



CHAPTER 14

The North Coast Bioregion

1. Location

The North Coast Bioregion runs up the east coast of NSW from just north of Newcastle to just inside the Qld border. The total area of the bioregion is 5,924,130 ha (IBRA 5.1) and the NSW portion is 5,692,351.6 ha or 96.1% of the bioregion. The NSW portion of North Coast Bioregion occupies 7.11% of the state.

The Sydney Basin Bioregion bounds the North Coast Bioregion in the south and the Nandewar and New England Tablelands bioregions lie against its western boundary. The North Coast Bioregion has proven to be a popular place to live, with hundreds of “holiday towns” lining the coast and eastern inland, including Port Macquarie, Ballina, Coffs Harbour, Byron Bay, Tweed Heads, Lismore, Alstonville, Dorrigo, Forster and Taree.

The Tweed, Richmond, Clarence, Coffs Harbour, Bellinger, Nambucca, Macleay, Hastings and Manning River catchments all fall in the North Coast Bioregion.

2. Climate

The general trend in this bioregion from east to west is from a sub-tropical climate on the coast with hot summers, through sub-humid climate on the slopes to a temperate climate in the uplands in the western part of the bioregion, characterised by warm summers and no dry season. A montane climate occurs in a small area in the southwest of the bioregion at higher elevations.

3. Topography

The North Coast Bioregion covers northern NSW from the shoreline to the Great Escarpment. Typically, there is a sequence from coastal sand barrier, through low foothills and ranges, to the steep slopes and gorges of the Escarpment itself, with rainfall increasing inland along this transect.

Mean Annual Temperature	Minimum Average Monthly Temperature	Maximum Average Monthly Temperature	Mean Annual Rainfall	Minimum Average Monthly Rainfall	Maximum Average Monthly Rainfall
8 – 20°C	-2.8 – 9.8°C	20.3 – 30.9°C	607 – 2912mm	30 – 99mm	76 – 499mm

4. Geology and geomorphology

The North Coast Bioregion is one of the most diverse in NSW. It has Devonian and Permian bedrocks that are part of the New England Fold Belt and have been closely faulted as they were thrust over the northern margin of the Sydney Basin. Small bodies of granite and granodiorite have intruded the sedimentary rocks and there are three centres of Tertiary basalt eruption.

At the time of the opening of the Tasman Sea by plate movements 80 to 100 million years ago during the break up of Gondwana, the coast of the Australian continent was uplifted and warped. As the ocean widened the uplifted block subsided at the coast and river systems developed that eroded back toward the inland flexure along the warp. Rapid headward erosion of these streams formed the Great Escarpment and cut deep gorges back into the plateau areas of the adjacent New England Tablelands Bioregion. The Great Escarpment is very prominent in this bioregion.

The largest volcanic centre, resulting from Tertiary basalt eruption, is the Tweed volcano and the associated Mt Warning caldera (exploded crater) near the NSW/Qld border. This complex is dated between 20 and 24 million years old, and at the time of eruption was a shield volcano with low slopes that covered an area 80 by 100 km. Mt Warning itself is the remains of a large central feeding chamber, filled with coarser rock than the basalts, rhyolites and tuff on the caldera rim.

The bioregion covers that part of the Late Triassic to Early Cretaceous Clarence-Moreton Basin in NSW. Sediments in this sequence are similar to those in the Sydney Basin and include some minor coal seams. The Clarence-Moreton Basin, however, is in a warmer, wetter environment than most of the Sydney Basin and relatively few plants are common to both environments.

During the cold periods of the Quaternary, the sea level was more than 100 m lower than at present and in the past 18,000 years it has risen to its present position, sweeping sand from the continental shelf before it. This sand has accumulated in the coastal barrier systems that reach their maximum degree of development in the Myall Lakes system, with high foredunes, low inner barrier ridges, wide lake basins and high parabolic dunes blown onto bedrock hills.

5. Geodiversity

Important features include the following:

- the Tweed volcano complex and Mt Warning are one of the best exposed in Australia;
- Ebor Plateau and Comboyne Plateau are central volcanoes about 18 million years old;
- a large number of economic mineral deposits, including extended deposits of heavy minerals in beach and dune sands, most of which have associated heritage items;
- the Great Escarpment is well developed in this bioregion with deep gorges on every major river; and
- areas of serpentinite are evidence of deep-sea sediment accretion on the Australian mainland through time – these rocks also weather to soils with toxic levels of some metals, which affects the vegetation growing on them.

6. Soils

The soil and vegetation patterns in the bioregion are very complex because of the different substrates, the topographic variation and the climatic differences encountered across and along the bioregion. In general, only the most fertile soils (normally from basalts) support rainforests, but exceptions

to this are found in numerous protected pockets where plant nutrients have accumulated through organic cycling in litter.

On the basalts the soils are typically red, friable loams or clay loams with high fertility, good structure and excellent water-holding capacity. On granites and most of the quartz rich sedimentary rocks, shallow yellow earths are found on hillcrests, yellow and brown texture contrast profiles are found on the slopes, and organic loams or sandy loams are found on the alluvial plains. In the coastal dunes, deep siliceous sands and very well developed podsols can be found.

7. Biodiversity

7.1 Plant communities

In the north of the bioregion, soils derived from basalts support sub-tropical and warm temperate rainforests, or wet sclerophyll forests. Dominant species include black booyong (*Argyrodendron actinophyllum*), white booyong (*Argyrodendron trifoliolatum*), hoop pine (*Araucaria cunninghamii*), bangalow palm (*Archontophoenix cunninghamiana*), climbing palm (*Calamus muelleri*), rough tree fern (*Cyathea australis*), Australian cedar (*Toona australis*), teak (*Flindersia australis*), white mahogany (*Eucalyptus acmenoides*), small-fruited grey gum (*Eucalyptus propinqua*), tallowwood (*Eucalyptus microcorys*) and



Photo: Mike Williams

Sydney blue gum (*Eucalyptus saligna*). In the south of the bioregion on the Barrington Plateau, cool temperate species are more common, including Antarctic beech (*Nothofagus moorei*), which occurs as a monoculture with a fern understorey. In addition to the fertile areas derived from basalts, rainforests are sometimes found inhabiting protected pockets where plant nutrients have accumulated through organic cycling in litter.

Forests occurring on soils derived from granites are mainly eucalypt vegetation communities. The dominant species include blackbutt (*Eucalyptus pilularis*), Sydney blue gum, spotted gum (*Eucalyptus maculata*), grey gum (*Eucalyptus punctata*), forest red gum (*Eucalyptus tereticornis*), red bloodwood (*Corymbia gummifera*), brush box (*Tristania conferta*) and white mahogany.

In the coastal dunes, the vegetation sequence includes coast tea tree (*Leptospermum laevigatum*) and coastal wattle (*Acacia longifolia*) near the beach, with some areas of beach she-oak (*Casuarina equisetifolia*), snappy gum (*Eucalyptus racemosa*), blackbutt, dwarf red bloodwood and bastard mahogany (*Eucalyptus umbra*). Banksia and bangalow palms are found in the dunes and heath and paperbark swamps occur behind the dunes and near the lagoons. Rare patches of rainforest species can be found even here where sufficient nutrients have accumulated.

Estuaries are dominated by mangrove communities composed of *Avicennia marina*, *Aegiceras coniculatum*, *Exoecaria agallocha* and saltmarsh species. Freshwater margins are occupied by swamp oak (*Casuarina glauca*) and paperbark (*Melaleuca quinquenervia*) while flooded gum (*Eucalyptus grandis*) grows on alluvial river flats.

7.2 Significant flora

Two hundred and two flora species found in the North Coast Bioregion are listed in the schedules of the TSC Act. Of these, 108 are endangered, 89 are vulnerable and 5 are considered extinct in the bioregion (NSW NPWS 2001).

Several of these species are endemic to the bioregion, including *Zieria prostrata* and *Elaeocarpus* sp. Rocky Creek. *Z. prostrata* is restricted to Moonee Beach Nature Reserve and is listed as endangered in both State and Commonwealth legislation. *E. sp* Rocky Creek is found in only 4 locations on the southern edge of the Mt Warning caldera and is also listed as endangered in both State and Commonwealth legislation.

7.3 Significant fauna

One hundred and fifty-seven fauna species recorded in the North Coast Bioregion are listed in the schedules of the TSC Act (NSW NPWS 2001). Of these, 36 are listed as endangered and 121 are listed as vulnerable.

The subtropical habitats of the North Coast Bioregion are rich in bird diversity, with many endemic species and species with restricted distributions, especially in rainforest habitats where there are also several threatened species. The bioregion is important for the logrunner (*Orthonyx temminckii*), paradise riflebird (*Ptiloris paradiseus*), the vulnerable Albert's lyrebird (*Menura alberti*), rufous scrub-bird (*Atrichornis rufescens*) (both the northern vulnerable and near-threatened southern subspecies), the critically endangered Coxen's fig-parrot (*Cyclopsitta dipteralma coxeni*) and northern species of eastern bristlebird (*Dasyornis brachypterus*) (Australian Terrestrial Biodiversity Assessment 2002). The only breeding population of Gould's petrel (*Pterodroma leucoptera*) occurs on two small islands off the coast of Newcastle.

Numbers of grassland species and ground-feeding insectivorous birds, as well as temperate woodland and forest birds, appear to have declined in the bioregion. This decline in forest birds is against the national trend (Australian

Terrestrial Biodiversity Assessment 2002). The white-headed pigeon (*Columba leucomela*), long-billed corella (*Cacatua tenuirostris*), little corella (*Cacatua sanguinea*), rainbow lorikeet (*Trichoglossus haematodus*) and common myna (*Acridotheres tristis*) have increased in number in the bioregion. The continued loss of woodland birds, particularly those sensitive to fragmentation, is likely, while rainforests species remain stable (Australian Terrestrial Biodiversity Assessment 2002).

7.4 Significant wetlands

Eight significant wetlands have been identified in the North Coast Bioregion (Australian Terrestrial Biodiversity Assessment 2002). Clarrie Hall Dam supports several significant species, including the vulnerable comb-crested jacana (*Irediparra gallinacea*) and the endangered black-necked stork (*Ephippiorhynchus asiaticus*).

The Brunswick River Floodplain supports a number of threatened species including the vulnerable comb-crested black bittern (*Ixobrychus flavicollis*), freckled duck (*Stictonetta naevosa*), mangrove honeyeater (*Lichenostomus fasciolaris*) and the endangered black-necked stork (*Ephippiorhynchus asiaticus*). Threatened flora on this section of floodplain includes the vulnerable bakers wattle (*Acacia bakeri*) and the endangered *Randia moorei*.

Cumbebin Swamp provides habitat for the endangered black-necked stork (*Ephippiorhynchus asiaticus*) and Mitchell's rainforest snail (*Thersites mitchellae*). Other vulnerable species recorded are the bush hen (*Amaurornis olivaceus*), great knot (*Calidris tenuirostris*), grass owl (*Tyto capensis*) and the little bent-wing bat (*Miniopterus australis*).

Cokora Lagoon supports a diversity of wetland birds including the vulnerable brolga (*Grus rubicundus*), pied oystercatcher (*Haematopus longirostris*) and the endangered black-necked stork (*Ephippiorhynchus asiaticus*).

Blue Lake is protected in Yuraygir National Park. This wetland provides habitat for the vulnerable brolga (*Grus rubicundus*), the comb-crested jacana, the endangered black-necked stork and green and golden bell frog (*Litoria aurea*). The endangered little tern (*Sterna albifrons*) has also been recorded at the lake. The little tern is protected under both the JAMBA and CAMBA agreements. Other vulnerable species include the glossy black cockatoo (*Calyptorhynchus lathami*), masked owl (*Tyto novaehollandiae*), rose-crowned fruit dove (*Ptilinopus regina*) and squirrel glider (*Petaurus norfolcensis*).

An unnamed swamp next to Kalang River in the Nambucca catchment has also been identified as one of the most significant wetlands in the bioregion. The vulnerable comb-crested jacana and blue-billed duck (*Oxyura australis*), as well as the endangered black-necked stork, have been recorded at the swamp. Other vulnerable species found here include the glossy black cockatoo (*Calyptorhynchus lathami*), squirrel glider (*Petaurus norfolcensis*) and koala (*Phascolarctos cinereus*) (Australian Terrestrial Biodiversity Assessment 2002).

Lake Innes supports the vulnerable Australasian bittern (*Botaurus poiciloptilus*) and the endangered black-necked stork. Other vulnerable species recorded here include the osprey (*Pandion haliaetus*), grass owl (*Tyto capensis*), koala, greater broad-nosed bat (*Scoteanax rueppellii*) and wallum froglet (*Crinia tinnula*).

Grahamstown Lake provides habitat for the vulnerable blue-billed duck and freckled duck as well as the endangered black-necked stork. There have also been many sightings of the vulnerable koala (*Phascolarctos cinereus*) and the Australian Museum has recorded the vulnerable tiger quoll (*Dasyurus maculatus*) at the lake.

Threats to the wetlands in this bioregion are numerous and include changed drainage patterns from construction of roads, drains and channels, particularly in expanding urban areas. Cudgens Lake in particular is affected by increased flooding because the lake's entrance is permanently open.

Water quality is continually affected by urban and agricultural runoff such as the discharge of treated sewerage into Port Stephens estuary. Minor impacts have resulted from recreational activities such as camping and bushwalking, with more serious impacts, such as damage to coral reefs from boat anchors, caused by recreational and commercial users of the estuaries. Other impacts include the presence of feral animals and exotic weeds, acid sulfate soils, sedimentation, erosion and grazing pressure.

8. Regional history

8.1 Aboriginal occupation

The high diversity and abundance of natural resources available to the Aboriginal people (Berndt and Berndt 1964) of the North Coast Bioregion resulted in a high density of Aboriginal occupation in the bioregion, particularly around the northern rivers close to the coast. The marine environment coupled with the lush vegetation along the coast provided the people with much of what they needed to subsist.

Towards the grassy plains of the bioregion further inland, Aboriginal people were hunter-gatherers, living similar lifestyles to the people of the New England Bioregion and in the west. The coastal and inland groups were linked by trade and all shared a common interest in the landscape, which was closely linked to their spirituality, a factor which was threatened significantly by European settlement (HO and DUAP 1996).

The traditional lands of the Muruwari and Gumbaingirr people are on the mid-North Coast in the bioregion. Despite the hardships they encountered in association with the defence of their homelands during European settlement, they have retained their strong links with the land up to the present time (English and Brown 2000). During European settlement in the mid-nineteenth century, the Muruwari and Gumbaingirr people were subjected to much violence, including bloody massacres. After these clashes, the people were determined to remain on the land and gained pastoral work on farms, or lived in station camps or on vacant crown lands nearby, enabling them to achieve this (English and Brown 2000) while avoiding being moved onto Missions.

8.2 European occupation

John Oxley first explored the bioregion by land around 1818 and was soon followed by early settlers.

A penal settlement, which up until the 1820s was located at Newcastle, was moved to Port Macquarie in 1823. Here, convicts grew maize for their own consumption and also attempted to grow sugar on the Hastings and Wilsons Rivers. The sugar-growing venture was not viable due to frost and floods although its mild success prompted another attempt to be made in the 1860s. Cedar cutters who were initially stationed around the Hunter region followed the convicts north in the 1820s, reaching the Macleay in 1837, the Clarence in 1838 and moving further north to the Richmond River in 1842. Logs transported on the rivers were intercepted at ports downstream before being shipped to Sydney. These ports, including Ballina on the Richmond River and Grafton on the Clarence, were based on the cedar industry and were the first settlements on the rivers of the north coast (HO and DUAP 1996). Around the same time the demand for ships to transport the cedar to Sydney, and the

abundant timber sources along the rivers, encouraged the shipbuilders to accompany the cedar industry in its move northward (HO and DUAP 1996).

The Port Macquarie penal settlement was removed in 1833, leaving only a prison until 1846. This enabled the government to open up the land around Port Macquarie to free settlement, prompting the start of the pastoral occupation of the North Coast Bioregion (HO and DUAP 1996).

The early farming settlements of the North Coast Bioregion began in the late 1830s with holdings owned rather than leased by the landholders. These were concentrated on the small areas suitable for grazing. Beyond its beginnings in the 1840s, the expanding pastoral industry formed the basis for several towns such as Casino and Kempsey along the north coast. Much of the land in the bioregion was unsuitable for grazing and so experimental crops were planted and, when successful, harvested. Such crops included wheat, maize, tropical crops such as arrowroot, mangoes, sugarcane, breadfruit and opium poppies, while coffee, tea, tobacco, cotton and rice were also grown experimentally (HO and DUAP 1996). Of these experimental crops, maize and sugarcane were most successful although maize was worth little, often being fed to pigs, and after rapid expansion of the sugarcane industry through the 1860s and 1870s, sugarcane crops were struck by disease in the 1890s, at which point many farmers turned to dairying.

Despite early seasonal problems with dairying, the industry became highly successful towards the turn of the century, gradually expanding from the floodplains in the direction of the beef cattle industry further inland and then to the basaltic plateaus above the river valleys. Dairying began in the north around the Richmond River, but progressed further south with time, remaining successful beyond the 1920s (HO and DUAP 1996). It formed the foundation, complete with butter factories, for many towns of the bioregion, which also relied on maize and sugar farming.

The tourism industry accelerated in the 1960s and is still prolific today. Sand mining is also a relatively new industry in the bioregion. While dairying has withdrawn from the bioregion, the beef cattle industry has continued, and now occupies much of the former dairying land. The discovery of gold, silver and copper at fields in the north west of the bioregion in the 1880s saw the establishment of yet another land use in the bioregion (HO and DUAP 1996).

The bioregion has become a popular target for retirees who, along with younger people, have moved to the area to experience a more relaxed lifestyle than that seen in Sydney. The bioregion is illustrative of an environment that is so complex that it provides a wide diversity of niches, both ecologically and in terms of the land-use potential available within the bioregion (HO and DUAP 1996).

9. Bioregional-scale conservation

The North Coast Bioregion has the second highest area of conservation oriented mechanisms of the NSW bioregions. Together, these tenures occupy about 1,061,709.63 hectares or 18.65% of the bioregion.

National parks and nature reserves (under the NPW Act 1974) make the greatest contribution to the area conserved, occupying a total area of 991,386,82 ha, or about 17.42% of the bioregion. Of this area, about 347,425.61 ha is provided additional management under the Wilderness Act 1987 and is composed of 11 declared wilderness areas, together occupying about 6.1% of the bioregion.

Further recognition and protection is also given to national parks in the bioregion in an area extending from Newcastle to Brisbane, known as the Central Eastern Rainforest Reserves. This has been included on the globally recognised World Heritage list as one of three world heritage areas in NSW. Occupying approximately 307,284 ha or 5.40% of the bioregion, the area is protected by international convention as well as the Commonwealth EPBC Act 1999, which automatically protects all Australian properties that are on the World Heritage List.

Reserves (Crown Lands Act 1989) managed by the National Parks and Wildlife Service contributes 21,862.34 ha to the area managed for biodiversity conservation in the bioregion.

Other lands managed under the NPW Act 1974 include: land managed as Aboriginal area (125.61 ha or 0.002% of the bioregion); land managed as historic site (482.8 ha or 0.008% of the bioregion); and land managed as state recreation areas (222.1 ha or 0.004% of the bioregion).

Within recent years, landholders on 25 properties have entered into voluntary conservation agreements. Together the area managed permanently for conservation management occupies about 1362.53 ha or 0.02% of the

bioregion. Landholders on 71 properties also hold wildlife refuges, occupying 36,720.46 ha or 0.65% of the bioregion, making a significant contribution to off-park landscape conservation. Updated mapping is likely to increase the area occupied under wildlife refuges.

Landholders on 120 properties have entered into property agreements (NVC Act 1997). The conservation zones of the agreements occupy about 2,036.93 ha or 0.04% of the bioregion

Outside of the NPW Act 1974, 36 flora reserves under the provisions of the Forestry Act 1916 contribute towards biodiversity conservation in the bioregion, occupying about 7,510.05 ha or 0.13% of the bioregion.

Also under the provisions of the Forestry Act 1916, State forests (managed primarily for forestry activities but each with various degrees of zoning from commercial forestry to conservation), occupy about 789,329.45 ha or 13.87% of the bioregion.

Two State Environmental Planning Policies operate in the North Coast Bioregion. SEPP 14 (Coastal Wetlands) (78,317.08 ha or 1.38%) and SEPP 26 (Littoral Rainforests) (629.74 ha or 0.01% of the bioregion).



Photo: P. Green

10. Subregions of the North Coast Bioregion

(Morgan 2001)

Subregion	Geology	Characteristic landforms	Typical soils	Vegetation
Murwillumbah	Folded Devonian lithic sandstones, slate and phyllite. Small areas of loamy alluvium.	Finely dissected steep ranges, with narrow alluvial plains. Relief to 250 m.	Shallow yellow earths on hill crests, yellow and brown texture contrast profiles on slopes and organic loams on alluvial plains.	Wet and dry sclerophyll forests, including blackbutt, Sydney blue gum, forest red gum on lower slopes and plains.
Richmond-Tweed	Jurassic lithic and quartz sandstones and shales exposed in valleys. Tertiary volcanics of the Mt Warning complex. Mainly sheet basalts, with minor rhyolite and tuffs. Major syenite and gabbro plug – remnant of the caldera explosion.	Dissected volcanic caldera with central plug of Mt Warning. Basement rocks exposed around the plug and an outer rim of volcanic flows with well-developed radial drainage pattern. Steep slopes and relief of 1100 m.	Red friable loams on basalts, texture contrast and fabric contrast soils on volcanic rocks on slopes, all with high fertility. Low fertility texture contrast soils on sandstones and shales. Cracking clays in valleys.	Subtropical and warm temperate rainforests and wet sclerophyll forests including; black booyong, white booyong, hoop pine, bangalow palm, climbing palm, rough tree fern, Australian cedar, teak, white mahogany, small-fruited grey gum, tallowwood and Sydney blue gum.
Woodenbong	Jurassic lithic and quartz sandstones, and shales with areas of Tertiary basalts.	Hilly, basalt ridges and plateau remnants. Outer and dissected parts of Mt Warning caldera slopes. Relief to 600 m.	Fertile red earths and red loams on basalt. Poor red, brown and yellow, texture contrast soils on sedimentary rocks. Sands and loams along streams.	Rainforests on basalt as for Richmond-Tweed. Wet and dry sclerophyll, including New England blackbutt, red bloodwood and tallowwood on sedimentary rocks.
Clarence Basin	Sub-horizontal Jurassic and Cretaceous lithic and quartz sandstones and claystones. Extensive areas of alluvials and coastal barrier sands.	Low stepped hills and plains, with hillier areas in west and south. Beach, dune and lagoon barrier systems and estuarine fills along the main streams.	Mellow texture contrast soils and areas of deep sand on Mesozoic rocks. Deep siliceous sands and podsols in dunes, organic sands and mud in estuaries.	Dry sclerophyll forests and woodlands of spotted gum, grey gum, blackbutt, red bloodwood and white mahogany in the hills. Dune sequence includes paperbark, snappy gum, blackbutt, dwarf red bloodwood, bastard mahogany with banksia, bangalow palm and areas of heath and paperbark swamp. Mangroves in estuaries.
Nymboida	Complex faulted bedrock of Devonian slates and quartzites, and Permian mudstones and lithic sandstones both intruded by granodiorites. Areas of Tertiary basalt on the margins of the Great Escarpment. Serpentinite at Baryulgil.	Foothills of the Great Escarpment with steep slopes and high rainfall. Relief to 750 m. Some isolated plateaus often with a basalt cap.	Red earths and red loams on basalts and granodiorites. Red and brown texture contrast soils on volcanics and sedimentary rocks.	Dry sclerophyll forest, including northern grey ironbark, broad-leaved white mahogany, white mahogany, tallowwood and turpentine. Rainforest elements in sheltered locations along escarpment including coachwood, crabapple, prickly ash, and rough tree fern.

10. Subregions of the North Coast Bioregion *CONTINUED*

Subregion	Geology	Characteristic landforms	Typical soils	Vegetation
Manning-Macleay	Extremely complex faulted terrain where the New England Fold belt over-thrusts the Sydney Basin. Main rocks present are: Silurian and Devonian slates, quartzites and acid volcanics, Carboniferous mudstones and lithic sandstones, and less deformed Permian shales and sandstones. Small areas of granite and plateaus of Tertiary basalt on Barrington and Comboyne Plateaus. Quaternary coastal sands.	Complex pattern of ridges and valleys running to the Great Escarpment, strong structural control along fault lines. Coastal beach, dune and lagoon barrier systems reach their maximum development at Myall Lakes.	Red brown structured loams on basalt. A range of other soil types relating to geology but poorly known. Deep siliceous sands and very well developed podsols in dunes, particularly the older high dunes. Organic sands in estuaries.	Wet sclerophyll forest with white mahogany, small-fruited grey gum, Sydney blue gum, blackbutt, tallowwood and brush box. White gum, blackbutt, forest red gum and grey box on dry open flats. Dense Antarctic beech on Barrington tops and patches of mixed cool temperate and warm temperate rainforest on Comboyne Plateau on basalt. Coastal complex of banksia, paperbark, smooth-barked apple, and blackbutt with numerous shrubs and areas of heath and swamp on dunes. Mangroves in estuaries.
Southern Coastal Lowlands	Quaternary alluvial sand, coastal sands. Minor Devonian slate, phyllite and quartzite.	Alluvial plains and coastal beach, dune barrier system and estuary of the Tweed River. Low hills to 25 m.	Siliceous sands and deep podsols in older dunes. Organic sands and muds along the streams and edges of the estuary. Mellow texture contrast soils on bedrock.	Coastal heaths and woodlands on the dunes with paperbark, snappy gum, blackbutt, dwarf red bloodwood, bastard mahogany with banksia, bangalow palm and other shrubs. Areas of seasonally waterlogged heath and swamp. Swamp oak, paperbark and saltmarsh species with mangroves in estuaries. Flooded gum on alluvial flats.

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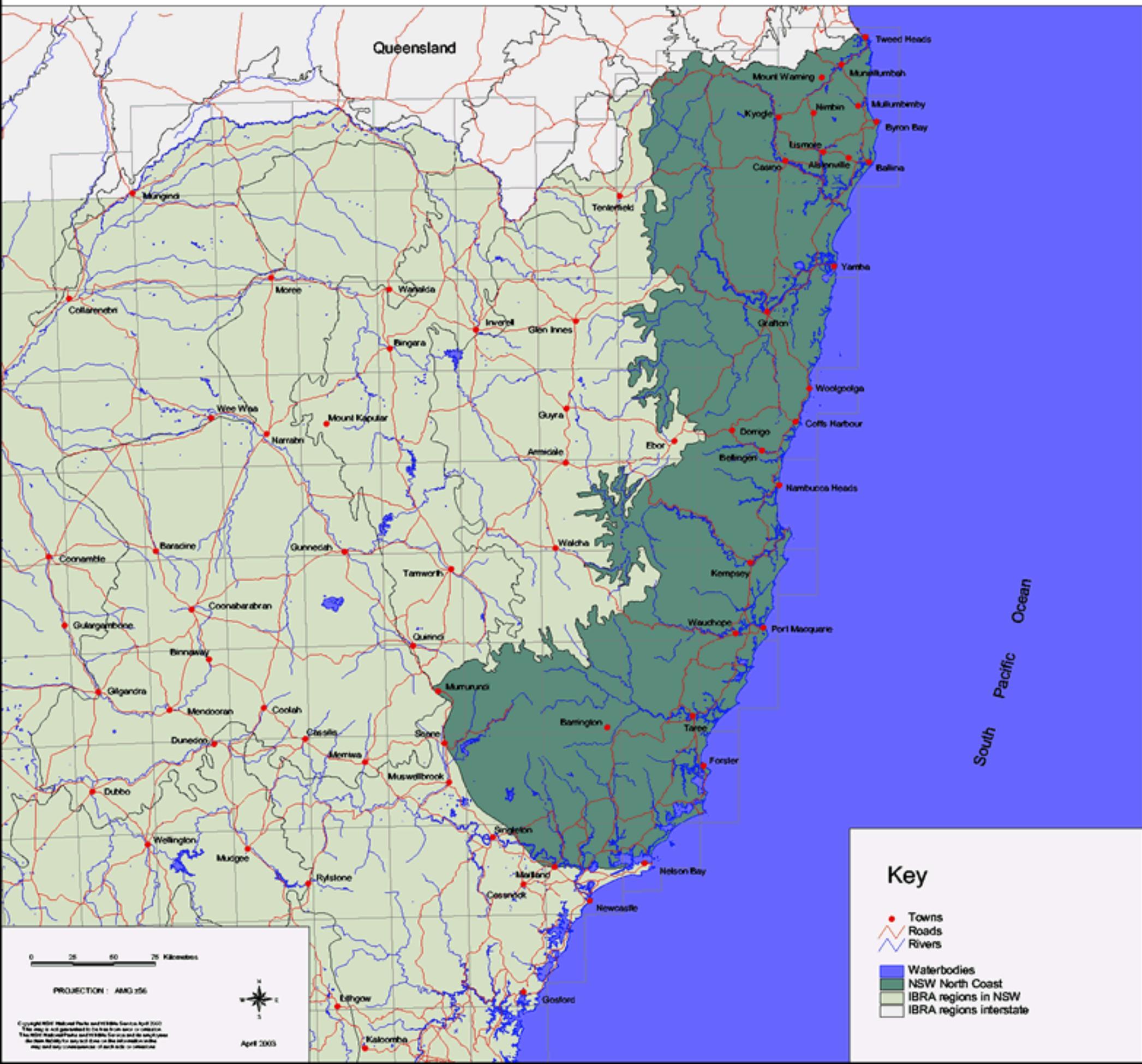
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NSW North Coast Biogeographic Region (IBRA) - Location



0 25 50 75 Kilometres

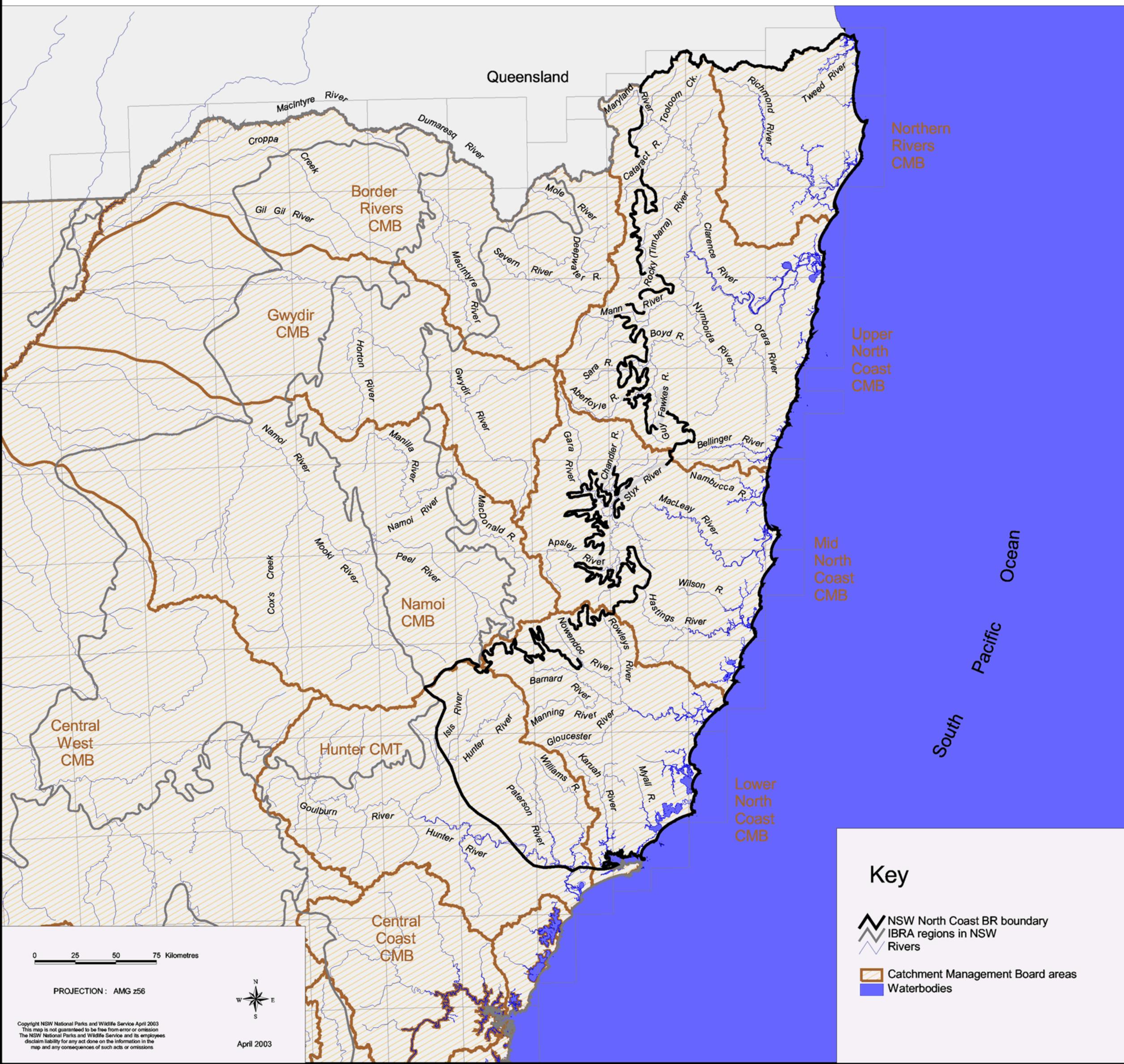
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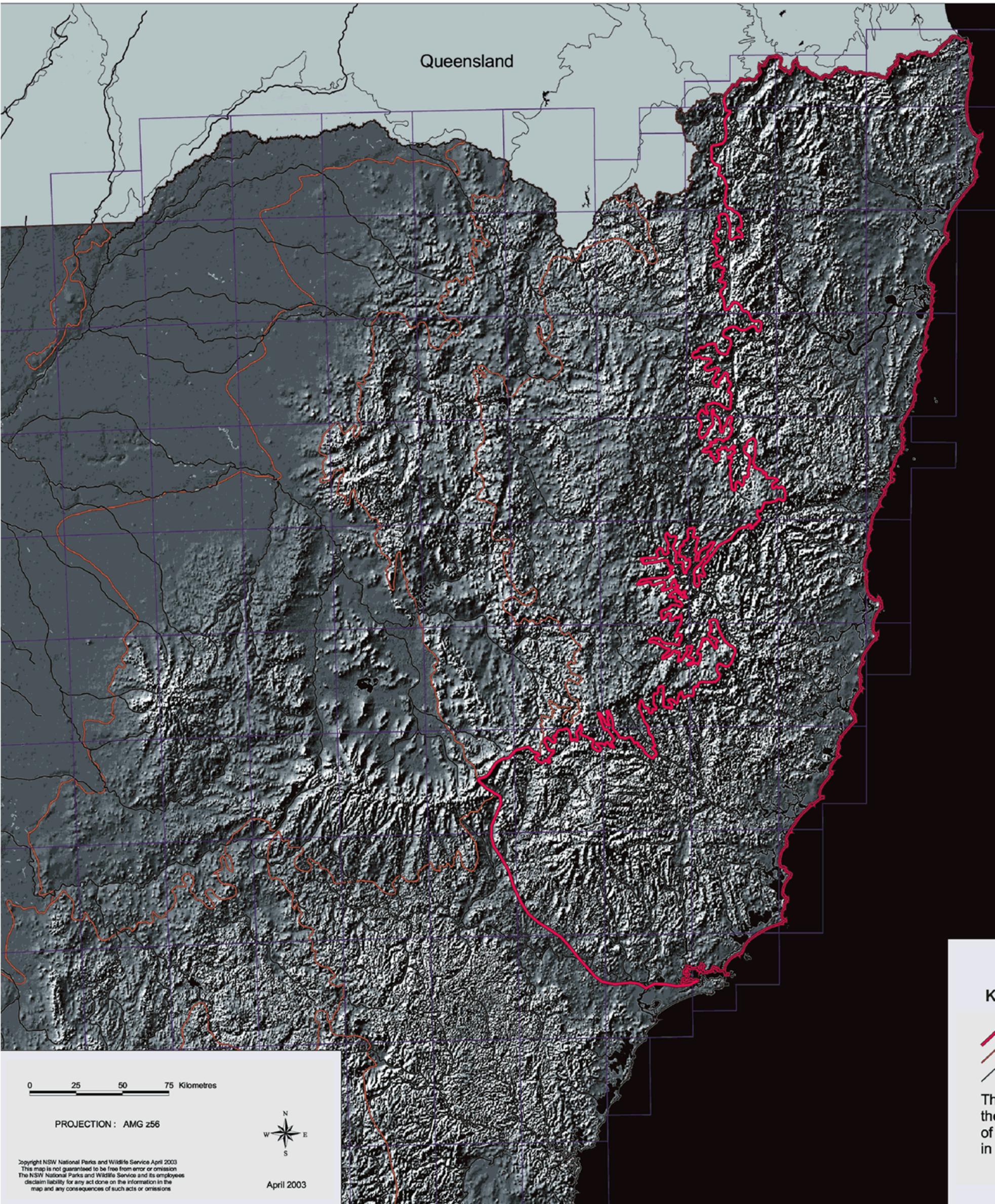
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NSW North Coast Biogeographic Region (IBRA) - Rivers



NSW North Coast Biogeographic Region (IBRA) - Topography



Queensland

South Pacific Ocean

Key

-  NSW North Coast boundary
-  Other IBRA boundaries
-  Rivers

This map describes the topography of the region, by simulating the illumination of the landscape as expected with the sun in the north western sky.

0 25 50 75 Kilometres

PROJECTION: AMG z56



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NSW North Coast Biogeographic Region (IBRA) - Vegetation



0 25 50 75 Kilometres

PROJECTION : AMG z56



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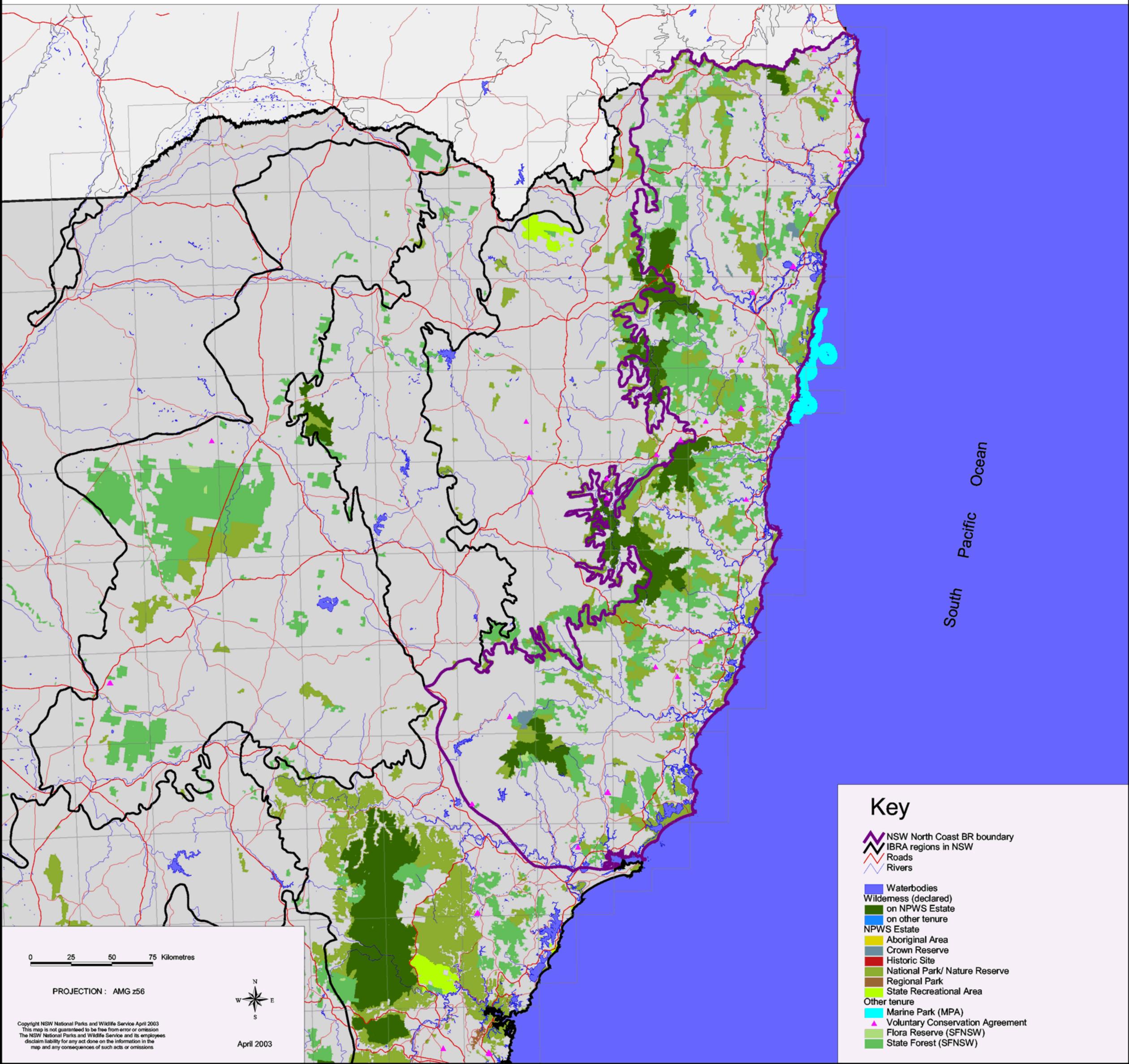
Key

- NSW North Coast BR boundary
- Roads
- Rivers

- Cleared of Vegetation
- Vegetated
- Regional Vegetation Committee area
- Waterbodies

* Being 'Cleared of Vegetation' is largely a reference to the state of the canopy layer, see NPWS (in preparation).

NSW North Coast Biogeographic Region (IBRA) - Tenure/Reserves



South Pacific Ocean

Key

- NSW North Coast BR boundary
- IBRA regions in NSW
- Roads
- Rivers
- Waterbodies
- Wilderness (declared)**
 - on NPWS Estate
 - on other tenure
- NPWS Estate**
 - Aboriginal Area
 - Crown Reserve
 - Historic Site
 - National Park/ Nature Reserve
 - Regional Park
 - State Recreational Area
- Other tenure**
 - Marine Park (MPA)
 - Voluntary Conservation Agreement
 - Flora Reserve (SFNSW)
 - State Forest (SFNSW)

0 25 50 75 Kilometres

PROJECTION : AMG z56



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April 2003

Key

-  Subregions (IBRA)
-  NSW North Coast
-  IBRA regions in NSW
-  IBRA regions interstate

Landscapes

 1	 45	 268
 2	 46	 270
 3	 49	 271
 4	 50	 276
 5	 52	 277
 6	 53	 303
 7	 56	 322
 8	 57	 334
 9	 58	 380
 10	 59	 388
 11	 60	 421
 12	 62	 428
 13	 63	 440
 14	 64	 446
 15	 65	 460
 16	 66	 462
 17	 67	 471
 18	 68	 473
 19	 73	 494
 20	 76	 497
 21	 77	 508
 22	 78	 510
 23	 79	 538
 24	 90	 540
 25	 91	 547
 26	 92	 557
 27	 93	 564
 28	 94	 565
 29	 95	 574
 30	 96	 578
 31	 97	 587
 32	 98	 588
 33	 107	 589
 34	 125	 590
 35	 131	 591
 36	 160	 592
 37	 161	 593
 38	 175	 594
 39	 181	 620
 40	 196	 642
 41	 214	 645
 42	 219	 661
43	 252	 662
44	 265	 667
	266	670

* A description of each landscape, identified by these landscape codes, is available in 'State Conservation Monitoring Project - Monitoring NSW Environments' (NPWS, in preparation)

0 25 50 75 Kilometres

PROJECTION : Lamberts

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