigofera adesmiifolia		1	
Indigofera baileyi			1
Indigofera linifolia		1	1
Iphigenia indica		1	1
Ischaemum triticeum			
Isoetes muelleri			
Isoetopsis graminifolia			
Isoglossa eranthemoides	1		
Isolepis aucklandica		1	
Isolepis fluitans		1	
Isolepis gaudichaudiana			1
Isolepis habra			1
Isolepis platycarpa			1
Isolepis producta		1	1
Isopogon mnoraifolius	1		
Isotoma anethifolia		1	1
Isotoma armstrongii			1
Isotoma axillaris		1	
Isotoma fluviatilis ssp borealis		1	
Isotoma fluviatilis ssp fluviatilis			1
Isotropis foliosa			1
Ixora beckleri			1
Jacksonia sp. nov. Bald Knob / Little Plain (JBW)			
Jacksonia stackhousii			1
Jagera pseudorhus var pseudorhus			1
Jasminum dallachii			1
Jasminum volubile			1
Juncus alexandri ssp melanobasis			1
Juncus australis			1
Juncus falcatus			1
Juncus filicaulis			1
Juncus laeviusculus ssp laeviusculus		1	1

<b>Juncus pallidus</b>			1
<b>Taxon</b>	<b>endemic</b>	<b>disjunct</b>	<b>range limit</b>
<b>Juncus pauciflorus</b>			1
<b>Juncus phaeanthus</b>		1	1
<b>Juncus procerus</b>		1	1
<b>Juncus revolutus</b>		1	1
<b>Juncus sandwithii</b>		1	1
<b>Juncus sarophorus</b>			1
<b>Juncus subglaucus</b>		1	
<b>Juncus vaginatus</b>			1
<b>Kennedia prostrata</b>			1
<b>Kennedia retrorsa</b>			
<b>Keraudrenia corollata var denticulata</b>		1	
<b>Knoxia sumatrensis</b>			1
<b>Korthalsella breviarticulata</b>			
<b>Kunzea bracteolata</b>			1
<b>Kunzea capitata</b>			1
<b>Kunzea obovata</b>			1
<b>Kunzea opposita</b>			
<b>Kunzea parvifolia</b>			1
<b>Kunzea rupestris</b>			
<b>Kunzea sp A</b>	1		
<b>Lambertia formosa</b>		1	1
<b>Lasiopetalum ferrugineum var cordatum</b>			
<b>Lasiopetalum ferrugineum var ferrugineum</b>			
<b>Lasiopetalum joyceae</b>			
<b>Lasiopetalum longistamineum</b>			
<b>Lasiopetalum parviflorum</b>			1
<b>Lastreopsis marginans</b>			1
<b>Lastreopsis silvestris</b>			1
<b>Lastreopsis smithiana</b>			1
<b>Lemna trisulca</b>			
<b>Lepiderema pulchella</b>			1
<b>Lepidium fasciculatum</b>		1	
<b>Lepidium hyssopifolium</b>			
<b>Lepidium peregrinum</b>			
<b>Lepidosperma concavum</b>			1
<b>Lepidosperma curtisiae</b>		1	1
<b>Lepidosperma filiforme</b>			1
<b>Lepidosperma latens</b>		1	1
<b>Lepidosperma neesii</b>		1	1
<b>Lepidosperma tortuosum</b>			1

<b>Lepidosperma urophorum</b>			1
<b>Taxon</b>	<b>endemic</b>	<b>disjunct</b>	<b>range limit</b>
<b>Leptinella filicula</b>			1
<b>Leptinella longipes</b>			
<b>Leptomeria drupacea</b>		1	1
<b>Leptopteris fraseri</b>			
<b>Leptorhynchus elongatus</b>			1
<b>Leptorhynchus squamatus</b>			1
<b>Leptospermum argenteum</b>	1		
<b>Leptospermum brachyandrum</b>			1
<b>Leptospermum deanei</b>			
<b>Leptospermum gregarium</b>			1
<b>Leptospermum laevigatum</b>			1
<b>Leptospermum liversidgei</b>			1
<b>Leptospermum petersonii ssp petersonii</b>			1
<b>Leptospermum semibaccatum</b>			1
<b>Leptospermum speciosum</b>			1
<b>Leptospermum spectabile</b>			
<b>Leptospermum variabile</b>			1
<b>Leptospermum whitei</b>			1
<b>Leptostigma reptans</b>		1	1
<b>Lepturus repens</b>			
<b>Lepyrodia caudata</b>			1
<b>Lepyrodia interrupta</b>			1
<b>Lepyrodia leptocaulis</b>			
<b>Lepyrodia muelleri</b>			1
<b>Lepyrodia species A</b>			
<b>Leucopogon attenuatus</b>			1
<b>Leucopogon cicatricatus</b>		1	
<b>Leucopogon confertus</b>	1		
<b>Leucopogon deformis</b>			1
<b>Leucopogon esquamatus</b>			1
<b>Leucopogon fraseri</b>			
<b>Leucopogon hookeri</b>			1
<b>Leucopogon muticus</b>		1	
<b>Leucopogon pilifer</b>		1	1
<b>Leucopogon recurvisepalus</b>			1
<b>Leucopogon rodwayi</b>		1	1
<b>Leucopogon sp. aff. Appressus</b>	1		
<b>Leucopogon sp. aff. fraseri</b>			
<b>Leucopogon sp. aff. setiger (Mt Belmore)</b>			
<b>Leucopogon sp.5 Echo Point Border Ranges</b>			

<b>Leucopogon trichostylus</b>			
<b>Taxon</b>	<b>endemic</b>	<b>disjunct</b>	<b>range limit</b>
<b>Libertia pulchella</b>			1
<b>Lilaeopsis polyantha</b>		1	
<b>Limosella australis</b>			
<b>Lindernia alsinoides</b>			1
<b>Lindsaea brachypoda</b>			1
<b>Lindsaea dimorpha</b>		1	
<b>Lindsaea fraseri</b>			1
<b>Lindsaea incisa</b>		1	1
<b>Linospadix monostachya</b>			1
<b>Linum marginale</b>			
<b>Liparis habenarina</b>			
<b>Liparis simmondsii</b>			1
<b>Lipocarpa microcephala</b>		1	
<b>Lissanthe sapida</b>			
<b>Lissanthe species A</b>			1
<b>Lissanthe sp. A</b>			1
<b>Lissanthe species B</b>			1
<b>Lobelia dentata</b>			1
<b>Lobelia membranacea</b>			
<b>Lomandra brevis</b>			
<b>Lomandra confertifolia ssp rubiginosa</b>			1
<b>Lomandra elongata</b>			1
<b>Lomandra filiformis ssp coriacea</b>		1	
<b>Lomandra filiformis ssp flavior</b>			1
<b>Lomandra fluviatilis</b>			
<b>Lomandra hystrix</b>			1
<b>Lomandra laxa</b>			1
<b>Lomandra spicata</b>			1
<b>Lomatia arborescens</b>			1
<b>Lomatia fraseri</b>			1
<b>Lomatia silaifolia</b>			
<b>Lophostemon confertus</b>			1
<b>Lophostemon suaveolens</b>			1
<b>Ludwigia octovalvis</b>		1	
<b>Ludwigia peploides ssp montevidensis</b>			
<b>Luzula densiflora</b>			1
<b>Luzula modesta</b>		1	1
<b>Lycopodium deuterodensum</b>			
<b>Lycopodium fastigiatum</b>			1
<b>Lygodium microphyllum</b>			1



<i>Lyperanthus nigricans</i>			1
Taxon	endemic	disjunct	range limit
<i>Lysimachia japonica</i>			1
<i>Macadamia tetraphylla</i>			1
<i>Macrothelypteris torresiana</i>			1
<i>Macrozamia communis</i>		1	1
<i>Macrozamia concinna</i>			
<i>Macrozamia fawcettii</i>	1		
<i>Macrozamia johnsonii</i>	1		
<i>Macrozamia pauli-guilielmi</i> ssp <i>flexuosa</i>			1
<i>Macrozamia stenomera</i>			
<i>Marsdenia fraseri</i>			
<i>Marsdenia hemiptera</i>			
<i>Marsdenia liisae</i>			1
<i>Marsdenia lloydii</i>			1
<i>Marsdenia longiloba</i>			1
<i>Marsdenia suaveolens</i>			1
<i>Maytenus bilocularis</i>			1
<i>Mazus pumilio</i>			
<i>Medicosma cunninghamii</i>			
<i>Melaleuca alternifolia</i>			1
<i>Melaleuca biconvexa</i>			1
<i>Melaleuca bracteata</i>			1
<i>Melaleuca deanei</i>			
<i>Melaleuca ericifolia</i>			1
<i>Melaleuca groveana</i>			1
<i>Melaleuca squamea</i>			1
<i>Melaleuca squarrosa</i>			
<i>Melaleuca tamariscina</i> ssp <i>irbyana</i>			1
<i>Melaleuca tortifolia</i>			1
<i>Melastoma affine</i>			1
<i>Melichrus adpressus</i>		1	1
<i>Melichrus</i> sp A			
<i>Melichrus</i> sp. <i>Gibberagee</i>			
<i>Melicope elleryana</i>			1
<i>Melicope erythrococca</i>			1
<i>Melicope vitiflora</i>			1
<i>Melodinus guilfoylei</i>			1
<i>Microcitrus australasica</i> var <i>australasica</i>			1
<i>Micromelum minutum</i>			1
<i>Micromyrtus blakelyi</i>			
<i>Micromyrtus sessilis</i>			

<b>Micromyrtus striata</b>		1	
<b>Taxon</b>	<b>endemic</b>	<b>disjunct</b>	<b>range limit</b>
<b>Microseris lanceolata</b>			
<b>Microstegium nudum</b>			
<b>Microtis rara</b>		1	
<b>Microtrichomanes vitiense</b>			1
<b>Millettia australis</b>			
<b>Millettia megasperma</b>			1
<b>Mimulus gracilis</b>			
<b>Minuria leptophylla</b>			
<b>Mirbelia confertiflora</b>			1
<b>Mirbelia speciosa ssp ringrosei</b>			1
<b>Mischocarpus anodontus</b>			1
<b>Mischocarpus australis</b>			1
<b>Mischocarpus lachnocarpus</b>			
<b>Mischocarpus pyriformis</b>			1
<b>Mitrasacme pygmaea</b>			
<b>Mitrasacme serpyllifolia</b>			1
<b>Momordica balsamina</b>		1	
<b>Monococcus echinophorus</b>			
<b>Monotaxis macrophylla</b>			
<b>Morinda acutifolia</b>			1
<b>Mucuna gigantea</b>			
<b>Muehlenbeckia costata</b>			
<b>Muellerina myrtifolia</b>			1
<b>Myoporum betcheanum</b>			1
<b>Myoporum boninense ssp australe</b>			
<b>Myosotis australis</b>			1
<b>Myosotis exarrhena</b>			1
<b>Myriophyllum alpinum</b>		1	1
<b>Myriophyllum implicatum</b>			
<b>Myriophyllum pedunculatum ssp pedunculatum</b>			1
<b>Myriophyllum striatum</b>			
<b>Neisosperma poweri</b>			1
<b>Neoastelia spectabilis</b>	1		
<b>Nephrolepis cordifolia</b>			1
<b>Neptunia gracilis</b>		1	
<b>Nertera granadensis</b>		1	1
<b>Niemeyera chartacea</b>			1
<b>Notelaea johnsonii</b>			
<b>Notelaea linearis</b>			1
<b>Notelaea sp A</b>			1

<i>Nothofagus moorei</i>		1	
<b>Taxon</b>	<b>endemic</b>	<b>disjunct</b>	<b>range limit</b>
<i>Notothixos incanus</i>			
<i>Nymphaea gigantea</i>			
<i>Nymphoides crenata</i>		1	
<i>Oberonia complanata</i>			1
<i>Oberonia titania</i>			
<i>Ochrosia moorei</i>			1
<i>Ochrosperma citriodorum</i>	1	1	1
<i>Ochrosperma lineare</i>			1
<i>Olax angulata</i>	1		
<i>Olax retusa</i>			1
<i>Olea paniculata</i>			1
<i>Olearia alpicola</i>			1
<i>Olearia argophylla</i>		1	1
<i>Olearia canescens</i>			1
<i>Olearia chrysophylla</i>		1	
<i>Olearia cordata</i>			
<i>Olearia covenyi</i>		1	1
<i>Olearia cydoniifolia</i>		1	
<i>Olearia erubescens</i>		1	
<i>Olearia flocktoniae</i>	1		
<i>Olearia gravis</i>			
<i>Olearia heterocarpa</i>			1
<i>Olearia myrsinoides</i>			1
<i>Olearia oppositifolia</i>	1		
<i>Olearia phlogopappa</i>		1	1
<i>Olearia ramulosa</i>			
<i>Olearia</i> sp. aff. <i>erubescens</i>			
<i>Olearia</i> sp.2 Wollomombi			
<i>Olearia stellulata</i>		1	
<i>Olearia stilwelliae</i>	1		
<i>Olearia tomentosa</i>			1
<i>Opercularia varia</i>			1
<i>Ophioglossum lusitanicum</i> ssp. <i>coriaceum</i>			
<i>Ophioglossum pendulum</i>		1	1
<i>Ophioglossum reticulatum</i>			
<i>Oreobolus distichus</i>		1	1
<i>Oreobolus oxycarpus</i> ssp. <i>oxycarpus</i>		1	1
<i>Oreomyrrhis ciliata</i>			1
<i>Oreomyrrhis eriopoda</i>			1
<i>Orthoceras strictum</i>			

<b>Ottelia ovalifolia</b>			
<b>Taxon</b>	<b>endemic</b>	<b>disjunct</b>	<b>range limit</b>
<b>Owenia cepiodora</b>			1
<b>Oxylobium ellipticum</b>		1	
<b>Oxylobium pulteneae</b>			1
<b>Oxylobium robustum</b>			1
<b>Oxylobium scandens var obovatum</b>			1
<b>Ozothamnus adnatus</b>			
<b>Ozothamnus argophyllus</b>			1
<b>Ozothamnus bidwillii</b>			1
<b>Ozothamnus ferrugineus</b>			1
<b>Ozothamnus obcordatus ssp major</b>			
<b>Ozothamnus obovatus</b>			1
<b>Ozothamnus rufescens</b>			1
<b>Ozothamnus vagans</b>			1
<b>Ozothamnus whitei</b>		1	
<b>Pandorea baileyana</b>			1
<b>Pandorea jasminoides</b>			1
<b>Panicum lachnophyllum</b>			1
<b>Panicum paludosum</b>			
<b>Papillilabium beckleri</b>			
<b>Parsonsia brownii</b>			1
<b>Parsonsia dorrigensis</b>		1	1
<b>Parsonsia fulva</b>			1
<b>Parsonsia induplicata</b>			1
<b>Parsonsia largiflorens</b>			
<b>Parsonsia lilacina</b>			1
<b>Parsonsia longipetiolata</b>			1
<b>Parsonsia purpurascens</b>			1
<b>Parsonsia rotata</b>			1
<b>Parsonsia tenuis</b>			1
<b>Parsonsia ventricosa</b>			1
<b>Paspalidium albobillosum</b>			
<b>Paspalidium aversum</b>			
<b>Paspalidium breviflorum</b>			1
<b>Paspalidium constrictum</b>			
<b>Paspalidium gausum</b>			1
<b>Paspalidium grandispiculatum</b>			1
<b>Passiflora cinnabarina</b>		1	1
<b>Patersonia fragilis</b>		1	
<b>Patersonia longifolia</b>			1
<b>Pavetta australiensis</b>			1

<b>Pelargonium inodorum</b>			
<b>Taxon</b>	<b>endemic</b>	<b>disjunct</b>	<b>range limit</b>
<b>Pentaceras australe</b>			1
<b>Peristeranthus hillii</b>			
<b>Persicaria dichotoma</b>			1
<b>Persicaria elatior</b>	1		
<b>Persoonia acuminata</b>		1	1
<b>Persoonia adenantha</b>			1
<b>Persoonia chamaepeuce</b>			1
<b>Persoonia daphnoides</b>			1
<b>Persoonia hirsuta ssp evoluta</b>			
<b>Persoonia hirsuta ssp hirsuta</b>			
<b>Persoonia katerae</b>	1		
<b>Persoonia lanceolata</b>		1	1
<b>Persoonia laurina ssp. laurina</b>			1
<b>Persoonia levis</b>			1
<b>Persoonia linearis</b>			1
<b>Persoonia media</b>			1
<b>Persoonia oleoides</b>	1		
<b>Persoonia procumbens</b>			1
<b>Persoonia rigida</b>			1
<b>Persoonia rufa</b>	1		
<b>Persoonia stradbrokeensis</b>			1
<b>Persoonia terminalis ssp terminalis</b>			
<b>Persoonia virgata</b>			1
<b>Persoonia volcanica</b>			1
<b>Petalostigma pubescens</b>			1
<b>Petalostigma triloculare</b>			1
<b>Petermannia cirrosa</b>			1
<b>Phaius australis</b>		1	1
<b>Phaius tankervilliae</b>			1
<b>Phebalium ambiens</b>		1	1
<b>Phebalium dentatum</b>		1	1
<b>Phebalium elatius ssp beckleri</b>		1	1
<b>Phebalium elatius ssp elatius</b>			
<b>Phebalium glandulosum ssp eglandulosum</b>			
<b>Phebalium nottii</b>		1	
<b>Phebalium rotundifolium</b>			
<b>Phebalium squamulosum ssp ozothamnoides</b>			1
<b>Phebalium squamulosum ssp verrucosum</b>	1		1
<b>Phebalium sympetalum</b>			
<b>Phebalium woombye</b>			1

<b>Phyllanthus microcladus</b>			1
<b>Taxon</b>	<b>endemic</b>	<b>disjunct</b>	<b>range limit</b>
<b>Picris evae</b>			
<b>Picris sp. nov.</b>			
<b>Pimelea umbratica</b>			1
<b>Pimelea venosa</b>			
<b>Pipturus argenteus</b>			1
<b>Pisonia aculeata</b>			
<b>Pisonia umbellifera</b>			
<b>Pittosporum oreillyanum</b>			1
<b>Pittosporum rhombifolium</b>			1
<b>Planchonella chartacea</b>			1
<b>Planchonella cotinifolia</b>			1
<b>Planchonella laurifolia</b>			1
<b>Planchonella myrsinoides</b>			1
<b>Planchonella pohlmaniana</b>			
<b>Plantago cladarophylla</b>	1		
<b>Plantago hispida</b>		1	
<b>Plantago palustris</b>	1		
<b>Platysace clelandii</b>			
<b>Platysace species A</b>			1
<b>Plectranthus alloplectus</b>			1
<b>Plectranthus argentatus</b>		1	1
<b>Plectranthus cremnus</b>			
<b>Plectranthus nitidus</b>			1
<b>Plectranthus sp. 3 Long Gully</b>	1		
<b>Plectranthus sp. Barrington Tops (Chichester)</b>			
<b>Plectranthus sp. Coramba Rd (Nana Creek)</b>			
<b>Plectranthus sp. Dorrigo Mountain</b>			
<b>Plectranthus sp. Kangaroo River</b>			
<b>Plectranthus sp. New Italy</b>			
<b>Plectranthus sp. Nundle</b>			
<b>Plectranthus sp. Pinnacle</b>			
<b>Plectranthus sp. Star Ridge (Orara West)</b>			
<b>Plectranthus suaveolens</b>			
<b>Pleogyne australis</b>			1
<b>Plinthanthesis urvillei</b>		1	1
<b>Plumbago zeylanica</b>			
<b>Pneumatopteris pennigera</b>			
<b>Pneumatopteris sogerensis</b>			1
<b>Podolepis hieracioides</b>		1	1
<b>Podolepis monticola</b>			1

<b>Podolepis neglecta</b>			
<b>Taxon</b>	<b>endemic</b>	<b>disjunct</b>	<b>range limit</b>
<b>Podolobium aestivum</b>	1	1	
<b>Polyalthia nitidissima</b>			1
<b>Polygala linariifolia</b>			
<b>Polyscias sambucifolia ssp C</b>			1
<b>Pomaderris aspera</b>		1	1
<b>Pomaderris betulina</b>			1
<b>Pomaderris bodalla</b>			
<b>Pomaderris brunnea</b>			
<b>Pomaderris costata</b>			
<b>Pomaderris crassifolia</b>			
<b>Pomaderris elliptica</b>			1
<b>Pomaderris eriocephala</b>			
<b>Pomaderris ferruginea</b>			1
<b>Pomaderris helianthemifolia</b>			
<b>Pomaderris intermedia</b>			1
<b>Pomaderris ledifolia</b>			1
<b>Pomaderris nitidula</b>			1
<b>Pomaderris notata</b>			1
<b>Pomaderris pauciflora</b>			
<b>Pomaderris precaria</b>			
<b>Pomaderris prunifolia</b>		1	
<b>Pomaderris queenslandica</b>			1
<b>Pomaderris reperta</b>			
<b>Pomaderris sericea</b>			
<b>Pomaderris subcapitata</b>		1	1
<b>Pomaderris vellea</b>		1	
<b>Poranthera ericifolia</b>			1
<b>Potamophila parviflora</b>	1		
<b>Pothos longipes</b>			1
<b>Prasophyllum australe</b>			
<b>Prasophyllum brevilabre</b>			
<b>Prasophyllum dossenum</b>			
<b>Prasophyllum exilis</b>			1
<b>Prasophyllum flavum</b>			
<b>Prasophyllum odoratum</b>			1
<b>Prasophyllum patens</b>			
<b>Prasophyllum rogersii</b>		1	1
<b>Prasophyllum species A</b>	1		
<b>Prasophyllum striatum</b>			1
<b>Pratia concolor</b>			1

<b>Pratia pedunculata</b>			1
<b>Taxon</b>	<b>endemic</b>	<b>disjunct</b>	<b>range limit</b>
<b>Pratia surrepens</b>		1	1
<b>Premna lignum-vitae</b>			
<b>Prostanthera askania (Syn. P. sp. Strickland State Forest)</b>			
<b>Prostanthera caerulea</b>			1
<b>Prostanthera cryptandroides</b>			
<b>Prostanthera densa</b>			1
<b>Prostanthera discolor</b>			
<b>Prostanthera howelliae</b>		1	1
<b>Prostanthera incana</b>			1
<b>Prostanthera junonis (syn. P. sp. Somersby)</b>			
<b>Prostanthera sp. F Bundjalung National Park</b>	1		
<b>Prostanthera prunelloides</b>		1	1
<b>Prostanthera rhombea</b>		1	
<b>Prostanthera rotundifolia</b>			1
<b>Prostanthera saxicola var major</b>		1	
<b>Prostanthera scutellarioides</b>		1	1
<b>Prostanthera sp. aff. howelliae (Sherwood Nature Reserve)</b>			
<b>Prostanthera spinosa</b>		1	1
<b>Prostanthera staurophylla</b>			
<b>Pseudanthus divaricatissimus</b>			
<b>Pseudanthus orientalis</b>			
<b>Pseudanthus ovalifolius</b>			
<b>Pseudanthus sp. aff. pimeleoides</b>			
<b>Pseudoraphis paradoxa</b>			
<b>Pseudoweinmannia lachnocarpa</b>			1
<b>Psilotum complanatum</b>		1	1
<b>Psoralea tenax</b>			
<b>Psychotria simmondsiana</b>			1
<b>Pteris comans</b>			
<b>Pterocaulon redolens</b>			1
<b>Pterostylis abrupta</b>			1
<b>Pterostylis alveata</b>			1
<b>Pterostylis chaetophora</b>			1
<b>Pterostylis collina</b>			1
<b>Pterostylis cucullata (P. sp. D; P. sp. aff. cucullata)</b>	1	1	1
<b>Pterostylis cynocephala</b>			
<b>Pterostylis daintreana</b>			
<b>Pterostylis decurva</b>			1
<b>Pterostylis elegans</b>			



<b>Pterostylis furcata</b>			
<b>Pterostylis gibbosa</b>			
<b>Taxon</b>	<b>endemic</b>	<b>disjunct</b>	<b>range limit</b>
<b>Pterostylis laxa</b>			1
<b>Pterostylis longicurva</b>			
<b>Pterostylis longipetala</b>			1
<b>Pterostylis metcalfei</b>			
<b>Pterostylis mutica</b>			
<b>Pterostylis nigricans</b>			1
<b>Pterostylis ophioglossa</b>			
<b>Pterostylis reflexa</b>			1
<b>Pterostylis rufa</b>			1
<b>Pterostylis russellii</b>			1
<b>Pterostylis sp. aff. alata</b>		1	1
<b>Pterostylis sp. aff. alveata sens lat. (Mt. Duval and New England escarpment)</b>			
<b>Pterostylis sp. aff. cynocephala</b>			
<b>Pterostylis sp. aff. laxa (Barrington Tops)</b>			
<b>Pterostylis sp. aff. parviflora (Ebor)</b>			
<b>Pterostylis sp. aff. revoluta (Northern Tablelands) - syn. Pterostylis sp. B</b>			
<b>Pterostylis torquata</b>			
<b>Pterostylis truncata</b>			1
<b>Pterostylis woollsii</b>		1	
<b>Pultenaea altissima</b>			1
<b>Pultenaea blakelyi</b>			1
<b>Pultenaea campbellii</b>	1		
<b>Pultenaea cunninghamii</b>			
<b>Pultenaea dentata</b>			
<b>Pultenaea fasciculata</b>		1	1
<b>Pultenaea juniperina var mucronata</b>			1
<b>Pultenaea linophylla</b>			
<b>Pultenaea myrtoides</b>			1
<b>Pultenaea paleacea</b>			1
<b>Pultenaea petiolaris</b>		1	
<b>Pultenaea polifolia</b>			1
<b>Pultenaea pycnocephala</b>			1
<b>Pultenaea sp. aff. flexilis</b>	1		
<b>Pultenaea species B</b>	1		
<b>Pultenaea species J</b>			1
<b>Pultenaea stuartiana</b>			
<b>Pultenaea subspicata</b>			1
<b>Quassia sp. Moonee Creek (Quassia sp. B)</b>			
<b>Quassia sp.A</b>		1	

Quintinia verdonii			1
Randia chartacea			1
Taxon	endemic	disjunct	range limit
Randia moorei			1
Ranunculus pimpinellifolius			1
Rapanea sp. A	1		
Rapanea subsessilis			1
Restio fimbriatus			1
Restio stenocoleus			1
Restio tetraphyllus			
Restio tetraphyllus ssp meiostachyus			
Rhinerrhiza divitiflora			1
Rhizanthella slateri			
Rhizophora stylosa			1
Rhodamnia argentea			1
Rhodamnia maideniana			1
Rhodamnia whiteana			1
Rhodanthe polyphylla			
Rhodosphaera rhodanthema			1
Rhynchosia acuminatissima			1
Rhynchosia minima			
Rhynchospora corymbosa			
Rhynchospora rubra			1
Rhytidisporum procumbens			1
Ricinocarpos speciosus			1
Ripogonum brevifolium			1
Ripogonum discolor			1
Ripogonum elseyanum			1
Rostellularia obtusa			1
Rulingia hermanniifolia			
Rulingia procumbens			
Rulingia prostrata			
Rulingia salviifolia			1
Rutidosis heterogama		1	
Sambucus gaudichaudiana			
Sarcochilus aequalis			1
Sarcochilus australis			1
Sarcochilus ceciliae			1
Sarcochilus dilatatus			1
Sarcochilus fitzgeraldii (Dorrigo, Kunderang, Tweed metapopulations)			
Sarcochilus hartmannii			
Sarcochilus spathulatus			

<i>Sarcophilus weinthalii</i>			1
<i>Sarcopteryx stipata</i>			1
Taxon	endemic	disjunct	range limit
<i>Sarcostemma brunonianum</i>		1	
<i>Sauropus species A</i>			1
<i>Scaevola aemula</i>			1
<i>Scaevola hookeri</i>			1
<i>Schelhammera undulata</i>			1
<i>Schistotylus purpuratus</i>	1		1
<i>Schizachyrium fragile</i>			1
<i>Schizaea rupestris</i>		1	1
<i>Schoenus calostachyus</i>			1
<i>Schoenus latelaminatus</i>		1	
<i>Schoenus lepidosperma</i> ssp <i>pachylepis</i>			1
<i>Schoenus scabripes</i>			1
<i>Schoenus vaginatus</i>			1
<i>Schoenus villosus</i>			
<i>Scleria levis</i>			1
<i>Scleria rugosa</i>			1
<i>Scleria tricuspidata</i>			1
<i>Scutellaria mollis</i>		1	1
<i>Secamone elliptica</i>			1
<i>Selenodesmium elongatum</i>			1
<i>Senecio biserratus</i>			1
<i>Senecio glomeratus</i>			
<i>Senecio gunnii</i>		1	1
<i>Senecio linearifolius</i>			1
<i>Senecio macranthus</i>			1
<i>Senecio picridioides</i>		1	1
<i>Senecio quadridentatus</i>			
<i>Senecio</i> sp. aff. <i>lautus</i> Barrington Tops (swamps)			
<i>Senecio</i> sp. E			1
<i>Senecio tenuiflorus</i>			
<i>Senna acclinis</i>			
<i>Senna aciphylla</i>			
<i>Senna clavigera</i>			
<i>Senna odorata</i>			
<i>Sesbania cannabina</i> var <i>cannabina</i>		1	
<i>Setaria australiensis</i>			1
<i>Sida cordifolia</i>			1
<i>Sida corrugata</i>			
<i>Siphonodon australis</i>			1

<b>Solanum callium</b>			1
<b>Solanum corifolium</b>		1	1
<b>Taxon</b>	<b>endemic</b>	<b>disjunct</b>	<b>range limit</b>
<b>Solanum densevestitum</b>			1
<b>Solanum furfuraceum</b>			1
<b>Solanum inaequilaterum</b>			1
<b>Solanum laciniatum</b>		1	1
<b>Solanum linearifolium</b>			
<b>Solanum nemophilum</b>			1
<b>Solanum opacum</b>			
<b>Solanum papaverifolium</b>			1
<b>Solanum pungetium</b>			1
<b>Solanum vescum</b>			
<b>Solenogyne dominii</b>			1
<b>Solenogyne gunnii</b>		1	1
<b>Sophora fraseri</b>			1
<b>Sophora tomentosa</b>			
<b>Sparganium subglobosum</b>			
<b>Spermacoce brachystema</b>			1
<b>Sphaerolobium minus</b>			
<b>Spirodela punctata</b>			
<b>Sprengelia incarnata</b>			1
<b>Stackhousia spathulata</b>			
<b>Stenocarpus sinuatus</b>			1
<b>Stephania aculeata</b>			1
<b>Sterculia quadrifida</b>			
<b>Stipa densiflora</b>			
<b>Stipa setacea</b>			
<b>Stipa verticillata</b>			
<b>Strangea linearis</b>			1
<b>Streptothamnus moorei</b>			1
<b>Strychnos arborea</b>			
<b>Stuartina hamata</b>			
<b>Stylidium uliginosum</b>			1
<b>Styphelia perileuca</b>			
<b>Styphelia viridis ssp breviflora</b>			1
<b>Styphelia viridis ssp viridis</b>			1
<b>Swainsona fraseri</b>			1
<b>Swainsona monticola</b>			
<b>Swainsona parviflora</b>			
<b>Symphionema paludosum</b>			1
<b>Symplocos baeuerlenii</b>			1

<i>Syzygium corynanthum</i>			1
<i>Syzygium crebrinerve</i>			1
Taxon	endemic	disjunct	range limit
<i>Syzygium hodgkinsoniae</i>			1
<i>Syzygium luehmannii</i>			1
<i>Syzygium moorei</i>			1
<i>Syzygium paniculatum</i>			1
<i>Tabernaemontana pandacaqui</i>			1
<i>Taeniophyllum muelleri</i>			1
<i>Tapeinosperma pseudojambosa</i>			1
<i>Tarennia cameronii</i>			1
<i>Tasmannia glaucifolia</i>	1	1	1
<i>Tasmannia purpurascens</i>	1	1	1
<i>Telopea aspera</i>	1		
<i>Tephrosia baueri</i>			
<i>Tephrosia bidwillii</i>			1
<i>Tephrosia brachyodon</i>		1	
<i>Tephrosia filipes</i>			1
<i>Tephrosia rufula</i>			
<i>Tetraria capillaris</i>			1
<i>Tetratheca ericifolia</i>			1
<i>Tetratheca glandulosa</i>			
<i>Tetratheca juncea</i>			1
<i>Teucrium</i> sp. A			1
<i>Teucrium</i> sp. D			
<i>Thelionema grande</i>			
<i>Thelymitra circumsepta</i>		1	1
<i>Thelymitra cyanea</i>			1
<i>Thelymitra fragrans</i>		1	
<i>Thesium australe</i>		1	
<i>Thismia rodwayi</i>			
<i>Thysanotus juncifolius</i>			1
<i>Tinospora smilacina</i>			1
<i>Tinospora tinosporoides</i>			1
<i>Todea barbara</i>			
<i>Toeckima dasyrrhache</i>			1
<i>Toeckima tenax</i>			1
<i>Trachymene anisocarpa</i>		1	1
<i>Trachymene procumbens</i>			
<i>Tragia novae-hollandiae</i>			1
<i>Trichosanthes subvelutina</i>			
<i>Tricoryne anceps</i> ssp <i>pterocaulon</i>			1

Tricoryne simplex			1
Tricostularia pauciflora		1	1
Taxon	endemic	disjunct	range limit
Triglochin multifructum			
Tripladenia cunninghamii			1
Triplarina imbricata			
Triumfetta rhomboidea			1
Triunia youngiana			1
Trochocarpa sp. A	1		1
Turraea pubescens			1
Tylophora barbata			1
Tylophora benthamii			1
Tylophora grandiflora			1
Tylophora linearis			
Tylophora paniculata			1
Tylophora woollsii		1	
Typha domingensis			
Typha orientalis			
Typhonium brownii			
Typhonium eliosurum		1	1
Uncinia nemoralis			1
Uncinia tenella			1
Urochloa foliosa			1
Urochloa piligera			
Uromyrtus australis	1		
Uromyrtus sp. 1 (Lamington)			1
Utricularia aurea			1
Utricularia australis			1
Utricularia biloba			
Utricularia caerulea			1
Utricularia gibba			
Utricularia monanthos		1	1
Utricularia uniflora			1
Velleia montana		1	1
Velleia perfoliata			
Veronica gracilis		1	
Veronica notabilis			1
Veronica serpyllifolia			
Veronica species B	1		
Vesselowskyia rubifolia	1	1	1
Vetiveria filipes		1	
Vigna lanceolata			

<i>Vigna luteola</i>			1
<i>Vigna marina</i>			1
Taxon	endemic	disjunct	range limit
<i>Vigna vexillata</i>			
<i>Viola caleyana</i>			1
<i>Vitex trifolia</i> var <i>trifolia</i>			1
<i>Vittadinia dissecta</i>			
<i>Vittadinia hispidula</i>			
<i>Vittadinia muelleri</i>			
<i>Vittadinia sulcata</i>			
<i>Vittadinia tenuissima</i>			
<i>Wahlenbergia ceracea</i>		1	1
<i>Wahlenbergia glabra</i>			1
<i>Wahlenbergia graniticola</i>			
<i>Wahlenbergia littoricola</i>		1	
<i>Wahlenbergia luteola</i>			1
<i>Wahlenbergia scopulicola</i>			1
<i>Wahlenbergia</i> sp. 4 Point Lookout			
<i>Westringia amabilis</i>			
<i>Westringia blakeana</i>			1
<i>Westringia glabra</i>			
<i>Westringia longifolia</i>			1
<i>Westringia sericea</i>			1
<i>Wilkia austroqueenslandica</i>			1
<i>Wilkia macrophylla</i>			1
<i>Xanthorrhoea malacophylla</i>			1
<i>Xylosma terrae-reginae</i>			1
<i>Xyris gracilis</i> ssp <i>gracilis</i>			1
<i>Zannichellia palustris</i>			
<i>Zanthoxylum brachyacanthum</i>			1
<i>Zeuxine oblonga</i>			1
<i>Zieria adenodonta</i>			1
<i>Zieria floydii</i>			
<i>Zieria fraseri</i> ssp A			1
<i>Zieria furfuracea</i>			
<i>Zieria hindii</i>	1		

Taxon	endemic	disjunct	range limit
<b>Zieria involucrata</b>			
<b>Zieria lasiocaulis</b>			
<b>Zieria pilosa</b>			1
<b>Zieria prostrata</b>	1		
<b>Zieria smithii (Diggers Headland Form)</b>			
<b>Zieria species K</b>		1	
<b>Zornia floribunda</b>		1	1
<b>Zornia muriculata</b>		1	
<b>Summary</b>	89	227	998



# APPENDIX C – SUMMARY OF LANDSCAPE VALUES IDENTIFIED BY EXPERTS

Value in Landscape	Rare Species	Endemic	Important Habitat	Primitive/ Relictual	Refugia	Migratory Species	Disjunct Species or Species at Limits of their Range	Species Richness	Habitat Richness/ Wildlife Habitat
<p><b>SUMMARY</b></p> <p>Landscape values</p>	<ul style="list-style-type: none"> <li>• All rainforests</li> <li>• All E. tereticornis</li> <li>• Escarpment Forest</li> </ul>	<ul style="list-style-type: none"> <li>• Rainforest above 700m.</li> <li>• Dry Rainforest</li> <li>• Headwater areas.</li> <li>• Riparian rainforest and wet sclerophyll forest.</li> <li>• Wetlands etc.</li> <li>• Alpine grasslands and Sub-alpine areas in Barrington Tops</li> <li>• Rock Outcrops (Tweed Shield and Macleay and Guy Fawkes gorges)</li> <li>• Granite (Dorrigo plateau, Ebor volcano, Cathedral Rock, Torrington, Gibraltar Range, New England batholith, Hanging Rock at Nundle and Tuggelo).</li> <li>• Trachyte (Dorrigo Plateau and Ebor volcano).</li> <li>• Serpentine (Watchimbark, Curricabark and Baryulgil).</li> </ul>	<ul style="list-style-type: none"> <li>• Sub-tropical rainforest under 300m asl</li> <li>• Headwater areas.</li> <li>• Riparian rainforest and wet sclerophyll forest.</li> <li>• Wetlands etc.</li> <li>• Great escarpment</li> <li>• Forested Catchments</li> <li>• Areas dominated by winter-flowering eucalypts for nectivorous species.</li> </ul>	<ul style="list-style-type: none"> <li>• All Rainforest (Flora)</li> <li>• Nothofagus Rainforest.</li> <li>• Wetlands etc.</li> <li>• Wet Sclerophyll Forest below 300m asl.</li> <li>• Alpine grasslands</li> </ul>	<ul style="list-style-type: none"> <li>• All rainforest.</li> <li>• Wetlands etc.</li> <li>• Steep environmental gradients in dry forests</li> <li>• Sandstone Escarpments</li> <li>• Overlap between the western slopes and plains</li> <li>• Forested remnants of coastal plains and tablelands forest ecosystems as refugia from current environ. perturbations.</li> </ul>	<ul style="list-style-type: none"> <li>• Rainforests within 10 km of coast.</li> <li>• Wetlands etc. within 10 km of the coast.</li> <li>• Banksia and Melaleuca within 10 km of coast.</li> <li>• E. tereticornis within 10 km of coast.</li> <li>• Areas dominated by winter-flowering eucalypts for nectivorous species.</li> <li>• Identify all RAMSAR/ CAMBA Sites</li> </ul>	<ul style="list-style-type: none"> <li>• Nil</li> </ul>	<ul style="list-style-type: none"> <li>• Nil</li> </ul>	<ul style="list-style-type: none"> <li>• All rainforest</li> <li>• Great Escarpment</li> <li>• Sub-alpine areas</li> <li>• Wetlands etc.</li> <li>• The rainforest-wet sclerophyll forest - grassy open forest complex in Richmond Range, Ewingar, Washpool and Gibraltar Range.</li> </ul>

<b>Value in Landscape</b>	<b>Rare Species</b>	<b>Endemic</b>	<b>Important Habitat</b>	<b>Primitive/ Relictual</b>	<b>Refugia</b>	<b>Migratory Species</b>	<b>Disjunct Species or Species at Limits of their Range</b>	<b>Species Richness</b>	<b>Habitat Richness/ Wildlife Habitat</b>
SUMMARY  Landscape values  (Continued)	•	<ul style="list-style-type: none"> <li>• Dry open forest with heathy u/s on Glenreagh/Coadale Sandstone</li> <li>• Basalt areas in Barrington Tops.</li> <li>• Metasediment areas in Gibraltar Ranges</li> </ul>				•			<ul style="list-style-type: none"> <li>• Forested areas and adjacent grassy open areas in the Upper Clarence through Richmond Range to Wallaby Creek in the North</li> </ul>

**APPENDIX D – SUMMARY OF AREAS IDENTIFIED BY EXPERTS**

<b>Value in Landscape</b>	<b>Rare Species</b>	<b>Endemic</b>	<b>Important Habitat</b>	<b>Primitive/ Relictual</b>	<b>Refugia</b>	<b>Migratory Species</b>	<b>Disjunct Species or Species at Limits of their Range</b>	<b>Species Richness</b>	<b>Habitat Richness/ Wildlife Habitat</b>

SUMMARY	Important locations are:	Rainforest in:	Important locations are:		Rainforest in	Important locations are:			Important locations (for terrestrial mammals only) are:
Named Locations	<ul style="list-style-type: none"> <li>• Billinudgel</li> <li>• Canbol</li> <li>• Bungellun</li> <li>• Area between Ballina and Lennox Head.</li> <li>• Gibraltar Range</li> <li>• Washpool, Timbarra Plateau</li> <li>• Barrington Tops</li> <li>• Carrai Plateau</li> <li>• Chaelundi and Dorrig</li> <li>• Upper Hastings, Werrikimbe and Wingham</li> <li>• MacPherson Range</li> <li>• Richmond Range</li> <li>• New England and Styx River</li> <li>• Candole and Coast Range.</li> </ul>	Tweed Shield Richmond River Dorrig Plateau Ebor Volcano Barrington Tops Focal Peak Volcano  Important locations are: <ul style="list-style-type: none"> <li>• Gibraltar Ranges</li> <li>• Washpool</li> <li>• Timbarra Plateau</li> <li>• Barrington Tops</li> <li>• Carrai Plateau</li> <li>• Chaelundi/Dorrig</li> <li>• Upper Hastings, Werrikimbe and Wingham</li> </ul>	<ul style="list-style-type: none"> <li>• Gibraltar Range</li> <li>• Washpool</li> <li>• Timbarra Plateau</li> <li>• Barrington Tops</li> <li>• Carrai Plateau</li> <li>• Chaelundi and Dorrig</li> <li>• Upper Hastings, Werrikimbe and Wingham</li> <li>• MacPherson Range</li> <li>• Richmond Range</li> <li>• New England and Styx River</li> <li>• Candole and Coast Range</li> <li>• Volcanoes east of Gibraltar, Barrington Tops and Mt Warning</li> </ul>		Tweed Shield Dorrig Plateau Ebor Volcano Focal Peak Volcano Gibraltar Ranges	<ul style="list-style-type: none"> <li>• Billinudgel</li> <li>• Canbol</li> <li>• Bungellun</li> <li>• Area between Ballina and Lennox Head.</li> </ul>			<ul style="list-style-type: none"> <li>• Richmond Range</li> <li>• Candole and Coast Range</li> <li>• Clarence Valley</li> <li>• Myall Lakes (Lower Catchment)</li> </ul>

### Discrete Identification by Experts:

Willi Willi Caves - near Kemspey. Bat experts suggested that all forested areas within a 60 km radius of Willi Willi caves were of national significance. Willi Willi caves is the largest known maternity roost for the two migratory bat species *Miniopterus schreibersii* and *M. australis* in NSW. The 60 km radius was calculated using the known average maximum population at the cave of pregnant and lactating females, their apparent maximum foraging range and density, and the proximity of caves of similar importance on the Carrai Plateau (included within the 60 km radius).

The Gibraltar Range, Washpool and Ewingar forest areas represent among the best development of moist eucalypt forests in the world. Some experts consider NE NSW as the centre of evolutionary development of such types. The area also represents the best development of species richness for arboreal marsupials and macropods in NE in large spatial units.

## APPENDIX E – LIST OF DATA LAYERS THAT CONTRIBUTED TO NATIONAL ESTATE ANALYSIS

<b>Data Set</b>	<b>Agency</b>
Wildlife Atlas (fauna locality records)	NSW NPWS (Internal Data-Set)
Priority Fauna (fauna locality records)	NSW NPWS (CRA Data-Set)
Flora (flora locality records)	NSW NPWS (CRA Data-Set)
Endemic Flora (GIS shape)	NSW NPWS (CRA Data-Set)
Endemic Flora (GIS grid)	NSW NPWS (CRA Data-Set)
Endemic Fauna (GIS grid)	NSW NPWS (CRA Data-Set)
Endemic Invertebrates (GIS Grid)	Australian Museum (CRA Data-Set)
Forest Ecosystems	NSW NPWS (CRA Data-Set)
Old-growth forest	NSW NPWS (CRA Data-Set)
Digital Elevation Model 1:25,000 (GIS grid)	
Geology 1:250,000 (GIS grid)	
Biophysical Naturalness 1:250,000	Environment Australia (Internal Data-Set)
CRAFTI Project (Aerial Photo Interpretation)	CRA Data-Set
Wild Rivers Disturbance Index	Environment Australia (Jointly owned Commonwealth Government Data-Set)

# APPENDIX F – EXISTING PROTECTIVE MECHANISMS FOR NATURAL NATIONAL ESTATE VALUES IN NSW

National Estate Values	JANIS related value	Sensitivity <sup>a</sup> and resilience <sup>b</sup> to forestry activities covered by the RFA	Percentage of value on public land in reserves			Existing off-reserve protection mechanisms
			Formal Reserve	Informal Reserve	Formal Reserves as a Result of 1998 NSW Decision	
Wilderness (A.2, B.1)	Yes*	High sensitivity to unnatural disturbance. Low resilience to forestry activities	-	N/A	-	<i>Wilderness Act 1977.</i>
Oldgrowth forest and rare old-growth forest (A.2 & B.1)	Yes*	High sensitivity to logging, grazing, unnatural fire and other forestry activities. Low resilience to forestry activities	45	-	59	<i>Threatened Species Conservation Act 1995 (TSCA), Environmental Planning and Assessment Act 1979 (EPA Act), National Parks and Wildlife Act 1974, Endangered Species Protection Act 1992 (ESP Act); Native Vegetation Conservation Act 1997 Conservation Protocols, Forest Management Zoning (FMZs), and Management Plans</i>
Vegetation Communities Characteristic of their Class (D.1)	Yes*	High sensitivity to logging, grazing, unnatural fire and other forestry activities. Low resilience to forestry activities	N/A	N/A	N/A	<i>Threatened Species Conservation Act 1995 (TSCA), Environmental Planning and Assessment Act 1979 (EPA Act), National Parks and Wildlife Act 1974, Endangered Species Protection Act 1992 (ESP Act); Native Vegetation Conservation Act 1997 Conservation Protocols, Forest Management Zoning (FMZs), and Management Plans.</i>

<sup>a</sup> Sensitivity – to disturbance, relates to extent of loss or diminution in a value due to the effects of disturbance.

<sup>b</sup> Resilience – relates to the extent of likely recovery of a diminished value, and to the time and management effort required to achieve this recovery.

\* JANIS values for which there were explicit numerical targets.

National Estate Values	JANIS related value	Sensitivity <sup>a</sup> and resilience <sup>b</sup> to forestry activities covered by the RFA	Percentage of value on public land in reserves			Existing off-reserve protection mechanisms
			Formal Reserve	Informal Reserve	Formal Reserves as a Result of 1998 NSW Decision	
Vegetation Succession (A.2)	Yes	High sensitivity to logging, grazing, unnatural fire and other forestry activities. Low resilience to forestry activities	N/A	N/A	N/A	<i>Threatened Species Conservation Act 1995 (TSCA), Environmental Planning and Assessment Act 1979 (EPA Act), National Parks and Wildlife Act 1974, Endangered Species Protection Act 1992 (ESP Act); Conservation Protocols, , Forest Management Zoning (FMZs). and Management Plans</i>
Natural landscapes (A.2 & B.1)	No	High sensitivity to logging, grazing, unnatural fire and other forestry activities. Low resilience to forestry activities	50	-	61	<i>The Heritage Act 1977, Wilderness Act 1977.</i>
Undisturbed catchments	No	High sensitivity to logging, grazing, unnatural fire and other forestry activities. Low resilience to forestry activities	61	-	69	<i>The Heritage Act 1977, Wilderness Act 1977.</i>

<sup>a</sup> Sensitivity – to disturbance, relates to extent of loss or diminution in a value due to the effects of disturbance.

<sup>b</sup> Resilience – relates to the extent of likely recovery of a diminished value, and to the time and management effort required to achieve this recovery.



National Estate Values	JANIS related value	Sensitivity <sup>a</sup> and resilience <sup>b</sup> to forestry activities covered by the RFA	Percentage of value on public land in reserves			Existing off-reserve protection mechanisms
			Formal Reserve	Informal Reserve	Formal Reserves as a Result of 1998 NSW Decision	
Flora and fauna refugia (A.1 & A.2)	Yes?	High sensitivity to logging, grazing, unnatural fire and other forestry activities. Low resilience to forestry activities	42	-	51	<i>Threatened Species Conservation Act 1995 (TSCA), Environmental Planning and Assessment Act 1979 (EPA Act), National Parks and Wildlife Act 1974, Endangered Species Protection Act 1992 (ESP Act); Conservation Protocols, Forest Management Zoning (FMZs), and Management Plans</i>
Migratory Species (A2 Important Habitat)	No	High sensitivity to logging, grazing, fire and other forestry activities. Low resilience to forestry activities	21	-	26	<i>RAMSAR, CAMBA and JAMBA convention and agreements on migratory and wetland species, Threatened Species Conservation Act 1995 (TSCA), Environmental Planning and Assessment Act 1979 (EPA Act), National Parks and Wildlife Act 1974, Endangered Species Protection Act 1992 (ESP Act); Conservation Protocols, Forest Management Zoning (FMZs), and Management Plans</i>

<sup>a</sup> Sensitivity – to disturbance, relates to extent of loss or diminution in a value due to the effects of disturbance.

<sup>b</sup> Resilience – relates to the extent of likely recovery of a diminished value, and to the time and management effort required to achieve this recovery.

National Estate Values	JANIS related value	Sensitivity <sup>a</sup> and resilience <sup>b</sup> to forestry activities covered by the RFA	Percentage of value on public land in reserves			Existing off-reserve protection mechanisms
			Formal Reserve	Informal Reserve	Formal Reserves as a Result of 1998 NSW Decision	
Primitive and relictual species (A.1)	Yes	High sensitivity to logging, grazing, unnatural fire and other forestry activities. Low resilience to forestry activities	24	-	48	<i>Threatened Species Conservation Act 1995 (TSCA), Environmental Planning and Assessment Act 1979 (EPA Act), National Parks and Wildlife Act 1974, Endangered Species Protection Act 1992 (ESP Act); Conservation Protocols, Forest Management Zoning (FMZs), and Management Plans</i>
Species at the limits of their distribution range (A.1)	No	Value is dependent on individual species response. Species sensitive to logging, grazing, and unnatural fire are at particular risk.	Fauna: 21 Flora: 33	-	34 49	<i>Threatened Species Conservation Act 1995 (TSCA), Environmental Planning and Assessment Act 1979 (EPA Act), National Parks and Wildlife Act 1974, Endangered Species Protection Act 1992 (ESP Act); Conservation Protocols, Forest Management Zoning (FMZs), and Management Plans</i>

<sup>a</sup> Sensitivity – to disturbance, relates to extent of loss or diminution in a value due to the effects of disturbance.

<sup>b</sup> Resilience – relates to the extent of likely recovery of a diminished value, and to the time and management effort required to achieve this recovery.

National Estate Values	JANIS related value	Sensitivity <sup>a</sup> and resilience <sup>b</sup> to forestry activities covered by the RFA	Percentage of value on public land in reserves			Existing off-reserve protection mechanisms
			Formal Reserve	Informal Reserve	Formal Reserves as a Result of 1998 NSW Decision	
Habitat richness	No	Sensitivity and resilience varies depending on the habitat. Habitat types sensitive to logging, grazing, and unnatural fire are at particular risk.	32	-	37	<i>Environmental Planning and Assessment Act 1979 (EPA Act), Conservation Protocols, Forest Management Zoning (FMZs). and Management Plans</i>
Vegetation community richness		High sensitivity to logging, grazing, unnatural fire and other forestry activities. Medium resilience to forestry activities	32	-	34	<i>Environmental Planning and Assessment Act 1979 (EPA Act), Conservation Protocols, Forest Management Zoning (FMZs). and Management Plans</i>
Species richness (A.3)	Yes	High sensitivity to logging, grazing, unnatural fire and other forestry activities. Medium resilience to forestry activities	Fauna: 23 Flora: 30	-	44 59	<i>Environmental Planning and Assessment Act 1979 (EPA Act), Conservation Protocols, Forest Management Zoning (FMZs). and Management Plans</i>

<sup>a</sup> Sensitivity – to disturbance, relates to extent of loss or diminution in a value due to the effects of disturbance.

<sup>b</sup> Resilience – relates to the extent of likely recovery of a diminished value, and to the time and management effort required to achieve this recovery.

National Estate Values	JANIS related value	Sensitivity <sup>a</sup> and resilience <sup>b</sup> to forestry activities covered by the RFA	Percentage of value on public land in reserves			Existing off-reserve protection mechanisms
			Formal Reserve	Informal Reserve	Formal Reserves as a Result of 1998 NSW Decision	
Important habitat (A.2)	Yes	Sensitivity and resilience varies depending on the species and habitat required. Species sensitive to logging, grazing and unnatural fire are at particular risk.	34	-	48	<i>Threatened Species Conservation Act 1995 (TSCA), Environmental Planning and Assessment Act 1979 (EPA Act), National Parks and Wildlife Act 1974, Endangered Species Protection Act 1992 (ESP Act); Conservation Protocols, Forest Management Zoning (FMZs), and Management Plans</i>
Remnant vegetation (A.2)	Yes	High sensitivity to logging, grazing, unnatural fire and other forestry activities. Low resilience to forestry activities	45	-	59	<i>Native Vegetation Conservation Act 1997, Protection of the Environment Operations Act 1997, Threatened Species Conservation Act 1995 (TSCA), Environmental Planning and Assessment Act 1979 (EPA Act), National Parks and Wildlife Act 1974, Endangered Species Protection Act 1992 (ESP Act); Conservation Protocols, and Management Plans, Forest Management Zoning (FMZs).</i>

<sup>a</sup> Sensitivity – to disturbance, relates to extent of loss or diminution in a value due to the effects of disturbance.

<sup>b</sup> Resilience – relates to the extent of likely recovery of a diminished value, and to the time and management effort required to achieve this recovery.

National Estate Values	JANIS related value	Sensitivity <sup>a</sup> and resilience <sup>b</sup> to forestry activities covered by the RFA	Percentage of value on public land in reserves			Existing off-reserve protection mechanisms
			Formal Reserve	Informal Reserve	Formal Reserves As a Result of 1998 NSW Decision	
Species with disjunct ranges (A.1)	No	Sensitivity and resilience varies depending on the species and habitat required. Species sensitive to logging, grazing, and unnatural fire are at particular risk.	Fauna: 21 Flora: 49	-	47 68	<i>Threatened Species Conservation Act 1995 (TSCA), Environmental Planning and Assessment Act 1979 (EPA Act), National Parks and Wildlife Act 1974, Endangered Species Protection Act 1992 (ESP Act); Conservation Protocols, Forest Management Zoning (FMZs), and Management Plans.</i>
Centres of endemism – flora and fauna (A.1)	Yes	Value is dependent on individual species response. Species sensitive to logging, grazing, and unnatural fire are at particular risk.	29	-	42	<i>Threatened Species Conservation Act 1995 (TSCA), Environmental Planning and Assessment Act 1979 (EPA Act), National Parks and Wildlife Act 1974, Endangered Species Protection Act 1992 (ESP Act); Conservation Protocols, Forest Management Zoning (FMZs), and Management Plans</i>

<sup>a</sup> Sensitivity – to disturbance, relates to extent of loss or diminution in a value due to the effects of disturbance.

<sup>b</sup> Resilience – relates to the extent of likely recovery of a diminished value, and to the time and management effort required to achieve this recovery.

National Estate Values	JANIS related value	Sensitivity <sup>a</sup> and resilience <sup>b</sup> to forestry activities covered by the RFA	Percentage of value on public land in reserves			Existing off-reserve protection mechanisms
			Formal Reserve	Informal Reserve	Formal Reserves as a Result of 1998 NSW Decision	
Rare, uncommon or threatened species		Sensitivity and resilience varies depending on the species and habitat required. Species sensitive to logging, grazing, and unnatural fire are at particular risk.	Fauna: 29 Flora: 59	-	43 68	<i>Threatened Species Conservation Act 1995 (TSCA), Environmental Planning and Assessment Act 1979 (EPA Act), National Parks and Wildlife Act 1974, Endangered Species Protection Act 1992 (ESP Act); Native Vegetation Conservation Act 1997 Conservation Protocols, Forest Management Zoning (FMZs)., and Management Plans</i>
Rare vegetation communities (B.1)	Yes*	High sensitivity to logging, grazing, unnatural fire and other forestry activities. Low resilience to forestry activities	43	-	58	<i>Threatened Species Conservation Act 1995 (TSCA), Environmental Planning and Assessment Act 1979 (EPA Act), National Parks and Wildlife Act 1974, Endangered Species Protection Act 1992 (ESP Act); Native Vegetation Conservation Act 1997 Conservation Protocols, Forest Management Zoning (FMZs)., and Management Plans</i>

<sup>a</sup> Sensitivity – to disturbance, relates to extent of loss or diminution in a value due to the effects of disturbance.

<sup>b</sup> Resilience – relates to the extent of likely recovery of a diminished value, and to the time and management effort required to achieve this recovery.

National Estate Values	JANIS related value	Sensitivity <sup>a</sup> and resilience <sup>b</sup> to forestry activities covered by the RFA	Percentage of value on public land in reserves			Existing off-reserve protection mechanisms
			Formal Reserve	Informal Reserve	Formal Reserves as a Result of 1998 NSW Decision	
Natural History Sites - Type localities for species and research, teaching and benchmark sites (C.1)	No	Sensitivity and resilience varies depending on the species and habitat required. Species sensitive to logging, grazing, and unnatural fire are at particular risk.  Value is also dependent on individual site purpose. Sites sensitive to logging, grazing, and unnatural fire are at particular risk.	30	-	30	<i>Threatened Species Conservation Act 1995 (TSCA), Crown Lands Act (1989), Heritage Act 1977, Soil Conservation Act 1938 Environmental Planning and Assessment Act 1979 (EPA Act Native Vegetation Conservation Act 1997, Protection of the Environment Operations Act 1997, Clean Water Act (1970)</i>
Geoconservation values (A1, A2, A.3, B.1, C.1, C.2, D.1, H.1)	No	Values are generally not sensitive to most forest uses, however some surface values are sensitive to soil disturbance and fire.	29	-	29	<i>Crown Lands Act (1989), Heritage Act 1977, Soil Conservation Act 1938 Environmental Planning and Assessment Act 1979 (EPA Act Native Vegetation Conservation Act 1997, Protection of the Environment Operations Act 1997, Clean Water Act (1970)</i>

<sup>a</sup> Sensitivity – to disturbance, relates to extent of loss or diminution in a value due to the effects of disturbance.

<sup>b</sup> Resilience – relates to the extent of likely recovery of a diminished value, and to the time and management effort required to achieve this recovery.

## **APPENDIX G – LIST OF EXPERTS CONSULTED IN ASSESSMENT OF NATURAL NATIONAL ESTATE VALUES IN NSW**

### **Forest Ecosystems**

Andrew Benwell, Independent Expert  
 Douglas Binns, State Forests of NSW, Agency Expert  
 Carmel Flint, NSW NPWS, Agency Expert  
 Phil Gilmour, Independent Expert  
 Stephanie Horton, Independent Expert Barbara Stewart, Independent Expert

### **Fauna**

Keith Cherry, NSW NPWS, Agency Expert  
 Mark Fitzgerald, NSW NPWS, Agency Expert  
 Phil Gibbons, Independent Expert  
 Sandy Gilmore, NSW NPWS, Agency Expert  
 Glenn Hoye, Independent Expert  
 Rod Kavanagh, State Forests of NSW, Agency Expert  
 Ross Knowles, NSW NPWS, Agency Expert  
 Brad Law, State Forests of NSW, Agency Expert  
 Frank Lemckert, State Forests of NSW, Agency Expert  
 Michael Mahoney, Independent Expert  
 Dave Milledge, Independent Expert  
 Harry Recher, Independent Expert  
 Jim Shields, State Forests of NSW, Agency Expert  
 Ross Saddlier, Independent Expert  
 Andrew Smith, Independent Expert

### **Flora**

Stephen Bell, Independent Expert  
 Andrew Benwell, Independent Expert  
 Phil Gilmour, Independent Expert  
 Stephanie Horton, Independent Expert Barbara Stewart, Independent Expert  
 R. John Hunter, NSW NPWS, Agency Expert Peter Richards, NSW NPWS, Agency Expert Paul Sheringham, NSW NPWS, Agency Expert  
 Douglas Binns, State Forests of NSW, Agency Expert

### **Geoheritage**

Armstrong Osborne, Consultant

### **Natural History Sites**

Martin Denny, Consultant

### **Additional Persons Consulted**



Dailan Pugh, Nature Conservation Council  
Simon Bennett, Environment Australia  
Simon Clarke, Nature Conservation Council  
Martin Robinson, Australian Museum  
Mike Rowe, Australian Museum  
Bruce Cummings, Environment Australia  
Rolan Eberhard, Environment Australia  
Tara Harris, Environment Australia  
Michael O'Brien, Environment Australia  
Geoff Moore, NSW National Parks and Wildlife Service

## APPENDIX H – SITES IDENTIFIED WITH SPATIAL INFORMATION FOR GEOHERITAGE

TYPE	CRITERIA	Data Status	Fragility
FOSSIL SITE - Plant macrof	H1,A1,C1	1	2
SHELLS FROM KITCHEN MIDDEN	A1	2	3
SHELLS FROM KITCHEN MIDDEN	A1	2	3
CALCIC BASALT	D1	1	4
WETLANDS	A2	1	3
WETLANDS	A2	1	3
WETLANDS	A2	1	3
SEDIMENTOLOGY - Red Cliff	A1	1	3
LIMBURGITE	D1	1	4
WETLANDS	A2	1	3
WETLANDS	A2	1	3
WETLANDS	A2	1	3
WETLANDS	A2	1	3
WETLANDS	A2	1	3
WETLANDS	A2	1	3
WETLANDS	A2	1	3
WETLANDS	A2	1	3
WETLANDS	A2	1	3
WETLANDS	A2	1	3
WETLANDS	A2	1	3
WETLANDS	A2	1	3
WETLANDS	A2	1	3
WETLANDS	A2	1	3
SEDIMENTOLOGY - Red Cliff	A1	1	3
WETLANDS	A2	2	3
WETLANDS	A2	2	3
BASALT CAP	A1	2	4
BANDED JASPER	AI, D1	2	3
DUNES (Qs)	A2, D1	2	3
LATERITE	A1	2	3
HISTORIC LIME KILN	H1	1	2
TERTIARY STRATIGRAPHY	A1	1	3
K-AR DATING OF BASALT	A1, C1	1	3

TYPE	CRITERIA	Data Status	Fragility
FOSSIL SITE - Plant macrof	A1,B1,C1	1	2
FOSSIL SITE - Plant macrof	A1, B1,C	1	2
FOSSIL SITE - Plant macrof	A1, B1,C	1	2
EPITHERMAL SILVER-GOLD	D1	2	3
EPITHERMAL SILVER-GOLD	D1	2	3
CMB OUTLIER (Jlr)	A1	2	4
CMB OUTLIER (Jlr)	A1	2	3
DOLERITE INTRUDING GRANITE	A1	2	3
WATERFALL IN GRANITE	D1	2	3
WATERFALL IN GRANITE	D1	1	3
WATERFALL	D1	1	3
HETEROLITHIC BRECCIA	D1	1	3
VOLCANIC LANDFORM - Brecci	D1	1	3
LAVA SEQUENCE/LAVA FLOW	A1	1	4
STRUCTURE - Columnar joint	D1	1	3
WATERFALL	D1	1	3
PORPHYRITIC OR ANDESITIC B	D1	1	
WATERFALL	D1	1	3
WATERFALL	D1	1	3
ALLUVIAL TIN	D1	2	2
WETLANDS	A2	1	3
WETLANDS	A2	1	3
WETLANDS	A2	1	3
WETLANDS	A2	1	3
WETLANDS	A2	1	3
STRUCTURE/DEFORMATION - Be	A1	1	
MEGABRECCIA	A1	1	3
FOSSIL SITE - Wood	B	1	2
RESIDUAL BASALT FLOW	A1	1	4

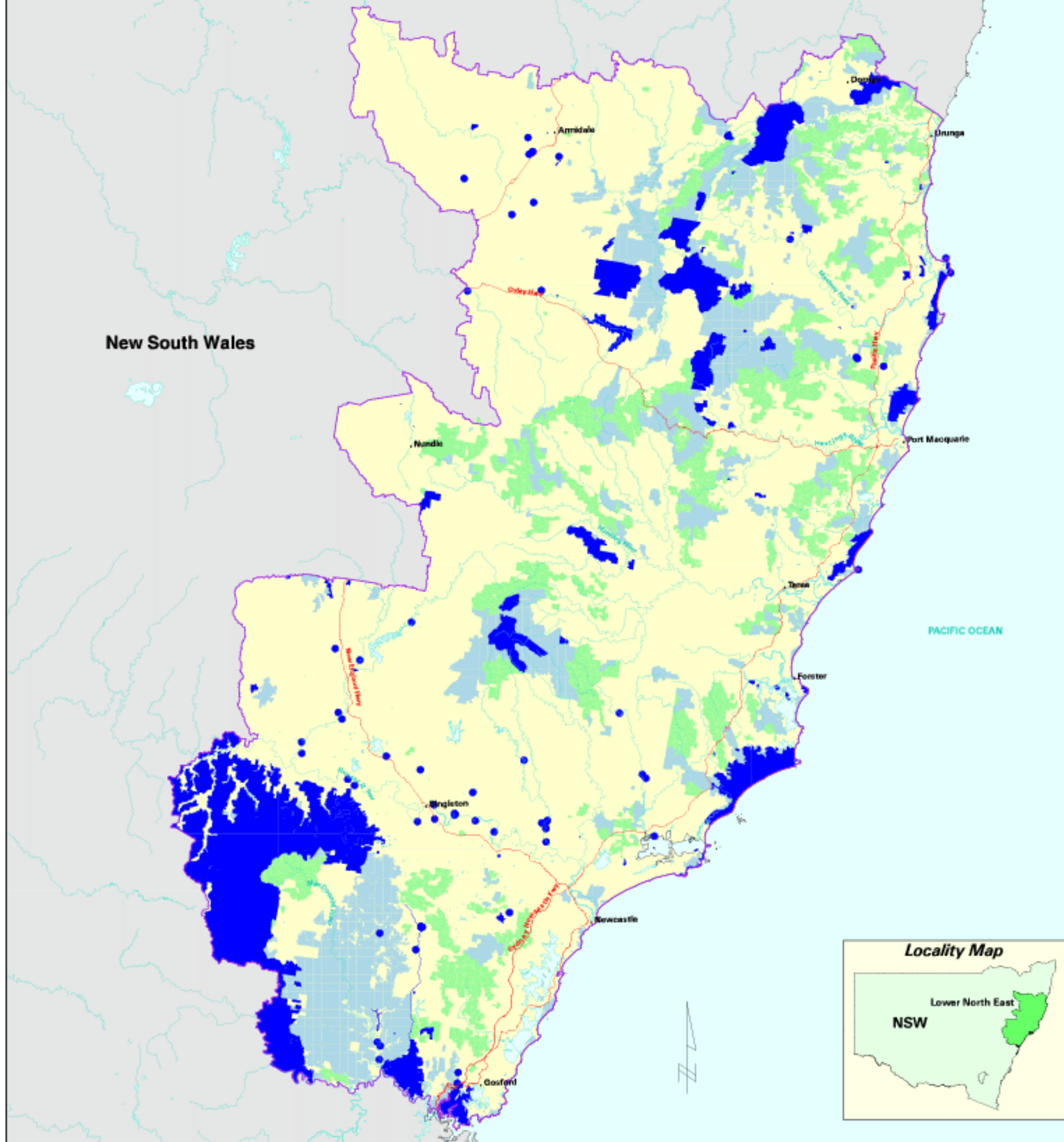
FOSSIL SITE - Plant macrof	A1,B1,C1	1	2
FOSSIL SITE - Plant macrof	A1,B1,C1	1	2
<b>TYPE</b>	<b>CRITERIA</b>	<b>Data Status</b>	<b>Fragility</b>
K-AR DATING SITE	A1, C1	1	3
WATERFALL	D1	1	3
CLIFFS	D1	1	3
LAVA VENT	A1	1	3
LAVA VENT	A1	1	3
LAVA VENT	A1	1	3
LAVA VENT	A1	1	3
LAVA VENT	A1	1	3
LAVA VENT	A1	1	3
LAVA VENT	A1	1	3
LAVA VENT	A1	1	3
CLIFFS	D1	1	3
DIATOMACEOUS EARTH DEPOSIT	A1	1	3
WATERFALL	D1	1	3
WATERFALL	D1	1	3
BASALT FLOWS - bole sandwi	A1	1	3
SHIELD VOLCANO	D1	1	4
SHEILD VOLCANO	D1	1	4
SHIELD VOLCANO	D1	1	4
GORGE	D1	1	3
GORGE	D1	1	3
WATERFALL	D1	1	3
GORGE	D1	1	3
GORGE	D1	1	3
TRUNCATIONS	D1	1	2
DISRUPTED LAYERS	D1	1	2
TRUNCATIONS	D1	1	2
WELL BEDDED TUFF	D1	1	2
LONG WAVE LENGTH/LOW WAVE	D1	1	2
TRUNCATIONS	D1	1	2
WAVY BEDDING	D1	1	2
ESTUARINE WETLANDS	A2	1	3
DUNE FORMATION	D1	1	3
INTERBARRIER CREEK	D1	1	3
ESTUARINE WETLANDS	A2	1	3

ESTUARINE WETLANDS	A2	1	3
INTERBARRIER CREEK	D1	1	3
INTERBARRIER CREEK	D1	1	3
WETLANDS	A2	1	3
<b>TYPE</b>	<b>CRITERIA</b>	<b>Data Status</b>	<b>Fragility</b>
ESTUARINE WETLANDS	A2	1	3
COLUMNAR BASALT	A1, D1	1	3
WETLANDS	A2	1	3
AURIFEROUS BEACH SANDS	D1	2	3
FOSSIL SITE - Coral reef	A1, B1,C	1	2
OXBOWS	D1	2	
SANDSTONE LANDFORM	D1	2	4
SANDSTONE LANDFORM	D1	2	4
CARBONACEOUS SANDROCK (Czw	D1	2	3
CAINOZOIC SEDIIMENT (Czs)	A1, D1	2	3
CAINOZOIC SEDIIMENT (Czs)	A1, D1	2	3
FOSSIL SITE - Vertebrate	C1	1	2
FOSSIL SITE - Invertebrate	C1	1	2
FOSSIL SITE - Plant	C1	1	2
FOSSIL SITE - Plant	C1	1	2
TYPE LOCALITY	C1	1	3
TYPE SECTION	C1	1	3
TYPE SECTION	C1	1	3
TYPE SECTION	C1	1	3
TYPE SECTION	C1	1	3
TYPE SECTION	C1	1	3
TYPE SECTION	C1	1	3
TYPE LOCALITY	C1	1	3
TYPE SECTION	C1	1	3

**APPENDIX I – SITES IDENTIFIED WITH SPATIAL INFORMATION FOR OTHER NATURAL HISTORY SITES**





TYPE	NAME	LATITUDE	LONGITUDE
Herpetofauna	Egernia modesta	-30.47	151.37
TYPE	NAME	LATITUDE	LONGITUDE
Threatened Flora	Gentiana wissmannii	-30.5000	152.2700
Threatened Flora	Bertya ingramii	-30.6700	151.7300
Threatened Flora	Allocasuarina defungens	-32.1000	152.3800
Threatened Flora	Allocasuarina simulans	-32.1000	152.3800
Threatened Flora	Prostanthera stricta	-32.9200	151.4800
Threatened Flora	Eucalyptus cannonii	-32.9200	151.4800
TYPE	NAME	LATITUDE	LONGITUDE
Mammal	Antechinus swainsonii	-30.50	152.50
TYPE	NAME	LATITUDE	LONGITUDE
Lichen	Melanelia pseudoglabra	-30.53	152.03
Lichen	Xanthoparmelia heinari	-31.47	152.87
Lichen	Relicina filsonii	-32.03	151.62
Lichen	Hypotrachyna booralensis	-32.48	151.97
Lichen	Parmelina euplectina	-32.65	151.97
TYPE	LOCATION	LATITUDE	LONGITUDE
Reference Sites	Bellingen Island	-30.450	152.900
Reference Sites	CSIRO Nth Sites	-30.560	152.160
Reference Sites	Eastwood SF	-30.580	151.680
Reference Sites	CSIRO Nth Sites	-30.960	152.390
Reference Sites	CSIRO Nth Sites	-31.340	152.630
Reference Sites	Pappinbarra Centre	-31.380	152.500
Reference Sites	CSIRO Nth Sites	-31.510	151.770
Reference Sites	CSIRO Nth Sites	-31.580	152.010
Reference Sites	Copeland	-32.000	151.830
Reference Sites	Telegherry River	-32.400	151.750
Reference Sites	Mount Owen	-32.400	151.120
Reference Sites	Boarding House Dam	-33.020	151.180
Reference Sites	Gap Creek FR	-33.030	151.420
Reference Sites	Naru Reserve	-33.070	151.640
TYPE	NAME	LATITUDE	LONGITUDE
Insects	Onthophagus kiambram	-30.33333333	152.7166667
Insects	Onthophagus kumbaingeri	-30.33333333	152.7166667
Insects	Onthophagus kumbaingeri	-30.33333333	152.7166667
Insects	Demarziella scarpensis	-30.33333333	152.7166667
Insects	Amphistomus primonactus	-30.33333333	152.7166667
Insects	Amphistomus primonactus	-30.33333333	152.7166667
Insects	Cheiloxena tuberosa	-30.33333333	152.7166667
Insects	Argiolestes griseus	-30.33333333	152.7166667
Insects	Austroargiolestes amabilis	-30.33333333	152.7166667
Insects	Austroargiolestes icteromelas	-30.33333333	152.7166667
Insects	Argiolestes fontanus	-30.33333333	152.7166667
Insects	Semelvillea parva	-30.33333333	152.7166667

Insects	Sternopriscus cervus	-30.33333333	152.7166667
Insects	Sternopriscus cervus	-30.33333333	152.7166667
Insects	Austrolimnius menopon	-32.16666667	151.5000000
Insects	Austrolimnius carus	-32.16666667	151.5000000
Insects	Austrolimnius thyas	-32.16666667	151.5000000
Insects	Dinotoperla cobra	-32.16666667	151.5000000
Insects	Dinotoperla cobra	-32.16666667	151.5000000
Insects	Barretthydrus geminatus	-32.26666667	151.5000000
Insects	Australocyon variegatus	-32.26666667	151.5000000
Insects	Ceronocyton obscurum	-32.26666667	151.5000000
Insects	Barretthydrus tibialis	-32.26666667	151.5000000
<b>TYPE</b>	<b>NAME</b>	<b>LATITUDE</b>	<b>LONGITUDE</b>
Arachnids	Cethegus broomi`	-30.57	151.90
Arachnids	Xamiatus kia	-30.67	152.95
<b>TYPE</b>	<b>LOCATION</b>	<b>LATITUDE</b>	<b>LONGITUDE</b>
Research Sites	Bundarra	-30.170	151.07
Research Sites	Newholme Field Lab	-30.370	151.67
Research Sites	Wollomombi Falls	-30.530	152.03
Research Sites	Eastwood SF	-30.580	151.68
Research Sites	Lana	-30.633	151.30
Research Sites	Bulls Ground	-31.600	152.73
Research Sites	Myall Lakes	-32.680	152.15
Research Sites	Matcham	-33.400	151.44
Research Sites	Warrah Trig	-33.550	151.30
<b>TYPE</b>	<b>NAME</b>	<b>LATITUDE</b>	<b>LONGITUDE</b>
Cavefauna	89 Willi Willi	152.45	-30.95
Cavefauna	62 Moparabah	152.52	-30.97
Cavefauna	94 Yessabah	152.70	-31.12
Cavefauna	26 Crawney Pass	151.08	-31.58
Cavefauna	22 Comboyne	152.47	-31.60
Cavefauna	81 Timor	151.17	-31.67
Cavefauna	70 Pigna Barney	151.58	-31.75
Cavefauna	36 Gloucester	152.08	-32.08
<b>TYPE</b>	<b>NAME</b>	<b>LATITUDE</b>	<b>LONGITUDE</b>
Endangered liverworts and mosses	Buxbaumia colyerae	-32.23	151.82



## LOWER NORTH EAST Comprehensive Regional Assessment

### MAP 1 Existing Areas Listed on the Register of the National Estate

- |   |  |   |              |
|---|--|---|--------------|
|  | Existing Areas Listed on the Register of the National Estate |  | RFA Boundary |
|  | National Parks and Reserves                                  |  | Rivers       |
|  | State Forest   |  | Roads        |

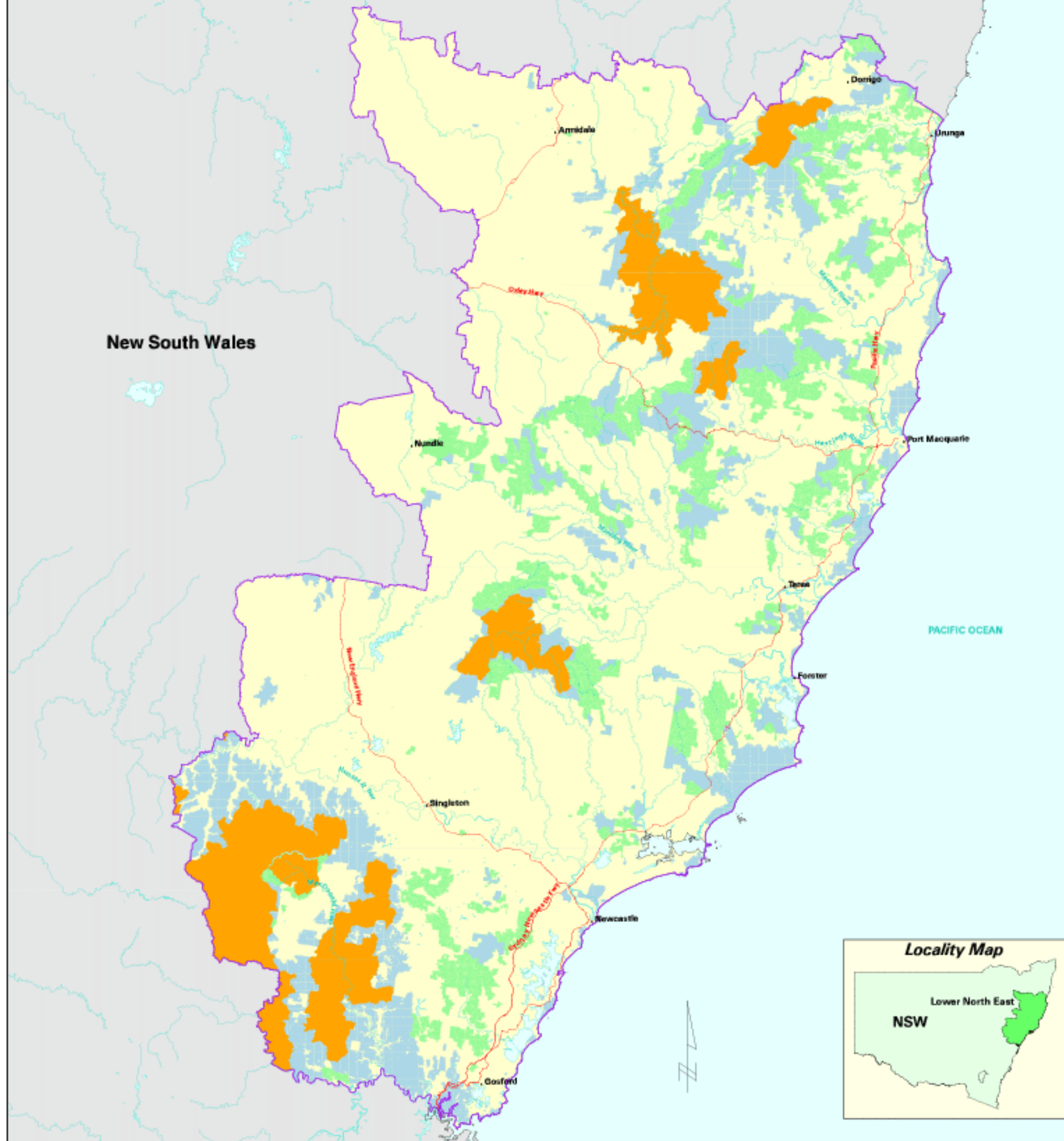
SOURCES:  
NSW LNE CRA National Estate Assessments - Environment Australia  
NSW LNE Regional Forest Agreement - LNE RFA Boundary - 1998  
Drainage and Roads - LID  
Places - AUSLIG  
TOPO 250K - AUSLIG  
Produced by Environment Australia - Version: 18 June 1999  
File Reference: me

5 0 5 10 15 20 25  
kilometres







Scale 1:1300000  
Projection - AMG Zone 56







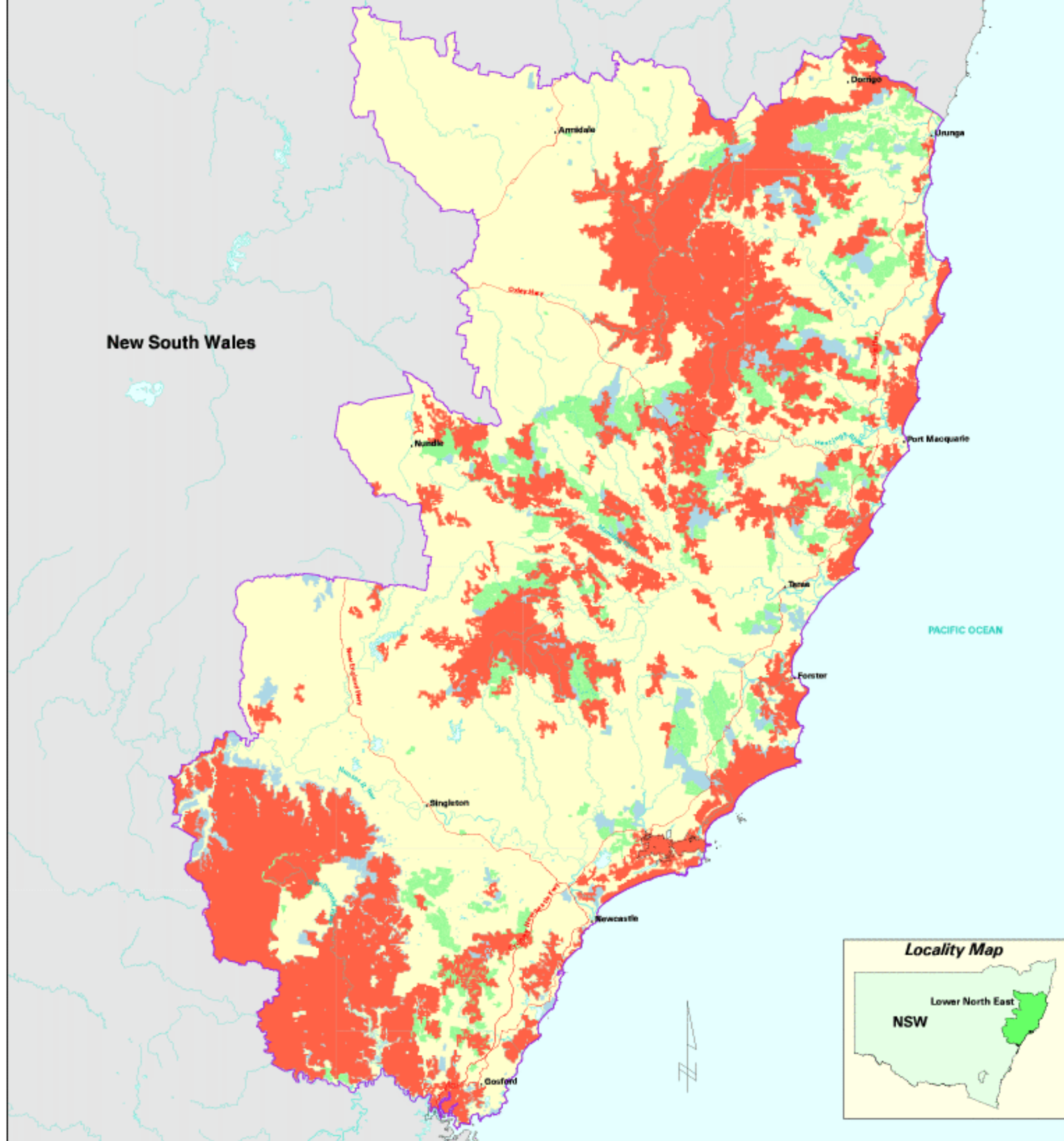
# **LOWER NORTH EAST** **Comprehensive Regional Assessment** **MAP 2** **Areas Meeting Wilderness Criteria**

- |   |                                   |   |              |
|---|-----------------------------------|---|--------------|
|  | Areas Meeting Wilderness Criteria |  | RFA Boundary |
|  | National Parks and Reserves       |  | Rivers       |
|  | State Forest                      |  | Roads        |

SOURCES:  
 NSW LNE CRA National Estate Assessments - Environment Australia  
 NSW LNE Regional Forest Agreement - LNE RFA Boundary - 1998  
 Drainage and Roads - LID  
 Places - AUSLIG  
 TOPO 250K - AUSLIG  
 Produced by Environment Australia - Version: 18 June 1999  
 File Reference: wildern

5 0 5 10 15 20 25  
 kilometres  
 Scale 1:1300000  
 Projection - AMG Zone 56





## LOWER NORTH EAST Comprehensive Regional Assessment

### MAP 3 Areas Above Threshold for Natural Landscapes

- |   |  |   |              |
|---|--|---|--------------|
|  | Areas Above Threshold for Natural Landscapes |  | RFA Boundary |
|  | National Parks and Reserves                  |  | Rivers       |
|  | State Forest                                 |  | Roads        |

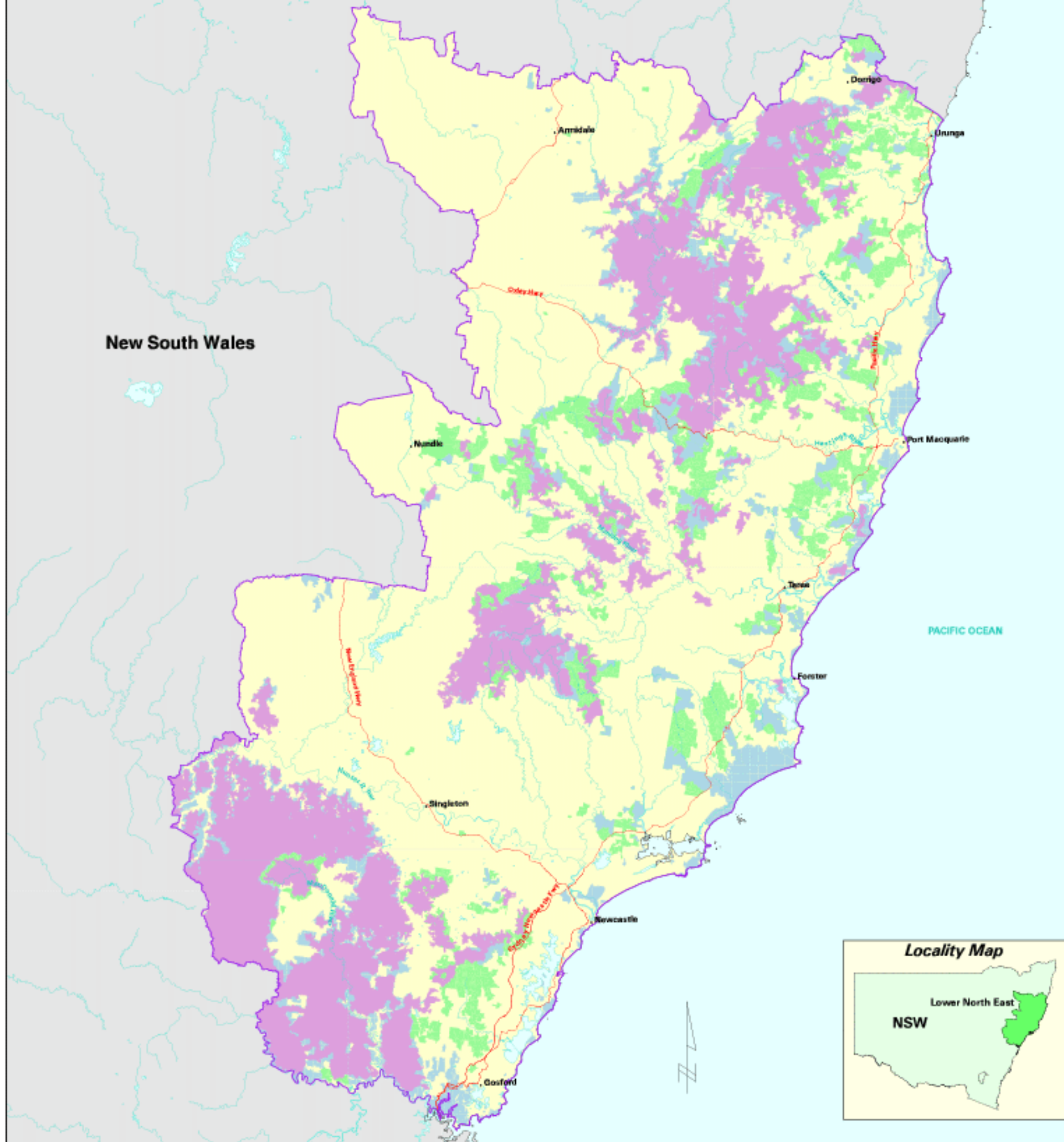
SOURCES:  
NSW LNE CRA National Estate Assessments - Environment Australia  
NSW LNE Regional Forest Agreement - LNE RFA Boundary - 1998  
Drainage and Roads - LID  
Places - AUSLIG  
TOPO 250K - AUSLIG  
Produced by Environment Australia - Version: 18 June 1999  
File Reference: ne\_natl.n

5 0 5 10 15 20 25  
kilometres

Scale 1:1300000  
Projection - AMG Zone 56













## LOWER NORTH EAST Comprehensive Regional Assessment

### MAP 4 Areas Above Threshold for Undisturbed Catchments

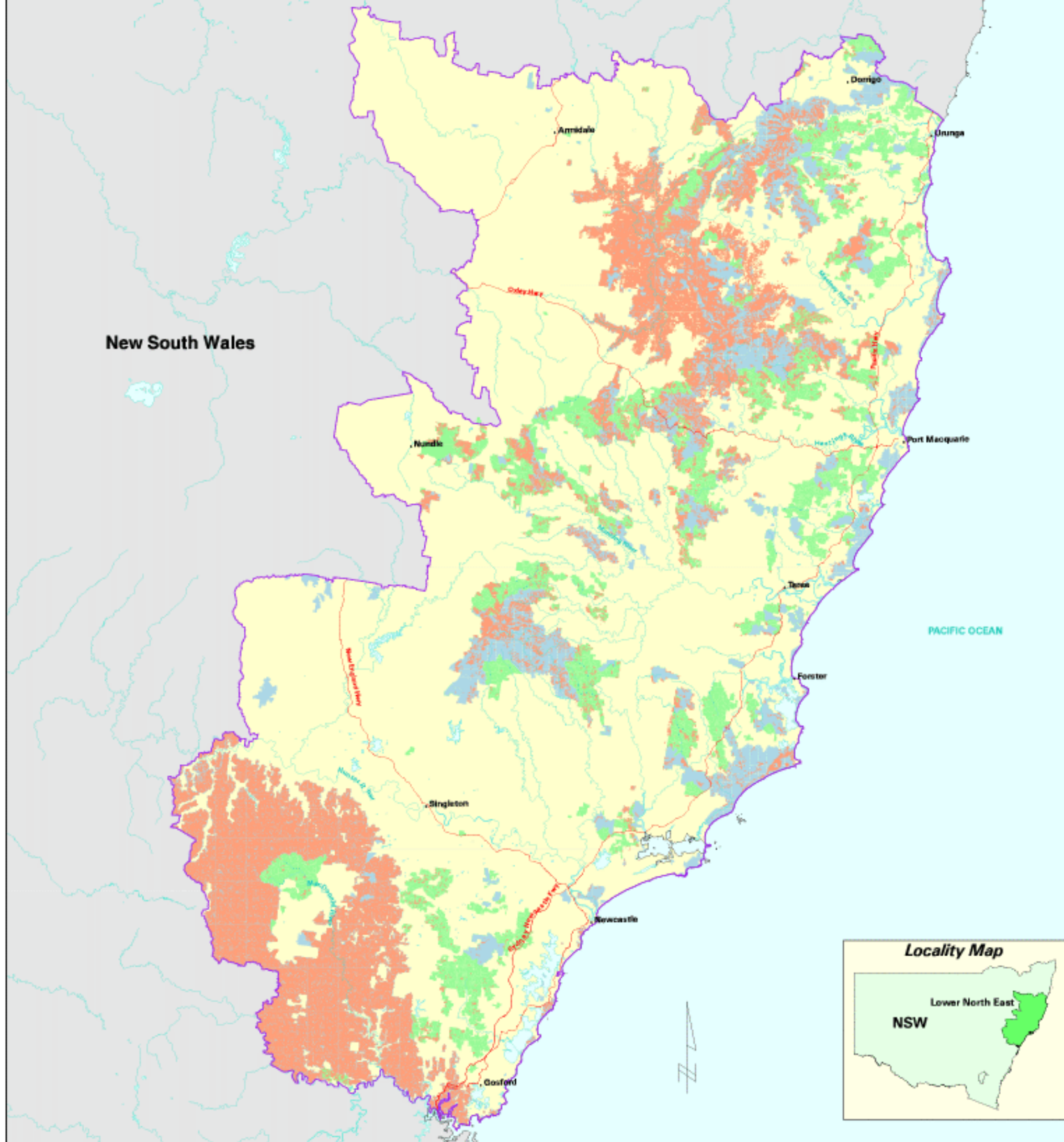
- |   |  |   |              |
|---|--|---|--------------|
|  | Areas Above Threshold for Undisturbed Catchments |  | RFA Boundary |
|  | National Parks and Reserves                      |  | Rivers       |
|  | State Forest                                     |  | Roads        |

SOURCES:  
NSW LNE CRA National Estate Assessments - Environment Australia  
NSW LNE Regional Forest Agreement - LNE RFA Boundary - 1998  
Drainage and Roads - LID  
Places - AUSLIG  
TOPO 250K - AUSLIG  
Produced by Environment Australia - Version: 18 June 1999  
File Reference: ne\_uncat

5 0 5 10 15 20 25  
kilometres

Scale 1:1300000  
Projection - AMG Zone 56





## LOWER NORTH EAST Comprehensive Regional Assessment

### MAP 5 Areas Above Threshold for National Estate Old-Growth Forest

- |   |   |   |              |
|---|---|---|--------------|
|  | Areas Above Threshold for National Estate Old-Growth Forest |  | RFA Boundary |
|  | National Parks and Reserves                                 |  | Rivers       |
|  | State Forest  |  | Roads        |

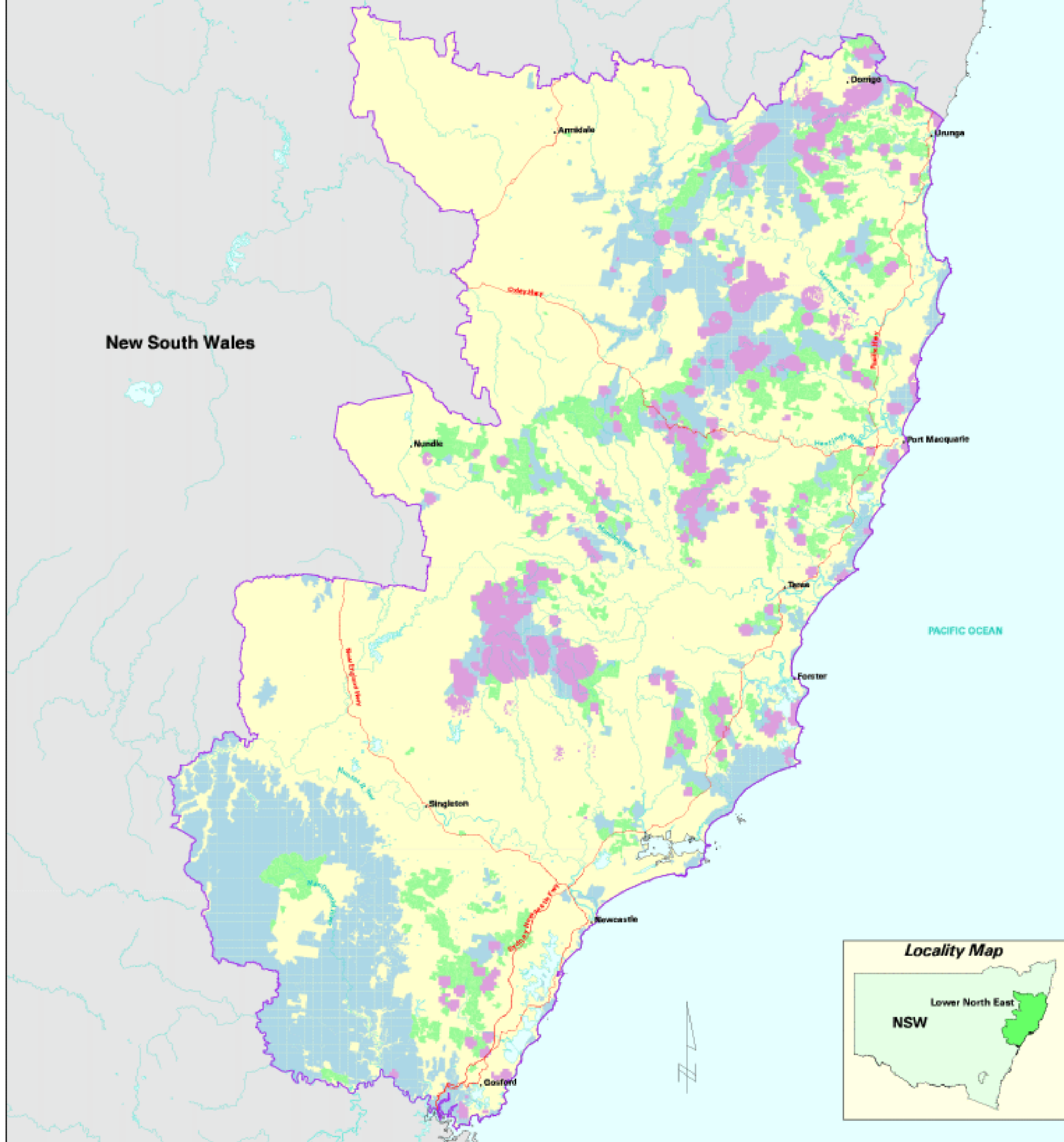
SOURCES:  
NSW LNE CRA National Estate Assessments - Environment Australia  
NSW LNE Regional Forest Agreement - LNE RFA Boundary - 1998  
Drainage and Roads - LID  
Places - AUSLIG  
TOPO 250K - AUSLIG  
Produced by Environment Australia - Version: 18 June 1999  
File Reference: ne\_olgr

5 0 5 10 15 20 25  
kilometres

Scale 1:1300000  
Projection - AMG Zone 56













## LOWER NORTH EAST Comprehensive Regional Assessment

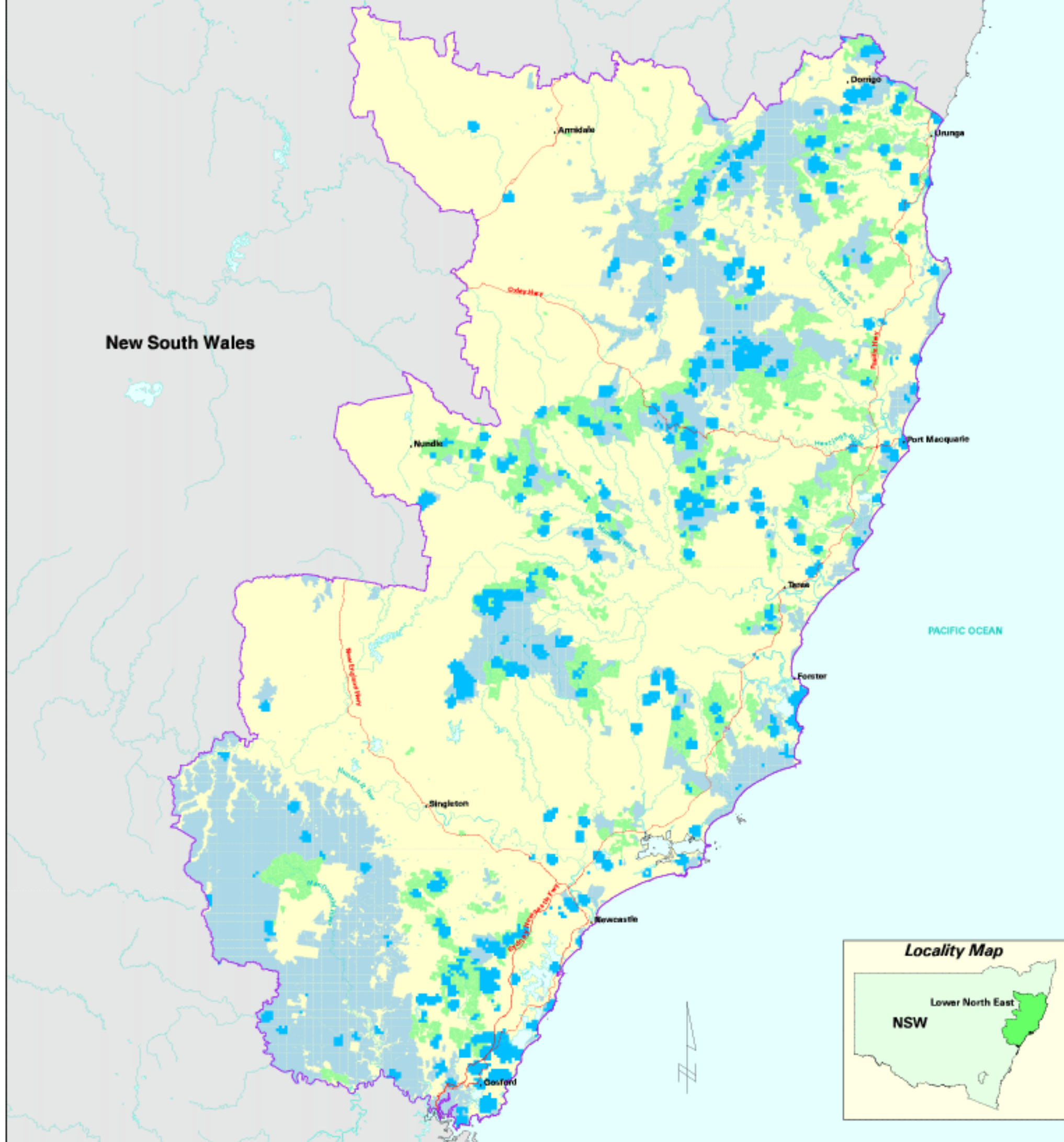
### MAP 6 Areas Above Threshold for Centres of Endemism

- |   |   |   |              |
|---|---|---|--------------|
|  | Areas Above Threshold for Centres of Endemism |  | RFA Boundary |
|  | National Parks and Reserves                   |  | Rivers       |
|  | State Forest                                  |  | Roads        |

SOURCES:  
 NSW LNE CRA National Estate Assessments - Environment Australia  
 NSW LNE Regional Forest Agreement - LNE RFA Boundary - 1998  
 Drainage and Roads - LID  
 Places - AUSLIG  
 TOPO 250K - AUSLIG  
 Produced by Environment Australia - Version: 18 June 1999  
 File Reference: ne\_endem

5 0 5 10 15 20 25  
 kilometres  
 Scale 1:1300000  
 Projection - AMG Zone 56





## LOWER NORTH EAST Comprehensive Regional Assessment

### MAP 7 Areas Above Threshold for Fauna with Disjunct Populations

- |   |   |   |              |
|---|---|---|--------------|
|  | Areas Above Threshold for Fauna with Disjunct Populations |  | RFA Boundary |
|  | National Parks and Reserves                               |  | Rivers       |
|  | State Forest  |  | Roads        |

SOURCES:  
 NSW LNE CRA National Estate Assessments - Environment Australia  
 NSW LNE Regional Forest Agreement - LNE RFA Boundary - 1998  
 Drainage and Roads - LID  
 Places - AUSLIG  
 TOPO 250K - AUSLIG  
 Produced by Environment Australia - Version: 18 June 1999  
 File Reference: ne\_delfn

5 0 5 10 15 20 25  
 kilometres

Scale 1:1300000  
 Projection - AMG Zone 56

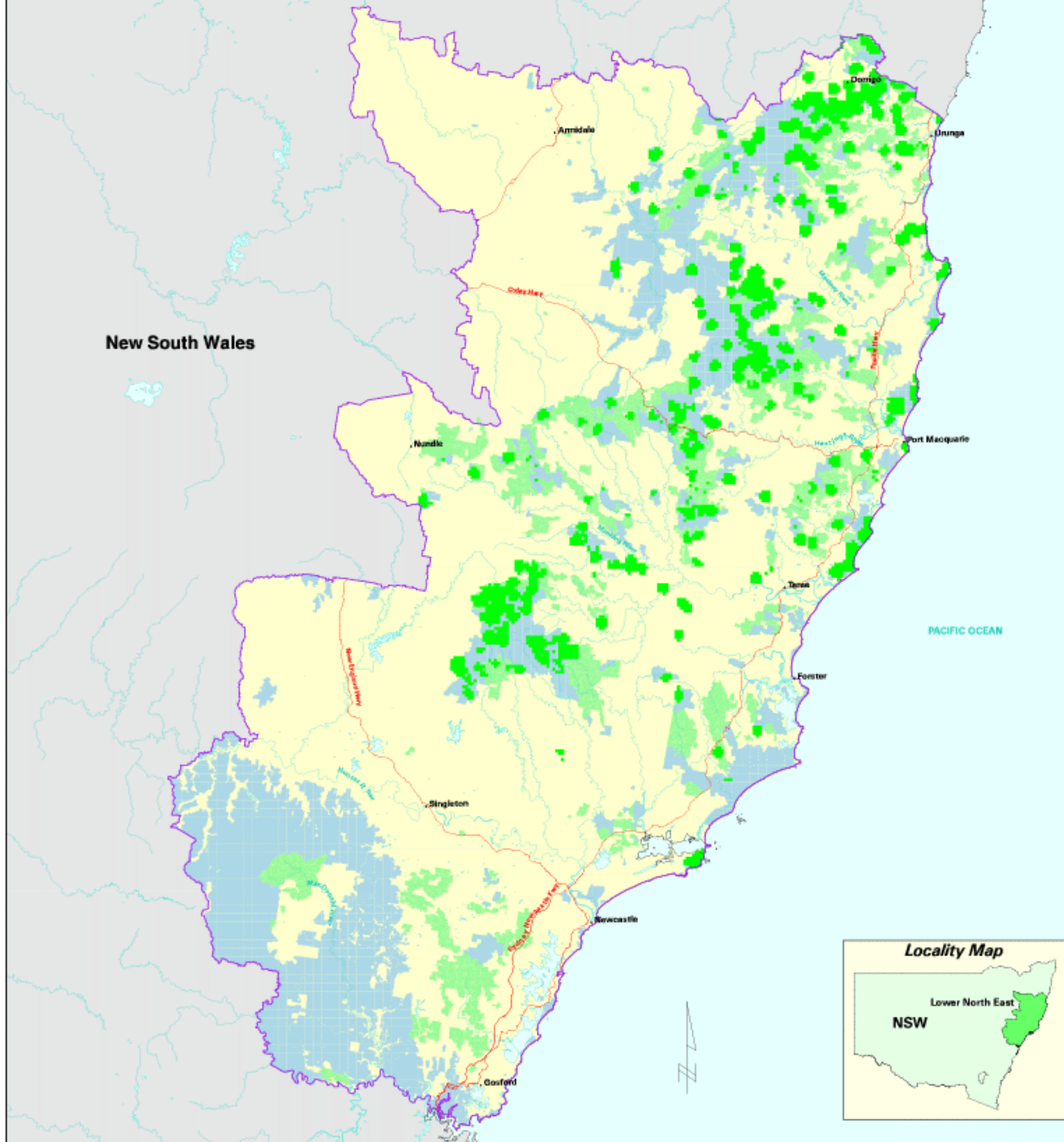












## LOWER NORTH EAST Comprehensive Regional Assessment

### MAP 10

### Areas Above Threshold for Flora at the Limit of their Range

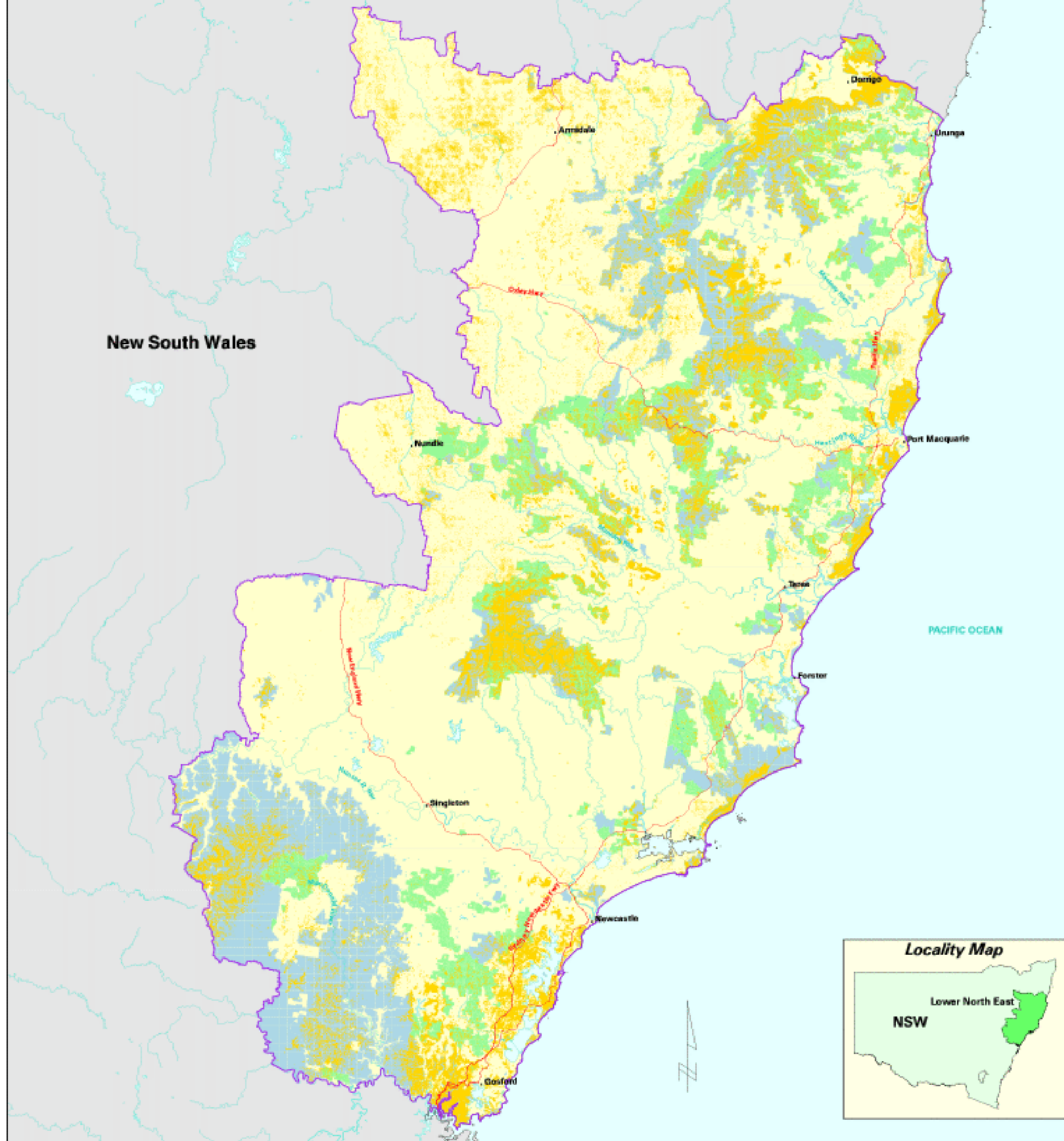
- |   |   |
|---|---|
| <span style="display: inline-block; width: 15px; height: 15px; background-color: #00ff00; border: 1px solid black;"></span> Areas Above Threshold for Flora at the Limit of their Range | <span style="display: inline-block; width: 15px; border-bottom: 2px solid purple;"></span> RFA Boundary |
| <span style="display: inline-block; width: 15px; height: 15px; background-color: #add8e6; border: 1px solid black;"></span> National Parks and Reserves                                 | <span style="display: inline-block; width: 15px; border-bottom: 2px solid blue;"></span> Rivers         |
| <span style="display: inline-block; width: 15px; height: 15px; background-color: #90ee90; border: 1px solid black;"></span> State Forest  | <span style="display: inline-block; width: 15px; border-bottom: 2px solid red;"></span> Roads           |

SOURCES:  
 NSW LNE CRA National Estate Assessments - Environment Australia  
 NSW LNE Regional Forest Agreement - LNE RFA Boundary - 1998  
 Drainage and Roads - LID  
 Places - AUSLIG  
 TOPO 250K - AUSLIG  
 Produced by Environment Australia - Version: 18 June 1999  
 File Reference: no limit

5 0 5 10 15 20 25  
 kilometres  
 Scale 1:1300000  
 Projection - AMG Zone 56







# **LOWER NORTH EAST** **Comprehensive Regional Assessment** **MAP 11** **Areas Above Threshold for Refugia**

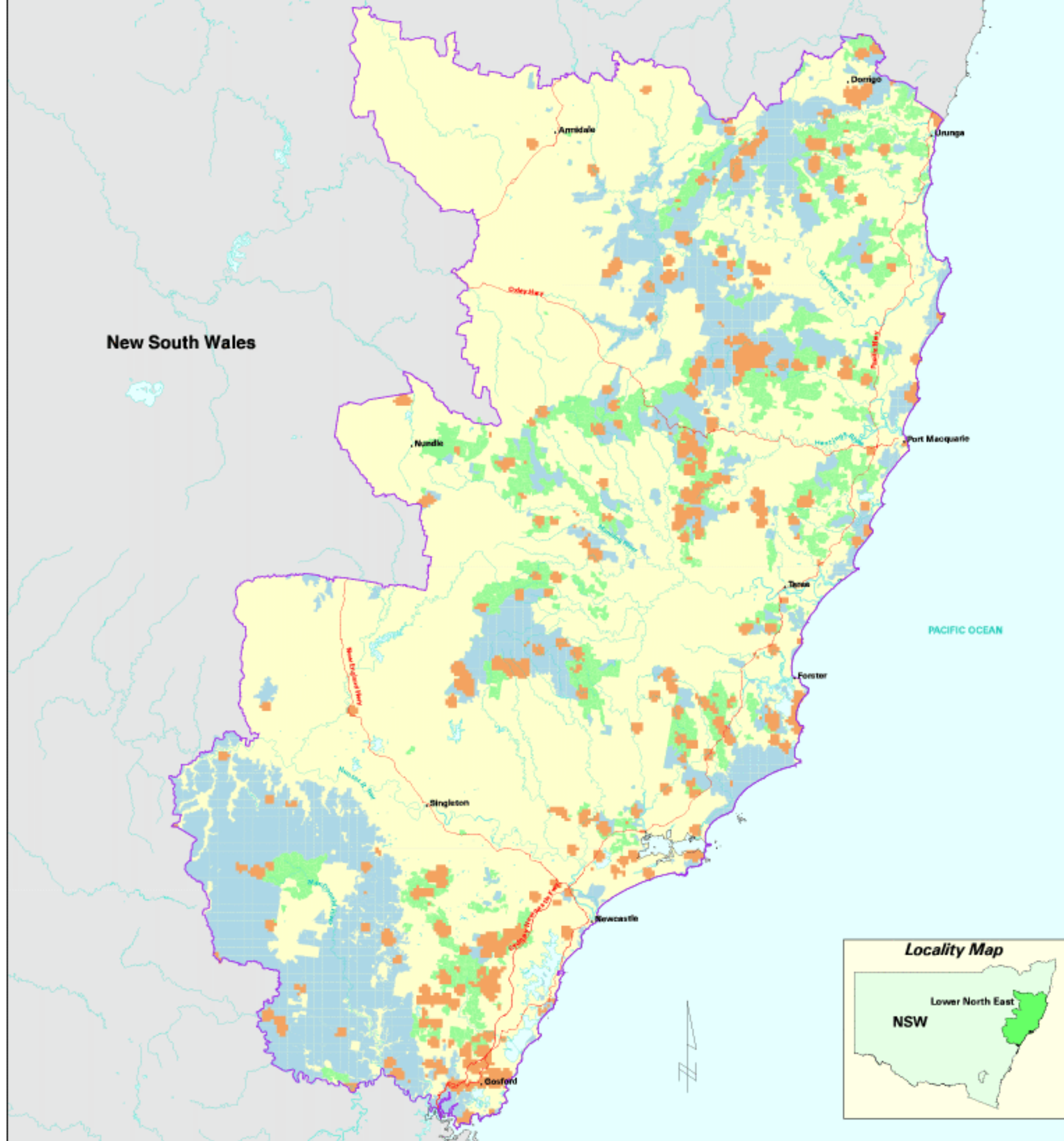
- |   |   |
|---|---|
| <span style="display:inline-block; width:15px; height:15px; background-color:yellow; border:1px solid black;"></span> Areas Above Threshold for Refugia | <span style="display:inline-block; width:15px; height:1px; background-color:purple; border:1px solid black;"></span> RFA Boundary |
| <span style="display:inline-block; width:15px; height:15px; background-color:lightblue; border:1px solid black;"></span> National Parks and Reserves    | <span style="display:inline-block; width:15px; height:1px; background-color:cyan; border:1px solid black;"></span> Rivers         |
| <span style="display:inline-block; width:15px; height:15px; background-color:lightgreen; border:1px solid black;"></span> State Forest                  | <span style="display:inline-block; width:15px; height:1px; background-color:red; border:1px solid black;"></span> Roads           |

SOURCES:  
 NSW LNE CRA National Estate Assessments - Environment Australia  
 NSW LNE Regional Forest Agreement - LNE RFA Boundary - 1998  
 Drainage and Roads - LID  
 Places - AUSLIG  
 TOPO 250K - AUSLIG  
 Produced by Environment Australia - Version: 18 June 1999  
 File Reference: ne\_refug

5 0 5 10 15 20 25  
 kilometres  
 Scale 1:1300000  
 Projection - AMG Zone 56













## LOWER NORTH EAST Comprehensive Regional Assessment

### MAP 12

### Areas Above Threshold for Primitive, Relictual and Phylogenetically Distinct Species

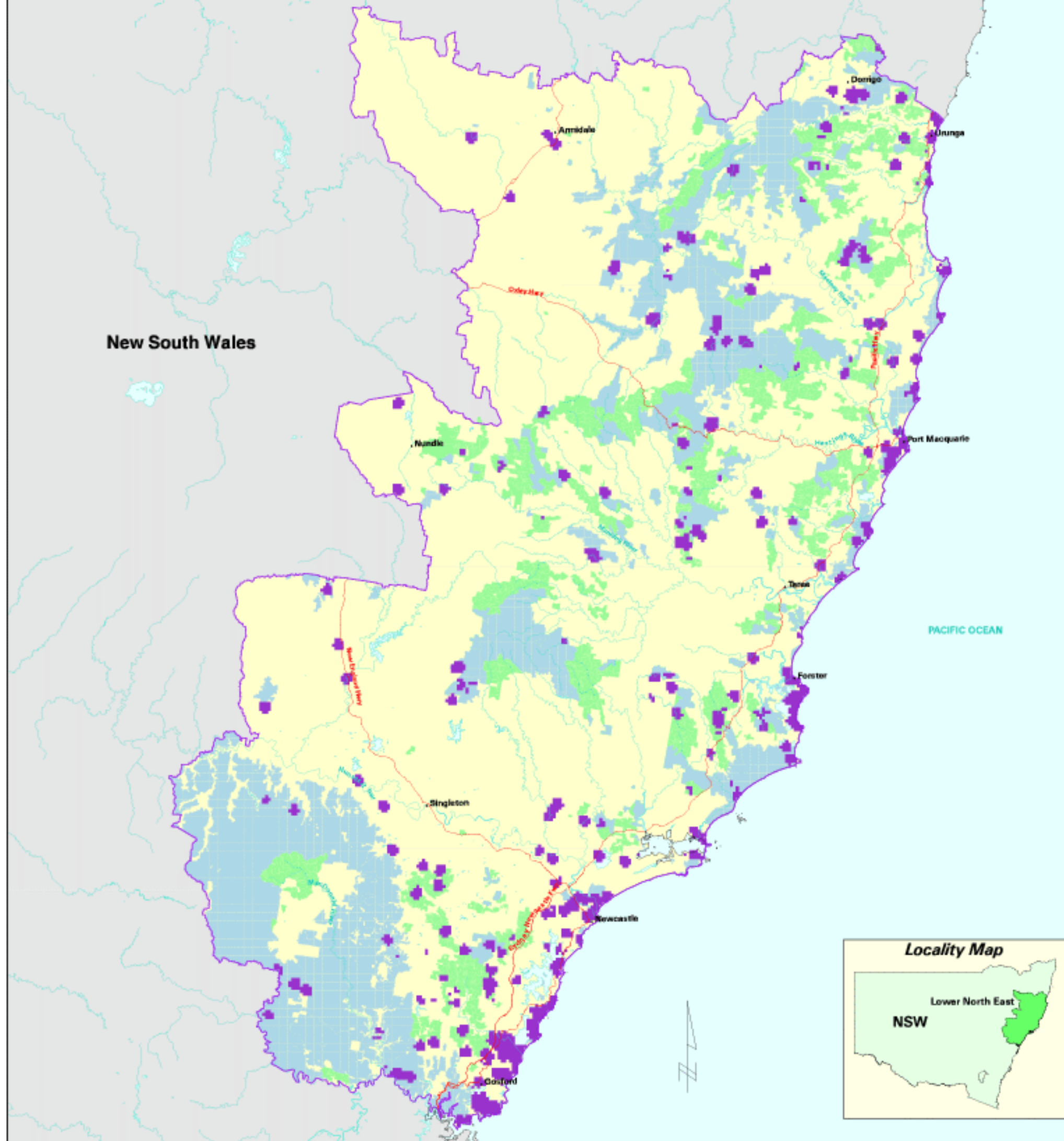
- |   |  |   |              |
|---|--|---|--------------|
|  | Areas Above Threshold for Primitive, Relictual and Phylogenetically Distinct Species |  | RFA Boundary |
|  | National Parks and Reserves  |  | Rivers       |
|  | State Forest   |  | Roads        |

SOURCES:  
 NSW LNE CRA National Estate Assessments - Environment Australia  
 NSW LNE Regional Forest Agreement - LNE RFA Boundary - 1998  
 Drainage and Roads - LID  
 Places - AUSLIG  
 TOPO 250K - AUSLIG  
 Produced by Environment Australia - Version: 18 June 1999  
 File Reference: ne.primf

5 0 5 10 15 20 25  
 kilometres

Scale 1:1300000  
 Projection - AMG Zone 56











## LOWER NORTH EAST Comprehensive Regional Assessment

### MAP 13

### Areas Above Threshold for Migratory Species

- |   |   |   |              |
|---|---|---|--------------|
|  | Areas Above Threshold for Migratory Species |  | RFA Boundary |
|  | National Parks and Reserves                 |  | Rivers       |
|  | State Forest                                |  | Roads        |

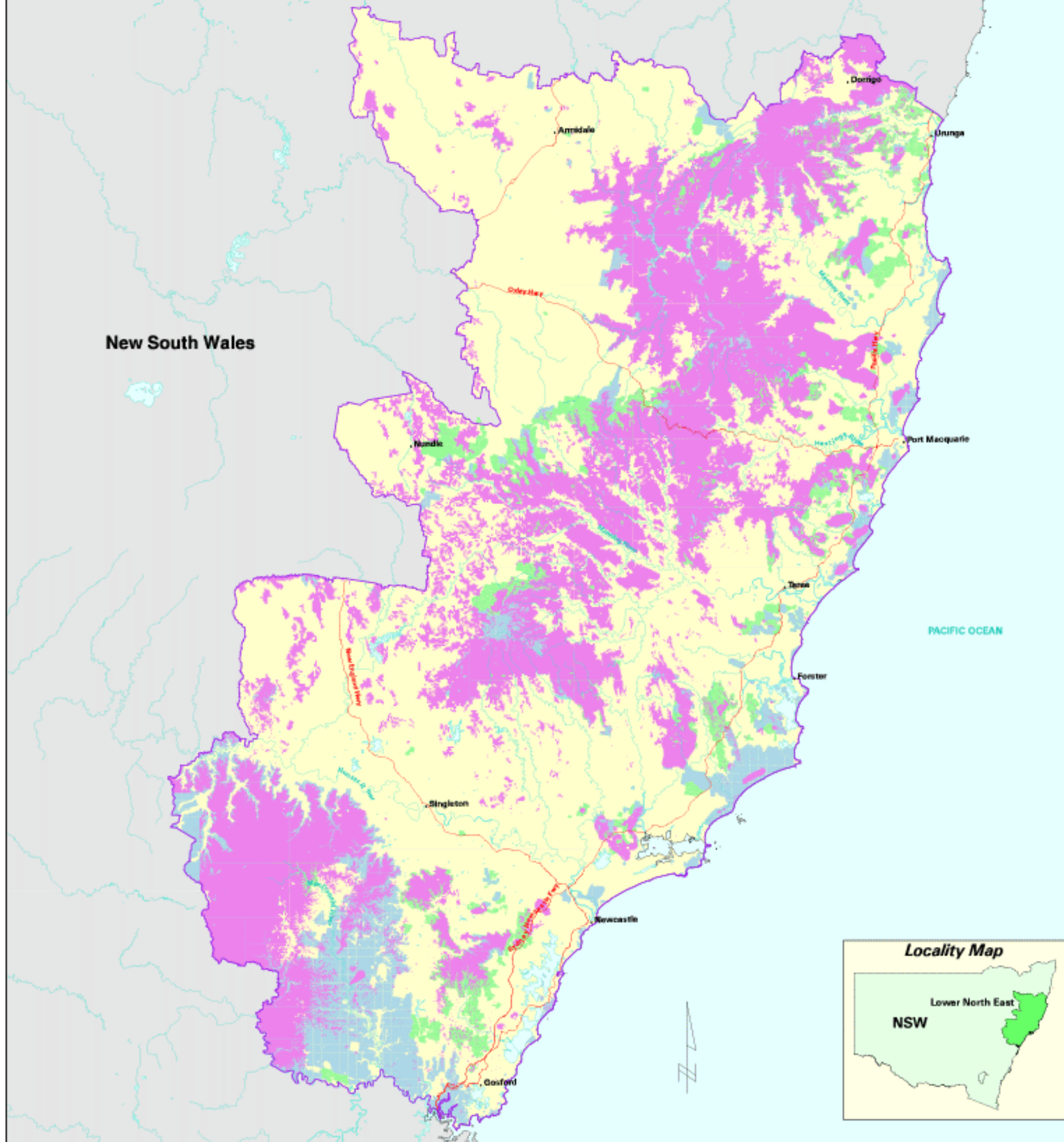
SOURCES:  
 NSW LNE CRA National Estate Assessments - Environment Australia  
 NSW LNE Regional Forest Agreement - LNE RFA Boundary - 1998  
 Drainage and Roads - LID  
 Places - AUSLIG  
 TOPO 250K - AUSLIG  
 Produced by Environment Australia - Version: 18 June 1999  
 File Reference: ne\_migr

5 0 5 10 15 20 25  
 kilometres

Scale 1:1300000  
 Projection - AMG Zone 56







## LOWER NORTH EAST Comprehensive Regional Assessment

### MAP 14

### Areas Above Threshold for Important Habitat

- |   |   |   |              |
|---|---|---|--------------|
|  | Areas Above Threshold for Important Habitat |  | RFA Boundary |
|  | National Parks and Reserves                 |  | Rivers       |
|  | State Forest                                |  | Roads        |

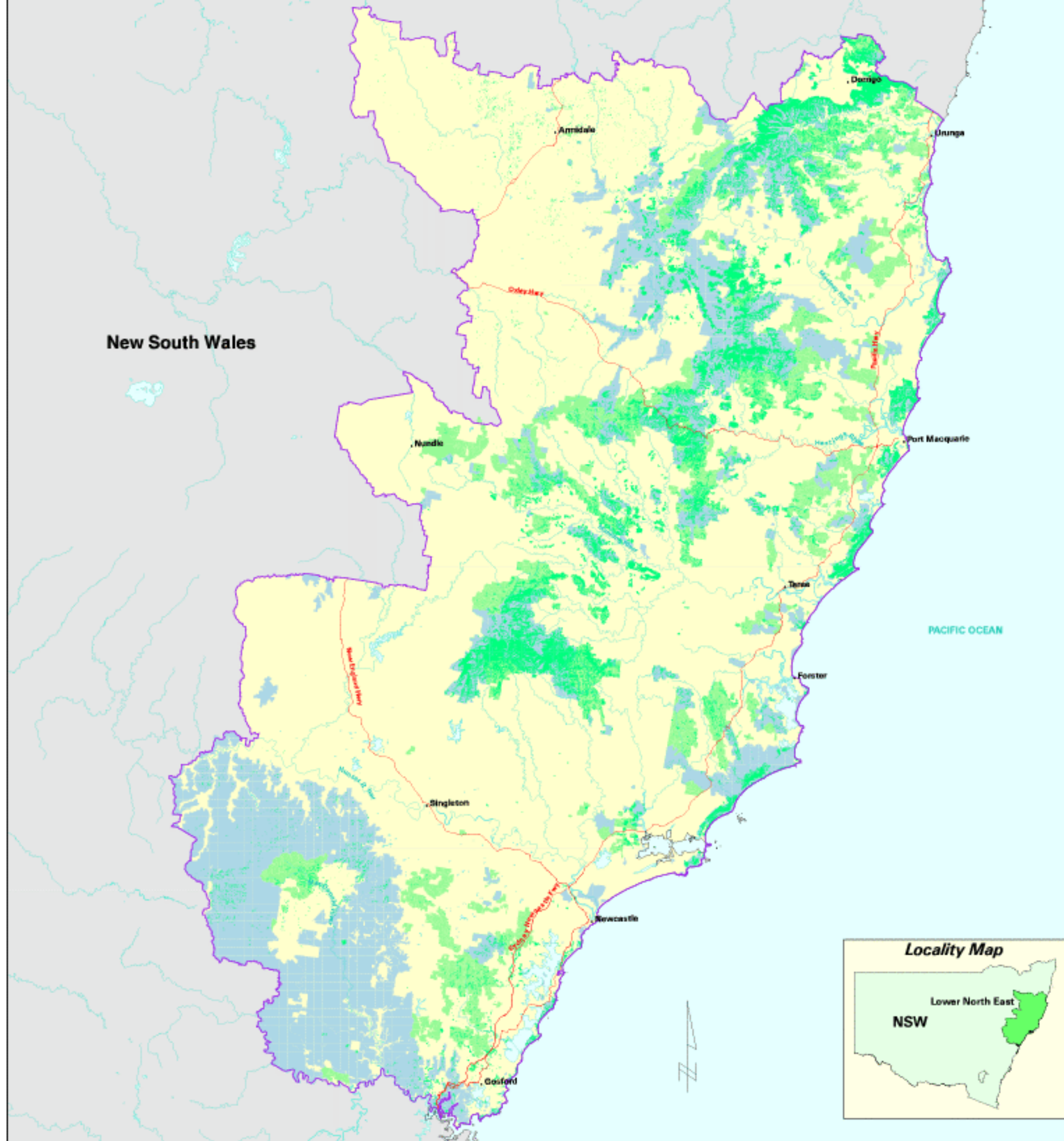
SOURCES:  
 NSW LNE CRA National Estate Assessments - Environment Australia  
 NSW LNE Regional Forest Agreement - LNE RFA Boundary - 1998  
 Drainage and Roads - LID  
 Places - AUSLIG  
 TOPO 250K - AUSLIG  
 Produced by Environment Australia - Version: 18 June 1999  
 File Reference: ne\_lmphb

5 0 5 10 15 20 25  
 kilometres

Scale 1:1300000  
 Projection - AMG Zone 56







## LOWER NORTH EAST Comprehensive Regional Assessment

### MAP 15

### Areas Above Threshold for Remnant Vegetation and Rare Old-Growth Forest

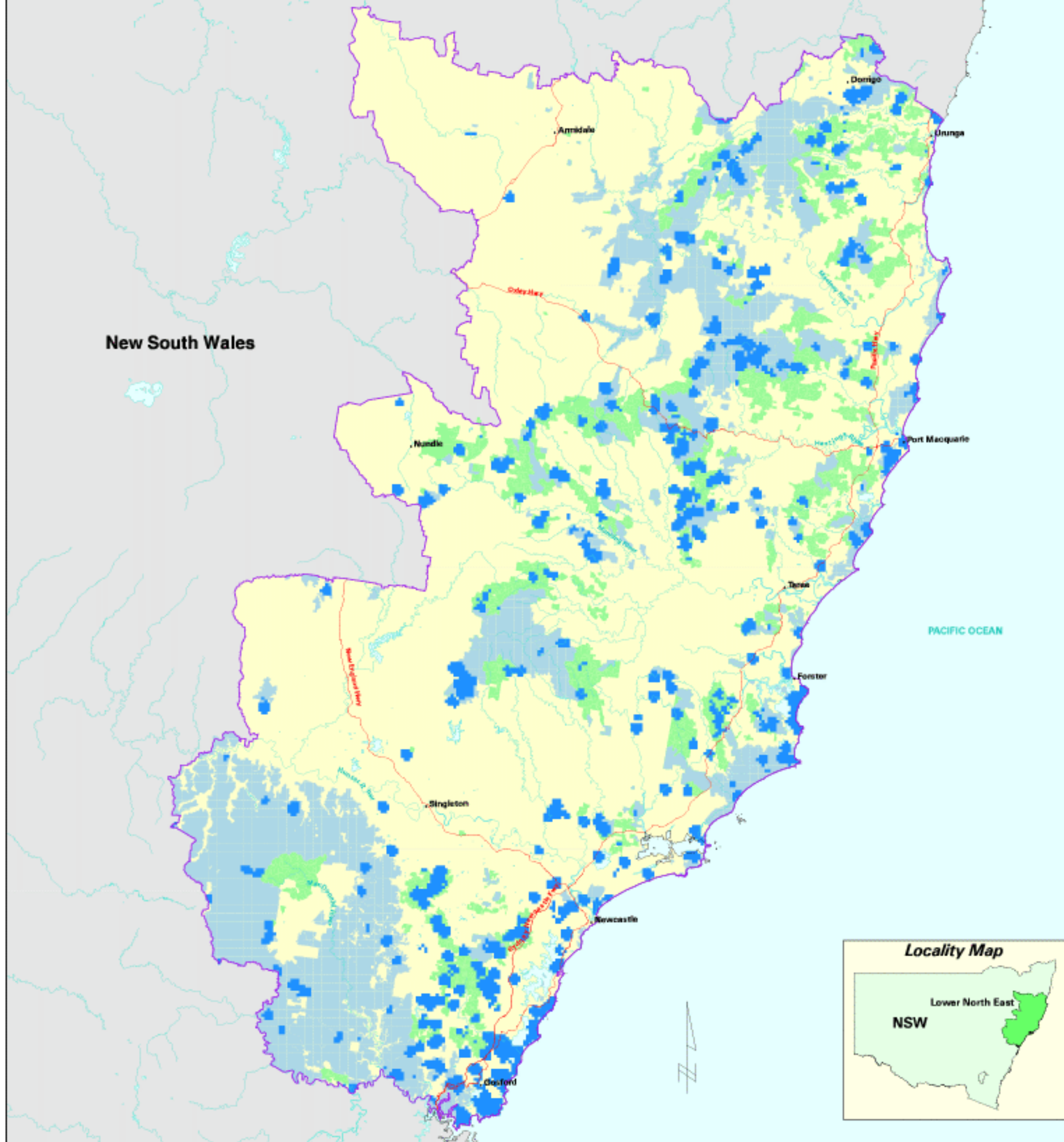
- |   |   |   |              |
|---|---|---|--------------|
|  | Areas Above Threshold for Remnant Vegetation and Rare Old-Growth Forest |  | RFA Boundary |
|  | National Parks and Reserves   |  | Rivers       |
|  | State Forest  |  | Roads        |

SOURCES:  
 NSW LNE CRA National Estate Assessments - Environment Australia  
 NSW LNE Regional Forest Agreement - LNE RFA Boundary - 1998  
 Drainage and Roads - LID  
 Places - AUSLIG  
 TOPO 250K - AUSLIG  
 Produced by Environment Australia - Version: 18 June 1999  
 File Reference: ne\_renvjg

5 0 5 10 15 20 25  
 kilometres

Scale 1:1300000  
 Projection - AMG Zone 56





## LOWER NORTH EAST Comprehensive Regional Assessment

### MAP 16

### Areas Above Threshold for Fauna Species Richness

- |   |   |
|---|---|
| <span style="display: inline-block; width: 15px; height: 15px; background-color: blue; border: 1px solid black;"></span> Areas Above Threshold for Fauna Species Richness | <span style="display: inline-block; width: 15px; border-bottom: 2px solid purple;"></span> RFA Boundary |
| <span style="display: inline-block; width: 15px; height: 15px; background-color: lightblue; border: 1px solid black;"></span> National Parks and Reserves                 | <span style="display: inline-block; width: 15px; border-bottom: 2px solid lightblue;"></span> Rivers    |
| <span style="display: inline-block; width: 15px; height: 15px; background-color: green; border: 1px solid black;"></span> State Forest                                    | <span style="display: inline-block; width: 15px; border-bottom: 2px solid red;"></span> Roads           |

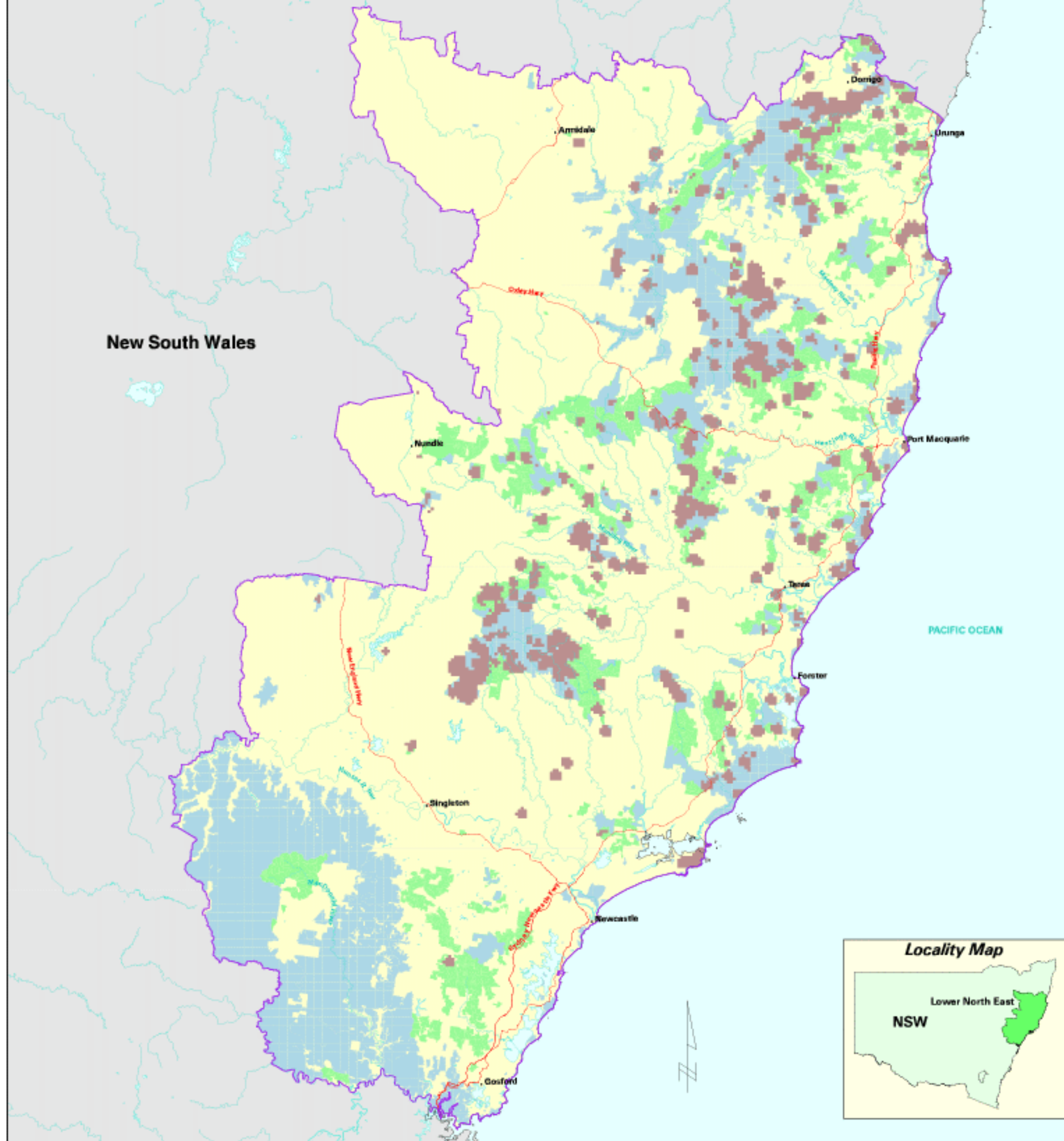
SOURCES:  
 NSW LNE CRA National Estate Assessments - Environment Australia  
 NSW LNE Regional Forest Agreement - LNE RFA Boundary - 1998  
 Drainage and Roads - LID  
 Places - AUSLIG  
 TOPO 250K - AUSLIG  
 Produced by Environment Australia - Version: 18 June 1999  
 File Reference: ne\_lnrch

5 0 5 10 15 20 25  
 kilometres

Scale 1:1300000  
 Projection - AMG Zone 56













## LOWER NORTH EAST Comprehensive Regional Assessment

### MAP 17

### Areas Above Threshold for Flora Species Richness

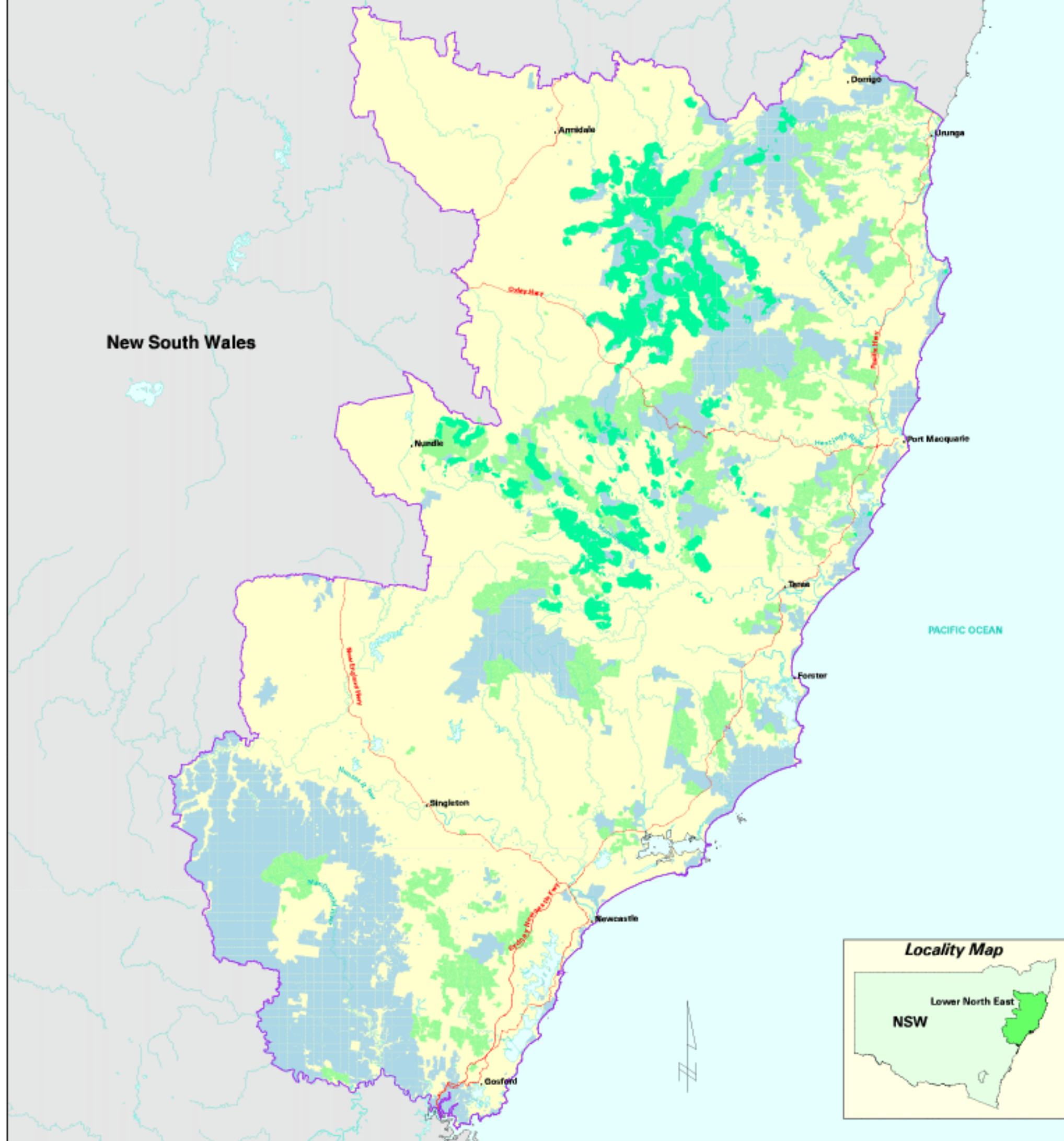
- |   |  |   |              |
|---|--|---|--------------|
|  | Areas Above Threshold for Flora Species Richness |  | RFA Boundary |
|  | National Parks and Reserves                      |  | Rivers       |
|  | State Forest                                     |  | Roads        |

SOURCES:  
 NSW LNE CRA National Estate Assessments - Environment Australia  
 NSW LNE Regional Forest Agreement - LNE RFA Boundary - 1998  
 Drainage and Roads - LID  
 Places - AUSLIG  
 TOPO 250K - AUSLIG  
 Produced by Environment Australia - Version: 18 June 1999  
 File Reference: ne\_17ch

5 0 5 10 15 20 25  
 kilometres  
 Scale 1:1300000  
 Projection - AMG Zone 56








## LOWER NORTH EAST Comprehensive Regional Assessment

### MAP 18

### Areas Above Threshold for Vegetation Community Richness

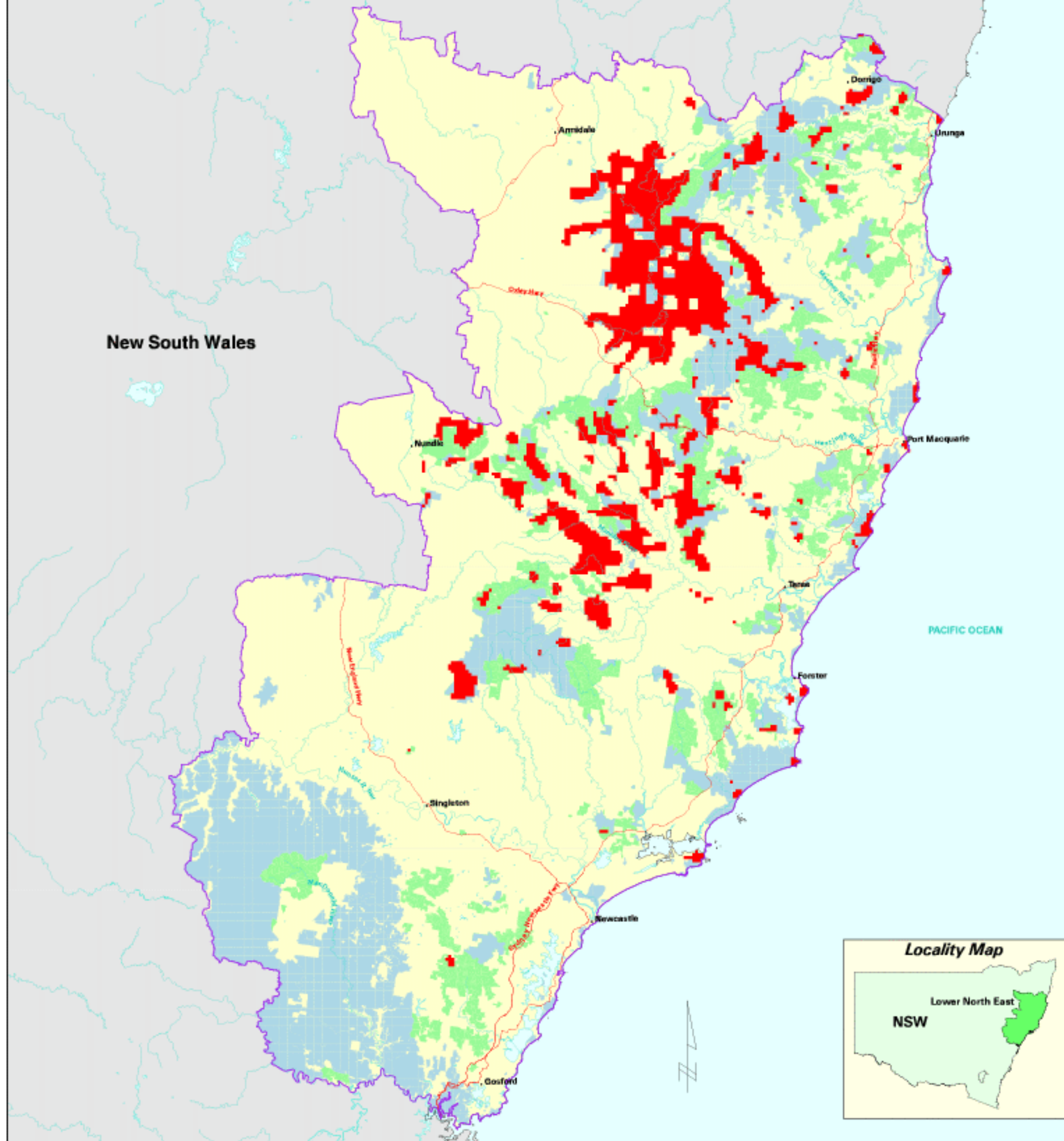
- |   |   |   |              |
|---|---|---|--------------|
|  | Areas Above Threshold for Vegetation Community Richness |  | RFA Boundary |
|  | National Parks and Reserves                             |  | Rivers       |
|  | State Forest  |  | Roads        |

SOURCES:  
 NSW LNE CRA National Estate Assessments - Environment Australia  
 NSW LNE Regional Forest Agreement - LNE RFA Boundary - 1998  
 Drainage and Roads - LID  
 Places - AUSLIG  
 TOPO 250K - AUSLIG  
 Produced by Environment Australia - Version: 18 June 1999  
 File Reference: ne\_vgrch

5 0 5 10 15 20 25  
 kilometres

Scale 1:1300000  
 Projection - AMG Zone 56





## LOWER NORTH EAST Comprehensive Regional Assessment

### MAP 19

### Areas Above Threshold for Habitat Richness

- |  |   |
|--|---|
| <span style="display: inline-block; width: 15px; height: 15px; background-color: red; border: 1px solid black;"></span> Areas Above Threshold for Habitat Richness | <span style="display: inline-block; width: 15px; border-bottom: 2px solid purple;"></span> RFA Boundary |
| <span style="display: inline-block; width: 15px; height: 15px; background-color: lightblue; border: 1px solid black;"></span> National Parks and Reserves          | <span style="display: inline-block; width: 15px; border-bottom: 2px solid cyan;"></span> Rivers         |
| <span style="display: inline-block; width: 15px; height: 15px; background-color: lightgreen; border: 1px solid black;"></span> State Forest                        | <span style="display: inline-block; width: 15px; border-bottom: 2px solid red;"></span> Roads           |

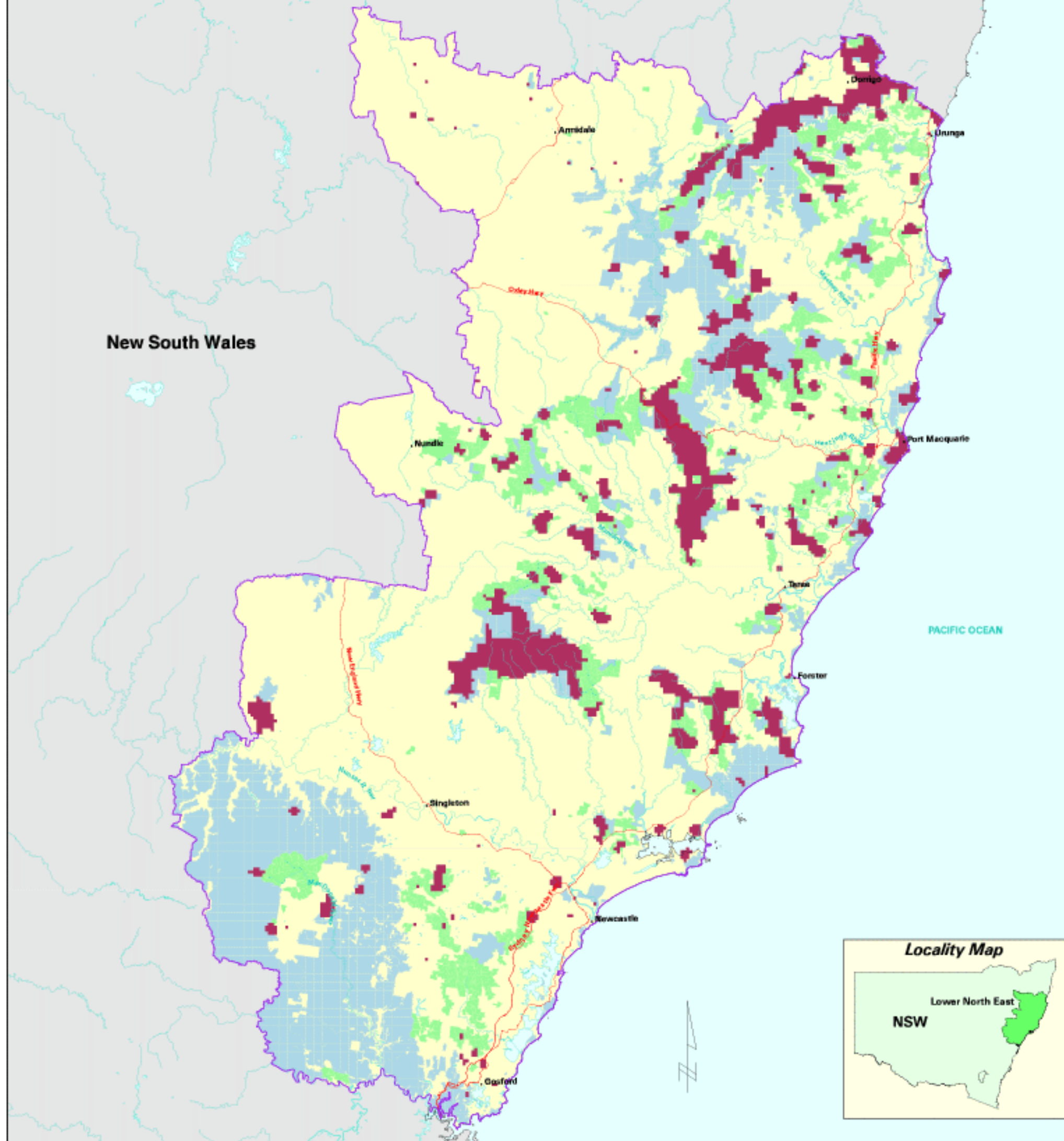
SOURCES:  
 NSW LNE CRA National Estate Assessments - Environment Australia  
 NSW LNE Regional Forest Agreement - LNE RFA Boundary - 1998  
 Drainage and Roads - LID  
 Places - AUSLIG  
 TOPO 250K - AUSLIG  
 Produced by Environment Australia - Version: 18 June 1999  
 File Reference: ne lbroh

5 0 5 10 15 20 25  
 kilometres

Scale 1:1300000  
 Projection - AMG Zone 56







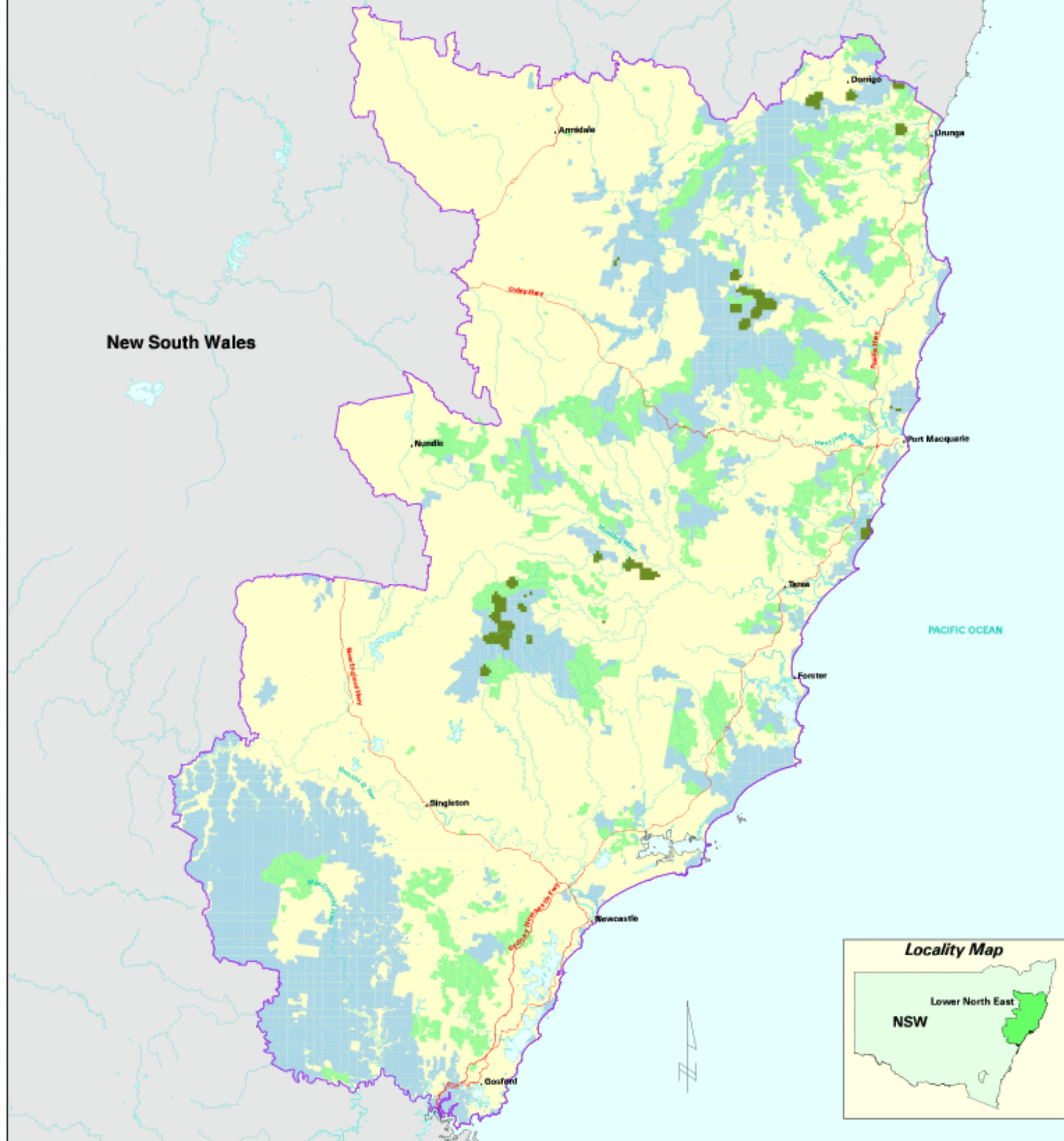
# **LOWER NORTH EAST** **Comprehensive Regional Assessment** **MAP 20** **Areas Above Threshold for Rare Fauna**

- |  |   |
|--|---|
| <span style="display: inline-block; width: 15px; height: 15px; background-color: darkred; border: 1px solid black;"></span> Areas Above Threshold for Rare Fauna | <span style="display: inline-block; width: 15px; border-bottom: 2px solid purple;"></span> RFA Boundary |
| <span style="display: inline-block; width: 15px; height: 15px; background-color: lightblue; border: 1px solid black;"></span> National Parks and Reserves        | <span style="display: inline-block; width: 15px; border-bottom: 2px solid blue;"></span> Rivers         |
| <span style="display: inline-block; width: 15px; height: 15px; background-color: lightgreen; border: 1px solid black;"></span> State Forest                      | <span style="display: inline-block; width: 15px; border-bottom: 2px solid red;"></span> Roads           |







SOURCES:  
 NSW LNE CRA National Estate Assessments - Environment Australia  
 NSW LNE Regional Forest Agreement - LNE RFA Boundary - 1998  
 Drainage and Roads - LID  
 Places - AUSLIG  
 TOPO 250K - AUSLIG  
 Produced by Environment Australia - Version: 18 June 1999  
 File Reference: ne\_rarfn

5 0 5 10 15 20 25  
 kilometres  
 Scale 1:1300000  
 Projection - AMG Zone 56





# **LOWER NORTH EAST** **Comprehensive Regional Assessment** **MAP 21** **Areas Above Threshold for Rare Flora**

- |   |                                      |   |              |
|---|--------------------------------------|---|--------------|
|  | Areas Above Threshold for Rare Flora |  | RFA Boundary |
|  | National Parks and Reserves          |  | Rivers       |
|  | State Forest                         |  | Roads        |

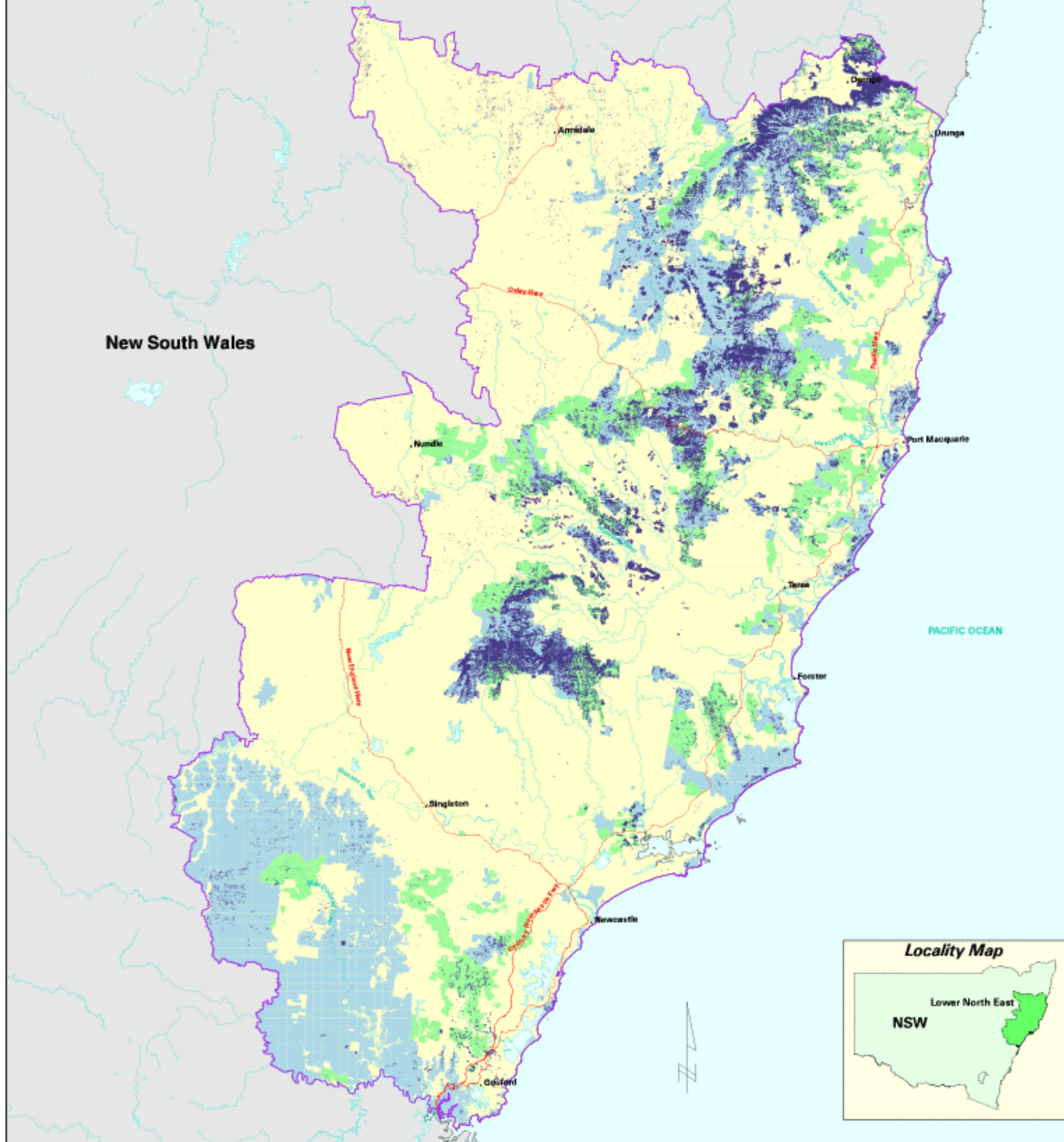
SOURCES:  
 NSW LNE CRA National Estate Assessments - Environment Australia  
 NSW LNE Regional Forest Agreement - LNE RFA Boundary - 1998  
 Drainage and Roads - LID  
 Places - AUSLIG  
 TOPO 250K - AUSLIG  
 Produced by Environment Australia - Version: 18 June 1999  
 File Reference: ne\_rarfl

5 0 5 10 15 20 25  
 kilometres

Scale 1:1300000  
 Projection - AMG Zone 56












## LOWER NORTH EAST Comprehensive Regional Assessment

### MAP 22

### Areas Above Threshold for Rare Vegetation Communities

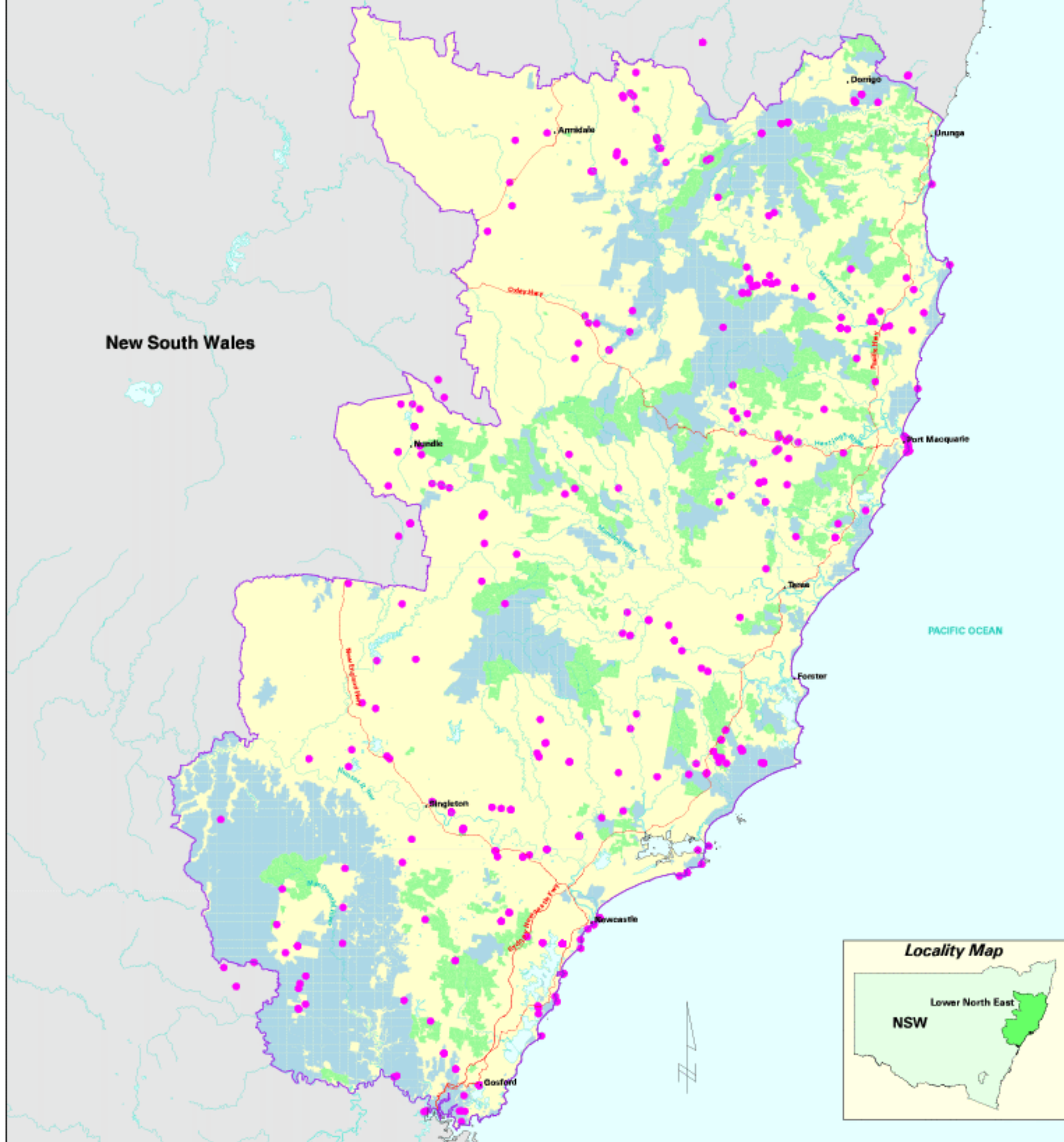
- |   |   |   |              |
|---|---|---|--------------|
|  | Areas Above Threshold for Rare Vegetation Communities |  | RFA Boundary |
|  | National Parks and Reserves                           |  | Rivers       |
|  | State Forest  |  | Roads        |

SOURCES:  
 NSW LNE CRA National Estate Assessments - Environment Australia  
 NSW LNE Regional Forest Agreement - LNE RFA Boundary - 1998  
 Drainage and Roads - LID  
 Places - AUSLIG  
 TOPO 250K - AUSLIG  
 Produced by Environment Australia - Version: 23 June 1999  
 File Reference: ne\_ranvg

5 0 5 10 15 20 25  
 kilometres

Scale 1:1300000  
 Projection - AMG Zone 56





# **LOWER NORTH EAST** **Comprehensive Regional Assessment** **MAP 23** **Areas Identified for Geoheritage Value**

- Areas Identified for Geoheritage Value
- National Parks and Reserves
- State Forest
- RFA Boundary
- Rivers
- Roads

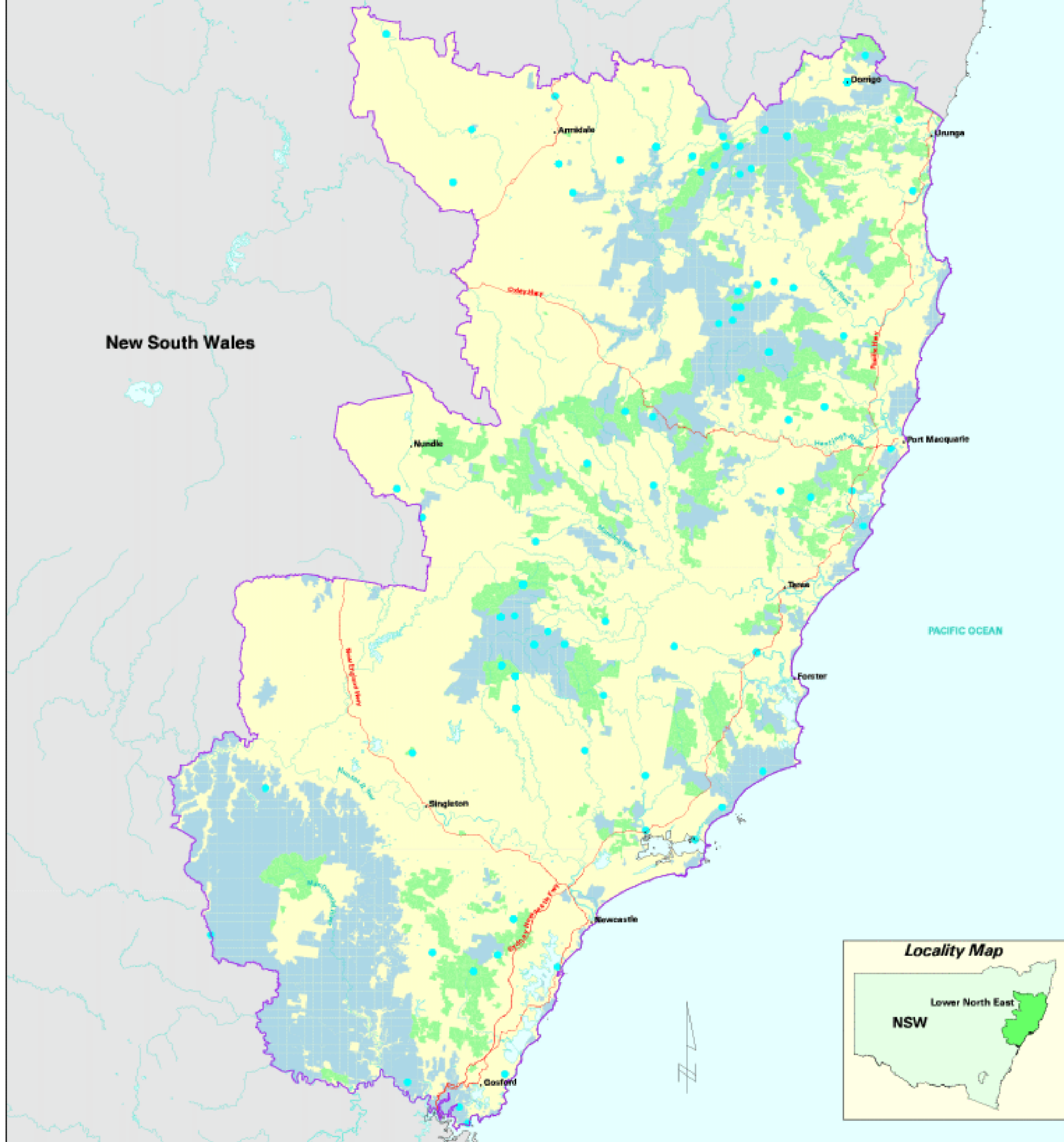
SOURCES:  
 NSW LNE CRA National Estate Assessments - Environment Australia  
 NSW LNE Regional Forest Agreement - LNE RFA Boundary - 1998  
 Drainage and Roads - LID  
 Places - AUSLIG  
 TOPO 250K - AUSLIG  
 Produced by Environment Australia - Version: 22 June 1999  
 File Reference: geohsr

5 0 5 10 15 20 25  
 kilometres

Scale 1:1300000  
 Projection - AMG Zone 56







## LOWER NORTH EAST Comprehensive Regional Assessment

### MAP 24

### Areas Above Threshold for Natural History

- |   |  |
|---|--|
| <span style="color: blue;">●</span> Areas Above Threshold for Natural History   | <span style="color: purple;">—</span> RFA Boundary |
| <span style="background-color: lightblue; border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span> National Parks and Reserves | <span style="color: blue;">—</span> Rivers         |
| <span style="background-color: green; border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span> State Forest                    | <span style="color: red;">—</span> Roads           |

SOURCES:  
 NSW LNE CRA National Estate Assessments - Environment Australia  
 NSW LNE Regional Forest Agreement - LNE RFA Boundary - 1998  
 Drainage and Roads - LID  
 Places - AUSLIG  
 TOPO 250K - AUSLIG  
 Produced by Environment Australia - Version: 18 June 1999  
 File Reference: nat\_hist

5 0 5 10 15 20 25  
 kilometres  
 Scale 1:1300000  
 Projection - AMG Zone 56

