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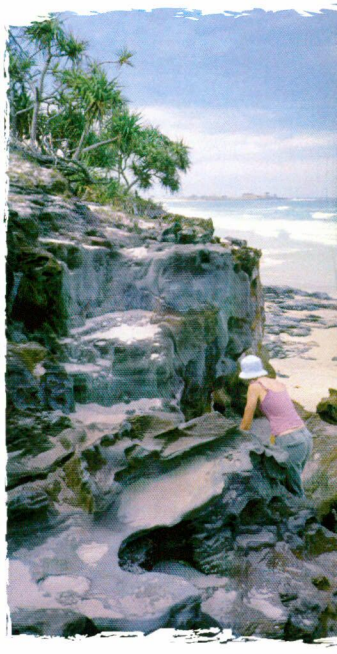

Far North Coast Regional Conservation Plan

NSW GOVERNMENT | Environment, Climate Change & Water

Far North Coast Regional Conservation Plan

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This document should be cited as:
DECCW 2010, *Far North Coast Regional Conservation Plan*, Department of Environment, Climate Change and Water, Sydney

Published by:
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ISBN 978 1 74293 033 6
DECCW 2010/982
December 2010

Summary

The Far North Coast Region is a highly diverse area containing a wide variety of high conservation value biodiversity assets, many of which are irreplaceable. The area also has important Aboriginal heritage values, reflecting past and present relationships with the landscape.

Like many other areas of New South Wales, the Far North Coast Region has inherited a legacy of clearing and urban development since non-indigenous settlement. The region's biodiversity is also subject to a variety of pressures, including development associated with a rapidly growing population and climate change.

The Government's Far North Coast Regional Strategy predicts a significant increase in urban development in the region by 2031 and seeks to guide development in a planned and sustainable manner.

This regional conservation plan will be a partner document to the regional strategy that identifies and discusses the Far North Coast Region's high conservation value biodiversity assets and predicts where these assets may be found. It includes an audit of these assets in the future urban development areas and employment lands identified in the regional strategy. The purpose of the regional conservation plan is to propose an overarching outcome of 'improving or maintaining' biodiversity values through avoiding, as far as possible, impacts on native flora and fauna.

This regional conservation plan provides general advice on protection mechanisms for biodiversity across the region through land-use planning. It identifies areas where rehabilitation of the landscape should be targeted strategically to enhance biodiversity conservation and landscape connectivity, and to build resilience to climate change.

Importantly, it also identifies areas where offsets, should they be required, may best be placed strategically in the landscape to facilitate conservation outcomes. A mix of delivery mechanisms is proposed to achieve an overall improve or maintain outcome for landscape-scale biodiversity conservation in the Far North Coast Region.

Knowledge of the occurrence and significance of Aboriginal cultural heritage values is not well documented. General principles of Aboriginal cultural heritage assessment and protection are provided, but until comprehensive Aboriginal cultural heritage management plans and consultation protocols are prepared and adopted in all local government areas, a region-wide analysis and plan cannot be developed.

The principle of avoiding impacts, as far as possible, equally applies to Aboriginal cultural heritage. However, unlike biodiversity where it may be possible to replace or restore degraded habitat over time and thus maintain biodiversity values, Aboriginal cultural heritage is irreplaceable. Where development and Aboriginal heritage values coincide, we must always look for innovative and respectful solutions.

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Abbreviations

AHIMS	Aboriginal Heritage Information Management System
ANZECC	Australian and New Zealand Environment and Conservation Council
ARA	Aboriginal Regional Assessment
BCL	Biodiversity Conservation Lands
BFT	Biodiversity Forecasting Tool
BioBanking	biodiversity banking and offsets scheme
BMP	biodiversity management plan
CA	conservation agreement
CAP	catchment action plan
CL Act	*Crown Lands Act 1989*
CMA	catchment management authority
DCP	development control plan
DECCW	Department of Environment, Climate Change and Water
EEC	endangered ecological community
EPA Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPI	environmental planning instrument
FM Act	*Fisheries Management Act 1994*
FMZ	Forest Management Zone (under the *Forestry Act 1916*)
FNCRS	Far North Coast Regional Strategy
IBRA	Interim Biogeographic Regionalisation for Australia
ICOLL	intermittently closed and open lake and lagoon
ILUA	indigenous land-use agreement
IUCN	International Union for the Conservation of Nature
JANIS	Joint ANZECC/MCFFA NFPS Implementation Subcommittee
LEP	local environmental plan
LGA	local government area
MCFFA	Ministerial Council on Forestry, Fisheries and Aquaculture
MNES	Matters of National Environmental Significance
NFPS	National Forest Policy Statement
NP	national park
NPW Act	*National Parks and Wildlife Act 1974*
NPWS	National Parks and Wildlife Service NSW
NR	nature reserve
NRM	natural resource management
NV Act	*Native Vegetation Act 2003*
PNF	private native forestry
PVP	property vegetation plan
RCP	regional conservation plan
SEPP	State Environmental Planning Policy
SI–LEP	Standard Instrument – Principal Local Environmental Plan
TSC Act	*Threatened Species Conservation Act 1995*

1 Introduction

The Far North Coast Region exhibits high ecosystem and species diversity, including outstanding biodiversity assets which deliver social, economic and environmental benefits for the communities it supports. These assets, in addition to their intrinsic values, deliver clean air and water to our communities and provide the natural resources which underpin industries and provide the foundation on which a significant tourism sector has been built.

The region has significant and unique Aboriginal cultural values that are continually interconnected with Country. This attachment is through earth, water, plants, animals, knowledge, traditions and stories, all of which are interwoven and inseparable, and are still strong today. Traditional practices, including use of fire, crafted a landscape in ecological equilibrium.

Non-indigenous settlement from the early 19th century introduced intensive land-use practices, including timber-getting and vegetation clearing for agricultural pursuits, such as grazing and cropping. These uses first targeted the relatively flat and fertile lands associated with river valleys and coastal plains, and volcanic-derived soils associated with the Mount Warning caldera. Subsequently, timber production and grazing became important industries on less fertile or steeper lands. Other uses such as resource extraction and urban development were also introduced.

Such competing land-use demands have the potential to generate significant impacts on biodiversity and thereby threaten the social and economic benefits on which the community relies. The same pressures on biodiversity also have the potential to impact on a range of Aboriginal cultural heritage values.

It is therefore imperative to actively manage these competing demands in order to protect the Far North Coast Region's biodiversity and secure a sustainable future. The Far North Coast Regional Conservation Plan (RCP) focuses on protecting and managing biodiversity assets in view of the population growth foreshadowed in the Far North Coast Regional Strategy (FNCRS) and the associated changes in land use (both residential and employment) required to accommodate this growth.

Although the primary focus of this RCP is on biodiversity, sound strategic conservation planning will also benefit Aboriginal cultural heritage in all of its various forms, due to the interconnectedness of Aboriginal culture with Country. Sound strategic planning will also protect other important land uses such as agriculture.

1.1 What is biodiversity?

Biological diversity, or biodiversity, is defined for the purpose of this RCP as:

> The variety of life forms, the different plants, animals and microorganisms, the genes they contain, and the ecosystems they form. It is usually considered at three levels: genetic diversity, species diversity and ecosystem diversity (Commonwealth of Australia 1996).

Genetic diversity refers to the variety of genetic information contained in all individual plants, animals and microorganisms.

Species diversity refers to the variety of species for a given area. It is usually a measure of the number of species (richness) and their relative abundances for a given area at any time.

Ecosystem diversity refers to the variety of habitats, biotic communities and ecological processes (NPWS 1999).

Landscapes (terrestrial and aquatic) add another level to the biodiversity hierarchy above ecosystems. They represent the variety and arrangement of landforms, communities and land uses (Peck 1998).

Biodiversity is a finite resource and it contributes to the maintenance of essential ecological processes (Fallding et al. 2001). Biodiversity underpins human wellbeing through the provision of ecological services, such as those that are essential for the maintenance of soil fertility and clean, fresh water and air. It also provides recreational opportunities and is a source of inspiration and cultural identity (Commonwealth of Australia 1996).

Although people tend to only recognise and value biodiversity they can relate to, such as at the ecosystem or landscape scale, the role and functions of biodiversity at one level of organisation confers resilience on the level above. Thus genetic or species diversity is essential to the health of ecosystems and landscapes, and to the maintenance of ecological services on which people depend (S. Ferrier 2009, pers. comm.).

1.2 What is Aboriginal cultural heritage?

Cultural heritage is the places, objects, customs and traditions that communities have inherited from the past and wish to preserve for current and future generations (NSW Heritage Office 1996). Aboriginal cultural heritage therefore comprises tangible (physical) sites, places and objects as well as intangible values and cultural practices associated with those sites, places and objects.

Natural elements of the landscape which acquire meaning for individuals and communities, such as headlands, prominent peaks and rivers in creation stories and traditional routes, may also become cultural heritage. Cultural heritage also includes traditional, historical and contemporary associations of people with heritage places. Cultural responsibilities, meaning, associations and understanding are intertwined with the identification of Aboriginal knowledge-holders to protect, acknowledge and appreciate cultural values associated with Country that are still strong today (DECCW 2009c).

1.3 Objectives of the Regional Conservation Plan

This RCP seeks to guide future land use in a manner which protects the Far North Coast Region's biodiversity and Aboriginal cultural heritage assets in a sustainable manner. It responds to future changes in land use as foreshadowed in the FNCRS.

The FNCRS mandates the need to prepare an RCP and provides a framework for the RCP with the following outcomes and actions (from DoP 2006):

- Biodiversity outcome – The Strategy supports the maintenance and enhancement of the region's biodiversity. Urban development will be directed away from areas considered important for conservation. Where development, including new land release, may impact on biodiversity, it will be designed to minimise impacts or provide offsets by protecting and enhancing the long term viability of priority vegetation and habitat corridors, as well as rehabilitating degraded priority areas. Infill redevelopment will be encouraged and controlled to ensure additional pressure on the environment is minimised.

  Action – Local environmental plans will protect and zone land with State or regional environmental, agricultural, vegetation, habitat, waterway, wetland or coastal values.

  Action – Local environmental plans will not zone land within the Environmental Assets and Rural Land area to permit urban purposes, other than rural residential development. Existing and future rural residential development will be located in this area, but not where it conflicts or coincides with the attributes or values listed above.

  Action – Local environmental plans will include provisions to encourage habitat and corridor establishment in future zoning of Environmental Assets and Rural Land area.

Action – New development adjoining or adjacent to farmland, extractive resources, waterways, wetlands, and areas of high biodiversity value will incorporate buffers to avoid land use conflict.

- Cultural heritage outcome (including Aboriginal) – All places, precincts, landscapes and buildings of historic, scientific, cultural, social, archaeological, architectural and aesthetic significance to the region are identified and protected in planning instruments. Future development proposals are compatible with the underlying heritage values of the location.

  Action – Councils are to ensure that Aboriginal cultural and community values are considered in the future planning and management of their local government area.

In delivering on the actions and aims outlined above, the RCP is underpinned by three biodiversity planning principles, described in Table 1. The principles underpinning consideration of Aboriginal cultural heritage are discussed more fully in section 2.11.

Development certainty and conservation outcomes are best achieved by good regional strategic planning, rather than planning at the development application stage.

Table 1: Conservation planning principles

Planning principles	Outcomes
Principle 1: Protect high value environments by avoiding direct impacts on the biodiversity of these areas	Reduces biodiversity loss and maintains important habitat Ensures greatest biodiversity benefit and reduces costs associated with providing offsets and/or rehabilitation Acknowledges that, theoretically, FNCRS yields can be accommodated on land unconstrained by vegetation
Principle 2: Mitigate indirect impacts (for example restricting access to conservation areas or weed control), or minimise direct impacts where Principle 1 cannot be achieved (for example refining subdivision layouts)	Achieving an improve or maintain outcome requires minimisation and management of impacts, both direct and indirect, where some development may proceed which is anticipated to have limited impacts on biodiversity.
Principle 3: Provide offsets for unavoidable impacts on biodiversity	Achieving an improve or maintain outcome requires offsets that adequately compensate for the biodiversity values lost due to the development. Some biodiversity values are so rare that it may not be possible to offset them (for example large areas of an endangered ecological community – EEC – in good condition) and achieve improve or maintain outcomes. Offsetting is guided by 13 principles. Several mechanisms can be used to secure offsets.

The goal of this RCP is to identify and conserve the Far North Coast Region's biodiversity assets in a sustainable manner and guide future land-use planning to protect high biodiversity and Aboriginal cultural heritage values.

Within this overriding goal, the specific objectives of the RCP include:

- to describe the statutory and policy framework which applies to natural and cultural heritage conservation and management
- to provide an overview of the region's biodiversity values
- to analyse the current status of biodiversity within the region
- to identify areas of State and regionally significant vegetation and corridor networks, provide rules for their on-ground verification and recommendations for protection, conservation and restoration
- to identify high conservation value biodiversity assets within nominated development areas and recommend priority areas where these values may be offset if in-situ protection cannot be achieved
- to identify mechanisms to implement the conservation, mitigation and offsetting strategies detailed within the RCP, to achieve an improve or maintain outcome for high conservation value biodiversity assets
- to provide a framework to assist councils in protecting biodiversity early in the planning process through biodiversity certification of environmental planning instruments (EPIs) and implementation of the biodiversity banking and offsets scheme (BioBanking)
- to highlight the importance of Aboriginal cultural heritage in local government planning, identify issues and provide a framework for its incorporation into EPIs, with the involvement of Aboriginal communities.

The RCP also seeks to contribute to the NSW State Plan's state-wide natural resource management (NRM) targets for an improvement in the extent and condition of native vegetation and to increase the number of sustainable native animal populations (DPC 2010).

1.4 Outline of the Regional Conservation Plan

In light of the above objectives, the RCP:

- describes the planning and legislative context (section 2)
- describes the region's biodiversity values (section 3)
- analyses the current status of the region's biodiversity (section 3)
- audits the biodiversity values contained with the areas proposed for future development within the FNCRS (section 4)
- provides general principles for protection and management of high biodiversity assets throughout the region and identifies priority areas for conservation and, where necessary, for offsetting potential impacts of urban development to improve or maintain biodiversity values (section 5)
- provides guidance on appropriate mechanisms for securing biodiversity assets or high conservation value lands (section 6)
- provides a framework to assist planning authorities which are applying to the Minister for Climate Change and the Environment for biodiversity certification of EPIs (all sections).

Options to improve the consideration of Aboriginal cultural heritage values in planning processes have also been included in this RCP (sections 2.11, 3.8, 4.5, 5.3 and 6.1). It is important that Aboriginal cultural heritage is considered at the broad strategic level.

In relation to local environmental plan (LEP) preparation, it is essential that Aboriginal people are appropriately consulted and involved in strategic land-use planning and that Aboriginal cultural values are provided with an appropriate level of protection in EPIs. The main steps in developing LEPs are to conduct Aboriginal cultural heritage studies covering a shire or a cultural country area (DECC 2009a) in partnership with the local Aboriginal community, and implement these through the cultural heritage provisions of the LEP template.

1.5 Where does the Regional Conservation Plan apply?

This RCP applies to the same local government areas (LGAs) covered by the FNCRS, namely Tweed, Byron, Ballina, Kyogle, Lismore and Richmond Valley (see Figure 1).

1.6 Who should use this Regional Conservation Plan?

This RCP is primarily intended for use by the six councils included within the FNCRS area, the Northern Rivers Catchment Management Authority (CMA), Department of Planning, other State agencies with land-use interests, and key interest groups including community and land development groups.

1.7 Ongoing review of the Regional Conservation Plan

As for the FNCRS, the RCP will be reviewed every five years. This is to ensure that progress toward the RCP's objectives is monitored and any necessary revisions are made to ensure that the objectives are met or updated to reflect new information. A key focus of the reviews will be to assess the effectiveness of strategic planning and development approval processes to deliver the RCP's goal and objectives over time.

Changes to the RCP are likely to occur in response to issues such as improved biodiversity knowledge, improved biodiversity impact prediction skills, changing population trends, shifting development pressures and improved knowledge of the predicted impacts of climate change.

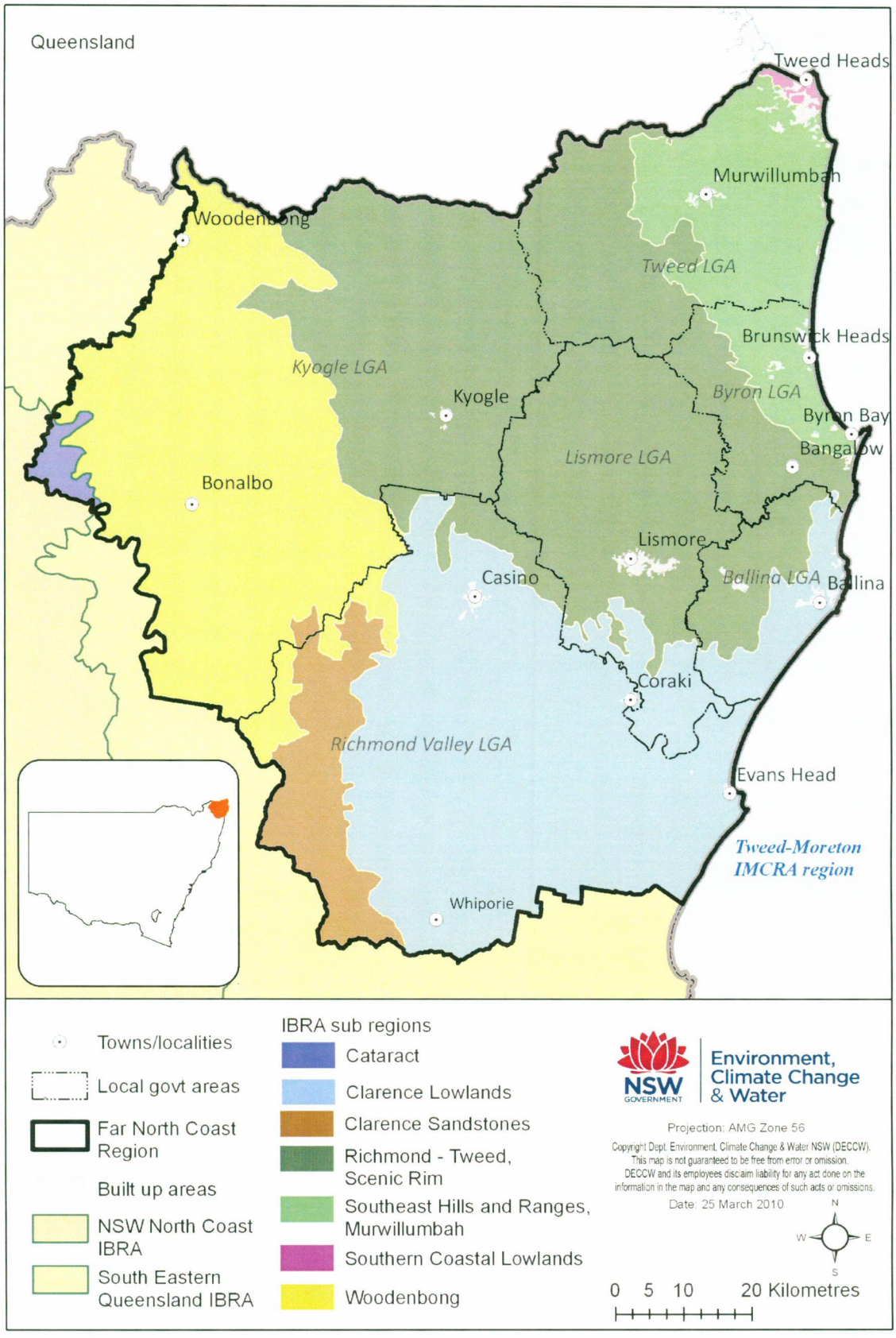

Figure 1: Far North Coast planning area

2 Planning and biodiversity conservation framework

2.1 Environmental Planning and Assessment Act 1979

The primary legislation governing land use in New South Wales is the *Environmental Planning and Assessment Act 1979* (EPA Act). The objects of the EPA Act include to encourage:

- the proper management and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment
- the promotion and co-ordination of the orderly and economic use and development of land
- the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities and their habitats
- ecologically sustainable development.

The *Environmental Planning and Assessment Amendment Act 2005* facilitated the modernisation and standardisation of LEPs across NSW. Subsequently, on 31 March 2006, a standard instrument for LEPs was gazetted, prescribing a standard form and content of a principal LEP. All new LEPs are to be prepared in accordance with this standard.

The Department of Planning has developed a series of regional strategies, including the FNCRS, to guide residential and employment-related development until 2031. The FNCRS is supported by EPA Act Section 117 Direction 5.1 Implementation of Regional Strategies, which requires that a draft LEP shall be consistent with a regional strategy released by the Minister for Planning. The Direction also provides that a LEP may be inconsistent in limited circumstances. Section 117 enables the Minister for Planning to direct the content of an LEP, including an outline of matters of environmental planning significance, that councils must consider when preparing the local provisions of their LEPs.

2.1.1 Far North Coast Regional Strategy

As noted, the FNCRS was prepared to guide sustainable development in the Far North Coast Region until 2031. In developing the FNCRS, the NSW Government committed to protecting land with high environmental or natural resource values and directing urban development away from areas considered important for conservation where possible (DoP 2006). As noted in section 1.3, the FNCRS mandates the preparation of an RCP to guide local councils in implementing conservation outcomes.

To achieve the aims of the FNCRS, it is necessary for councils to identify suitably unconstrained and serviceable land for residential and employment purposes. This is important so that communities can continue to enjoy a healthy, prosperous and sustainable lifestyle.

The RCP will assist councils in identifying and prioritising biodiversity assets and to identify high conservation value lands and modelled wildlife corridors. These lands can then be protected in the long term through appropriate zoning and local provisions in LEPs.

2.2 National Parks and Wildlife Act 1974

The objects of the *National Parks and Wildlife Act 1974* (NPW Act) include:

- the conservation of nature, including, but not limited to, the conservation of:
  (i) habitat, ecosystems and ecosystem processes, and
  (ii) biological diversity at the community, species and genetic levels, and
  (iii) landforms of significance, including geological features and processes, and
  (iv) landscapes and natural features of significance including wilderness and wild rivers,
- the conservation of objects, places or features (including biological diversity) of cultural value within the landscape, including, but not limited to:
  (i) places, objects and features of significance to Aboriginal people, and
  (ii) places of social value to the people of New South Wales, and
  (iii) places of historic, architectural or scientific significance.

These are to be achieved by applying the principles of ecologically sustainable development.

These objectives are not restricted to those lands reserved under the NPW Act but throughout the landscape. Part 6 of the NPW Act addresses Aboriginal cultural heritage issues such as ownership and notification of Aboriginal objects to the Department of Environment, Climate Change and Water (DECCW) as well as requirements for permits for activities that may disturb or damage Aboriginal objects. Part 7 and Part 8 deal with fauna and flora, while Part 9 deals with licensing issues for flora and fauna.

It is important to note that under the *Aboriginal Land Rights Act 1983*, Local Aboriginal Land Councils have a statutory function under Section 52 (4) to take action to protect the culture and heritage of Aboriginal persons in the Council's area, subject to any other law.

The RCP incorporates specific objectives that promote conservation across the landscape and assist councils in identifying and providing areas of high natural and cultural values with an appropriate level of protection in their EPIs.

2.3 Threatened Species Conservation Act 1995

The objects of the *Threatened Species Conservation Act 1995* (TSC Act) include:

- to conserve biological diversity and promote ecologically sustainable development, and
- to prevent the extinction and promote the recovery of threatened species, populations and ecological communities, and
- to protect the critical habitat of those threatened species, populations and ecological communities that are endangered, and
- to eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities, and
- to ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed, and
- to encourage the conservation of threatened species, populations and ecological communities by the adoption of measures involving co-operative management.

The *Threatened Species Legislation Amendment Act 2004* substantially amended a number of the provisions of the TSC Act. A key theme of the reforms to the TSC Act has been to shift the focus of conservation efforts from individual development sites to protecting and restoring habitat at a landscape scale. It now sets the framework for a number of biodiversity conservation planning initiatives, as follows.

2.3.1 Biodiversity certification

One of the key mechanisms to give effect to this renewed focus on landscape-scale strategic planning is the opportunity for biodiversity certification to be conferred on an area of land. Under the provisions of Part 7AA of the TSC Act, the Minister for Climate Change and the Environment has the ability to confer biodiversity certification if the Minister is satisfied that the package of measures contained in a biodiversity certification strategy will lead to the overall improvement or maintenance of biodiversity values, including threatened species and communities. The primary effect of granting certification in that any project under Part 3A, any development under Part 4 or any activity under Part 5 of the EPA Act is taken to be a development that is not likely to significantly affect threatened species, populations, ecological communities or their habitats. Similarly, the *Native Vegetation Act 2003* (NV Act) does not apply to biodiversity certified land. Applications for biodiversity certification are made by a planning authority.

Consideration of the RCP will be an important first step in the development of a biodiversity certification strategy. Proposals that are developed giving consideration to the RCP and particularly the 25-year conservation guide contained within the RCP (section 5.2.2) will achieve better biodiversity outcomes and provide more certainty for the development industry and consent authorities.

For those councils not actively seeking certification, the RCP is still a critical tool. It will guide biodiversity investment for conservation restoration, repair and management, triggered by a variety of planning processes, such as local- and State-significant development, critical infrastructure projects and property vegetation planning.

2.3.2 Biodiversity banking

The *Threatened Species Conservation Amendment (Biodiversity Banking) Act 2006* inserted Part 7A into the TSC Act to enable the establishment of BioBanking, which has been designed primarily to address impacts of urban expansion on biodiversity values at the development application stage.

The RCP guides the use of BioBanking and other offsetting mechanisms to ensure that biodiversity investment funds are focused on areas that will provide maximum biodiversity outcomes.

2.3.3 Recovery planning: biodiversity management plans

Section 56 of the TSC Act provides for the preparation of recovery plans to promote the recovery of the species, population or ecological community to a position of viability in nature. Initially, NSW recovery plans were developed on a species-by-species basis, but this proved to be not the most effective approach. In 2007, the Priorities Action Statement was developed to identify actions for State and local agencies and the community, with respect to management of threatened species (DECC 2007e).[1]

A further iteration of recovery planning has been the development of multispecies recovery plans, called biodiversity management plans (BMPs). Several are in preparation across NSW and other states. Three of these, the Lord Howe Island BMP (DECC 2007d), the Border Ranges Rainforest BMP (DECCW 2010a) and the Northern Rivers Regional BMP (DECCW 2010d) have been approved under Commonwealth legislation and adopted by the State.

With respect to the Far North Coast Region, both the Border Ranges Rainforest BMP and the Northern Rivers Regional BMP are publicly available (DECC 2009c). The former plan covers the federal government's Border Ranges North and South Biodiversity Hotspot (areas of Queensland and NSW) with respect to rainforest and

[1] www.threatenedspecies.environment.nsw.gov.au/tsprofile/home_PAS_new.aspx

related vegetation, including its dependent biodiversity. The latter considers species and habitats that are not included in the Border Ranges Rainforest BMP 'rainforest and related' category. The entire Far North Coast Region is considered in these BMPs.

Once adopted, the BMPs constitute the formal national recovery plan for federally listed species and ecological communities that are endemic to the area covered, having been prepared in accordance with the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (section 2.7). The Border Ranges Rainforest BMP also includes species of significance to both Queensland and NSW that are not formally listed under either the EPBC Act or the TSC Act.

While BMPs specifically address recovery of threatened species from threats and multiple stresses, this RCP focuses conservation efforts on offsetting urban development impacts. Although the RCP provides general guidance on protection of high value biodiversity assets, the BMPs should also be considered in strategic biodiversity planning in developing biodiversity action plans at a local level, as targeting actions to address recovery of threatened species will often also address broader conservation goals. While the RCP targets urban land-use planning for delivery of conservation outcomes, threatened species recovery planning depends on active community engagement to deliver on-ground actions. Thus there is a stronger social dimension in the BMPs than in the RCP. Further discussion on the interaction of BMPs and RCPs is provided in section 5.1.1.

2.4 Fisheries Management Act 1994

The objects of the *Fisheries Management Act 1994* (FM Act) are to conserve, develop and share the fishery resources of NSW for the benefit of present and future generations.

In particular, the objectives of the FM Act include:

- to conserve fish stocks and protect key fish habitats
- to conserve threatened species, populations and ecological communities of fish and marine vegetation
- to promote ecologically sustainable development, including the conservation of biological diversity
- to promote viable commercial fishing and aquaculture industries
- to promote quality recreational fishing opportunities
- to appropriately share fisheries resources among users of those resources
- to provide social and economic benefits for the wider community of NSW.

To meet these objectives, Part 7 of the FM Act outlines legislative provisions to protect fish habitat and Part 7A outlines threatened aquatic species legislation. The Part 7 provisions are commonly triggered by the 'integrated development' process under the EPA Act. However, there are other activities that may not require development consent but may require a permit from Industry and Investment NSW which administers the FM Act and associated Regulations.

Fish habitat conservation and management is a major component of the State Government's program to sustainably manage the State's fisheries. It also contributes to the State Government's commitment, via the State Plan, to maintain and improve the State's natural resources. Industry and Investment NSW has jurisdiction over all fish and marine vegetation in State waters, which include permanent and intermittent freshwater areas and 'water land' below the highest astronomical tide in tidal areas, normally extending to three nautical miles offshore. In marine parks, the *Marine Parks Act 1997* also applies.

2.4.1 NSW Fisheries Policy and Guidelines – Aquatic Habitat Management and Fish Conservation

The *Policy and Guidelines – Aquatic Habitat Management and Fish Conservation* (NSW Fisheries 1999) is targeted at local and State government authorities, proponents of developments and their advisers, and individuals or non-government organisations concerned with the planning and management of NSW's aquatic resources. It can be used to inform land-use and natural resource management planning, development planning and assessment processes, and is a valuable educational tool to improve awareness and understanding of the importance of fish habitats and how impacts can be mitigated or managed. The document focuses on ensuring compliance with NSW legislation and policies as they relate to fish habitat conservation and management.

This RCP incorporates information on threatened aquatic species listed under the FM Act. It promotes sound land use planning and management, and protection of high conservation value terrestrial, riparian and aquatic habitats, consistent with the FM Act's requirements for habitat and species protection.

2.5 Native Vegetation Act 2003

The objects of the NV Act, in accordance with the principles of ecologically sustainable development, include:

- to provide for, encourage and promote the management of native vegetation on a regional basis in the social, economic and environmental interests of the State
- to prevent broadscale clearing unless it improves or maintains environmental outcomes
- to protect native vegetation of high conservation value having regard to its contribution to such matters as water quality, biodiversity, or the prevention of salinity or land degradation
- to improve the condition of existing native vegetation, particularly where it has high conservation value
- to encourage the revegetation of land, and the rehabilitation of land, with appropriate native vegetation.

The NV Act[2] is primarily administered by CMAs which were established by the *Catchment Management Authorities Act 2003*. The NV Act is the primary legislation relating to the clearing of rural land and does not apply to urban areas. Under the NV Act, biodiversity and other environmental values of soil, water quality and salinity, must be improved or maintained (NSW Government 2005a). This means that the gains for biodiversity must be equal to or greater than any losses resulting from clearing or other forms of degradation. This goal is also reflected in the TSC Act with regard to biodiversity certification.

CMAs are responsible for controlling widespread clearing on rural lands and developing property vegetation plans (PVPs) with landholders to ensure management actions deliver an improve or maintain outcome on individual properties. DECCW remains responsible for administering private native forestry under the NV Act.

This RCP incorporates specific objectives for the Far North Coast Region that, if achieved, will contribute to the improve or maintain outcome. These draw from NRM targets that have already been adopted by the NSW Government. The RCP can also assist CMAs in identifying priority areas for investment, as well as guide the development of LEPs with respect to identification of high conservation value lands and modelled wildlife corridors.

[2] A detailed discussion on the NV Act and implications for landholders can be accessed at www.environment.nsw.gov.au/vegetation/nvmanagement.htm.

2.6 Crown Lands Act 1989

The *Crown Lands Act 1989* (CL Act) and its Regulation (2006) are the principal legislation in the management of Crown lands and provide important requirements and guidance for suitability assessment, including environmental values.

The objects of the CL Act are

- to ensure that Crown land is managed for the benefit of the people of New South Wales and in particular to provide for:
  - a proper assessment of Crown land,
  - the management of Crown land having regard to the principles of Crown land management contained in this Act,
  - the proper development and conservation of Crown land having regard to those principles,
  - the regulation of the conditions under which Crown land is permitted to be occupied, used, sold, leased, licensed or otherwise dealt with,
  - the reservation or dedication of Crown land for public purposes and the management and use of the reserved or dedicated land, and
  - the collection, recording and dissemination of information in relation to Crown land.

The principles of Crown land management are provided in Section 11 of the CL Act and are:

- that environmental protection principles be observed in relation to the management and administration of Crown land,
- that the natural resources of Crown land (including water, soil, flora, fauna and scenic quality) be conserved wherever possible,
- that public use and enjoyment of appropriate Crown land be encouraged,
- that, where appropriate, multiple use of Crown land be encouraged,
- that, where appropriate, Crown land should be used and managed in such a way that both the land and its resources are sustained in perpetuity, and
- that Crown land be occupied, used, sold, leased, licensed or otherwise dealt with in the best interests of the State consistent with the above principles.

These objectives and the principles for Crown land management mean that biodiversity conservation considerations are directly incorporated into decision-making with respect to the use of Crown land, including use for broader community, social and economic purposes. It also means that Crown land can play an important role in overall biodiversity protection within a region, as part of the vegetation matrix for wildlife habitat and movement (section 3.7).

One aspect of Crown land management is the reservation, where required, of such land for multiple or particular purposes, including for the preservation of native flora and/or fauna. This is further discussed in section 3.4.2. In addition, other Crown reserves not specifically reserved for nature conservation purposes also include biodiversity values. Crown reserves are generally managed by a Reserve Trust.

2.7 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is federal legislation with a particular focus on matters of national environmental significance (MNES). It establishes the national environmental assessment and approvals process, protects/conserves Australian biodiversity, and integrates the management of important natural and cultural places.

Under the EPBC Act, an action will require approval from the Federal Government Environment Minister if the action has, will have, or is likely to have, a significant impact on a MNES. These include:

- World Heritage properties
- National Heritage places
- wetlands of international importance (listed under the Ramsar Convention)
- threatened species and endangered ecological communities (EECs)
- migratory species protected under international agreement (for example JAMBA, CAMBA)
- the Commonwealth marine environment
- nuclear actions.

It also provides for the protection of the environment of Commonwealth land and assessment of actions taken by Australian Government agencies.

The EPBC Act provides for recovery planning for federally listed threatened species and EECs of which the BMPs (section 2.3.3) constitute multispecies examples. Once approved, the BMPs are statutory documents under this Act and must be considered when assessing impacts on MNES. The Act also provides for conservation advice, equivalent to the NSW Priorities Action Statement.

The RCP assists compliance with the EPBC Act by identifying high conservation value areas where MNES may be found and focuses on avoiding impacts on these areas of high biodiversity values, so that a significant impact on such matters, the trigger for Federal Government review, should not occur.

2.8 Biodiversity and natural resource policy

The RCP is consistent with a number of Federal and State biodiversity strategies, including the National Local Government Biodiversity Strategy, the National Strategy for the Conservation of Australia's Biological Diversity, the NSW Biodiversity Strategy, the NSW State Plan, the Natural Resources Commission standards and targets and the NSW Biodiversity and Climate Change Adaptation Framework (see box below). In particular, the State Plan strives for better outcomes for native vegetation, biodiversity, land, rivers and coastal waterways.

2.8.1 State-wide targets for natural resource management

As recommended by the Natural Resource Commission (NRC 2005, 2006), the State Government has adopted the state-wide targets for NRM in the State Plan. The following are particularly relevant to the RCP.

Macro-environmental priorities:

- By 2015 there is an increase in native vegetation extent and an improvement in native vegetation condition.
- By 2015 there is an increase in the number of sustainable populations of a range of native fauna species.
- By 2015 there is no decline in the condition of marine waters and ecosystems.

Specific priorities:

- By 2015 there is an increase in the recovery of threatened species, populations and ecological communities.
- By 2015 there is an improvement in the condition of important wetlands, and the extent of those wetlands is maintained.
- By 2015 there is an improvement in the condition of estuaries and coastal lake systems.

National and State biodiversity strategies

National Local Government Biodiversity Strategy

The National Local Government Biodiversity Strategy (ALGA 1999) recognises that:

- conservation and sustainable use of our natural resources will only be achieved through local area planning and management, along with community education and participation
- there is a willingness of local government across Australia to play a lead role in dealing with our most pressing and complex conservation issues – the loss of biodiversity
- a clear and cooperative partnership agreement is required between the three spheres of government.

Australia's Biodiversity Conservation Strategy 2010-2030

This Strategy is a guiding framework for conserving the nation's biodiversity over the coming decades. The vision of this Strategy is that Australia's biodiversity is healthy and resilient to threats, and valued both in its own right and for its essential contribution to our existence (NRMMC 2010).

NSW Biodiversity Strategy

The NSW Biodiversity Strategy proposes a collaborative approach to biodiversity conservation. It proposes a framework for coordinating and integrating government and community efforts, ensuring that available resources are efficiently applied. The actions in the Strategy detail a balanced response for the integration of ecological, social and economic objectives (NPWS 1999). This Strategy is currently under review. A discussion paper was exhibited late in 2008 (DECC 2008e) and the *Draft NSW Biodiversity Strategy 2010–2015* was exhibited late in 2010 (NSW Government 2010). The incorporation of land-use planning and regulation into conservation initiatives will be integral to the success of this Strategy.

NSW State Plan

The *NSW State Plan: A New Direction for NSW*, released in November 2006 (NSW Government 2006), set out the 34 priorities and 60 targets for Government action over the following 10 years. Chapter 6, Environment for Living, included eight priorities, of which Priority E4: Better outcomes for native vegetation, biodiversity, land, rivers and coastal waterways, noted that 'healthy and resilient natural resources and systems provide the basis for our primary industries, tourism and recreation activities as well as providing the habitat for our unique native flora and fauna'.

The State Plan was reviewed and a revised document, *NSW State Plan: Investing in a Better Future* (DPC 2010) was released. The new State Plan retains and updates about 75% of these priorities and targets. The revised priority: protect our native vegetation, biodiversity and coastal waterways, still addresses the target of meeting the state-wide targets for NRM (NRC 2005). The RCP directly addresses this priority and target.

NSW Biodiversity and Climate Change Adaptation Framework

The Framework is the starting point for raising awareness, conducting research and monitoring, and implementing actions to help protect biodiversity, including threatened plants and animals. The Framework identifies six key action areas with respect to biodiversity and climate change. Although it focuses on biodiversity, much of the Framework also applies to broader NRM and land-use planning, and will complement the activities of agencies such as the Australian Greenhouse Office (DECC 2007b).

2.8.2 Regional targets for natural resource management

Regional implementation of the NRC's targets is undertaken by CMAs. The Far North Coast region is included in the Northern Rivers CMA boundary which has developed a catchment action plan (CAP) that discusses planning and biodiversity issues.

Northern Rivers Catchment Action Plan: The Northern Rivers CMA includes a planning theme in its CAP in response to the high and sustained population growth and urban expansion. This development is putting great pressure on the natural resources and Aboriginal cultural landscapes in the region. The Northern Rivers

CAP recognises that the treatment of natural resources in planning process and instruments is a major influence on the resource condition and the achievement of local State and national targets (NRCMA 2005).

The main goal of the land-use planning program is to incorporate the protection of environmental assets and Aboriginal cultural landscapes into local and regional planning instruments. It includes a number of land-use planning targets, including the following which relate to biodiversity and Aboriginal cultural heritage:

- By 2011, 100% of LEPs will include provisions to ensure environmental assets and their values are adequately protected in the development of areas designated for urban settlement (50% by 2009).
- By 2011, 100% of regional and local planning instruments and decision-making processes identify and adequately manage landscapes which have physical, cultural or spiritual significance to Aboriginal communities (60% by 2009).

In addition to the land use planning theme, the Northern Rivers CMA's biodiversity program encompasses terrestrial and aquatic ecosystems and attempts to improve the condition of ecosystems in the region by:

- influencing the health, condition and connectivity of vegetation in the landscape
- reducing the impacts of introduced animals and plants on native vegetation and threatened flora and fauna species and addressing other threats
- fostering more biodiversity-friendly management within primary industries in the region.

See NRCMA (2005) for a complete list of targets.[3]

The RCP supports the State and regional targets by assisting councils to identify high conservation value biodiversity assets for protection and meet an improve or maintain biodiversity outcome with respect to land-use planning.

2.9 Biodiversity conservation criteria

In addition to the above, the criteria developed by the Joint ANZECC/MCFFA National Forest Policy Statement Implementation Subcommittee (JANIS) (Commonwealth of Australia 1997) have also informed the development of the RCP's biodiversity conservation guide and conservation objectives. The JANIS criteria are that:

1. a comprehensive, adequate and representative system of conservation reserves should be established on forested lands
2. 15% of pre-1750 distribution of each forest ecosystem should be reserved
3. where vegetation communities are recognised as vulnerable, at least 60% of their remaining extent should be reserved
4. all remaining occurrences of rare and endangered vegetation communities should be reserved or protected by other means as far as is practicable
5. the reserve system should seek to maximise the area of high quality habitat for all known elements of biodiversity wherever practicable
6. where conservation goals cannot be met on public land through the formal reserve system, other mechanisms may be required; for example, in fragmented landscapes, remnants that contribute to sampling the full range of biodiversity are vital parts of a forest reserve system and these areas should be identified and protected as part of the development of integrated regional conservation strategies
7. special features such as old-growth forest and wilderness warrant special protection.

[3] www.northern.cma.nsw.gov.au/programmes.php

Although these criteria were primarily developed to guide the selection of land for public reserves, these principles are applicable to landscape conservation and connectivity planning across all tenures (point 6 above). They will be particularly relevant in guiding conservation strategies in mitigation the impacts of human-induced climate change.

2.10 Climate change

It is now evident from observations in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level that the global climate system is warming (IPCC 2007). At a national level, modelled projections of temperature, precipitation, evapotranspiration and wind indicate that changes to more localised climate systems are probable, and these will influence drought and fire weather systems.

Projected changes in climate and associated attributes by 2050 for the Mid North Coast Region are summarised in Table 2. These are based on projections in a number of documents (DECC 2008b, 2009b; DECCW 2010c).

Higher temperatures, altered fire regimes and altered hydrology are likely to cause major changes to the region's ecosystems (DECCW 2010c). The ecosystems considered most at risk are those on the coastal lowlands, for example, coastal wetlands, mangroves and salt-marshes, and fragmented forests and woodlands in the hinterland.

Table 2: Projected changes in climate and associated attributes for the Far North Coast Region

Climatic attribute	Predicted impact
Temperature	Daytime maxima are projected to rise in all seasons by 1.0–3.0°C, with the greatest increases for winter (2.0–3.0°C). Overnight minima are projected to increase by 2.0–3.0°C in all seasons. Increased air temperatures also result in warmer ocean and freshwater temperatures.
Rainfall	Projected to increase in summer (5–20%) and autumn (5–10%), and decrease slightly in winter (5–10%). This leads to changes in runoff, including variations in freshwater flow to estuaries and in flood behaviour, including frequency and intensity.
Evaporation	Projected to increase between 5% and 20% and make all seasons drier, particularly winter and spring. Short-term droughts may be more severe.
Sea level	Projected rise of up to 0.4 metres above 1990 mean sea level by 2050, and 0.9 metres by 2100 (recent evidence suggests that this is a conservative projection). More extreme weather and storm surges are also predicted.

Specialised ecosystems which are naturally very limited, such as high altitude rainforests, are also likely to be at risk of degradation or loss. More widespread and fire-adapted forests are likely to be relatively resilient to climate change and undergo more subtle changes (DECCW 2010c). Possible increased fire frequency and severity remains a threat for rainforests and wet sclerophyll forests. Although predicted impacts as above are considered to be within most ecosystems' range of tolerance of climatic variation, the increasing frequency and duration of hot days, for example, may be more significant.

The reduced net water balance may affect freshwater ecosystems, including further drying of aquatic habitats, higher water temperatures with diminished water flows that will produce lower oxygen levels, and increased conductivity (salinity). Freshwater communities of fish and invertebrates in rivers, wetlands and floodplains are likely to be adversely affected as these have specialised habitat and dietary requirements. Freshwater flows are also a stimulus for breeding in many freshwater fish species, and thus any changes in volume and timing of spring floods are predicted to adversely affect fish recruitment.

On the coast, rising sea levels, increased ocean acidity, increased water temperature, changes to salinity and invasive animal and plant species are likely to cause widespread changes in biodiversity along coastal fringes and within estuaries. While species will be able to adapt to direct impacts, they may still be detrimentally affected by cumulative effects of multiple stresses associated with the exacerbation of other threats (DECC 2009c). Sea level rise, flooding and erosion from increased rainfall are likely to result in loss or damage to coastal Aboriginal middens and other coastal Aboriginal sites (DECCW 2010c).

Mitigation efforts to reduce the greenhouse gas emissions which are driving human-induced climate change are crucial to reduce the overall magnitude of warming. The NSW Government has committed to significant emissions reductions in the NSW Greenhouse Plan (NSW Government 2005b). Nevertheless, further climate change is inevitable because of time lags in the global carbon cycle and there is a growing awareness that adaptation to some degree of climate change is essential.

Adaptation seeks to facilitate natural adaptation to climate change and reduce the severity of its impact, in part by reducing other pressures on native species and ecosystems to maintain or restore their viability and resilience. In response to this challenge, DECC (2007c) developed its *Adaptation Strategy for Climate Change Impacts on Biodiversity (2007–2008).* This document outlines priority areas for action to be taken by DECCW over the next two years to help buffer this State's natural and cultural heritage against climate change.

Two priority areas to which the RCP contributes are:

- **building the reserve system**: The RCP will complement the NSW National Park Establishment Plan (DECC 2008a) by identifying key focus areas for investment to consolidate reserves across the landscape.
- **cross-tenure connectivity conservation planning**: A key focus of the RCP is to identify strategic wildlife habitats and corridors at a regional level, including climate change links between reserves and their surrounding landscapes, and prioritise these for future conservation. The RCP also identifies a range of mechanisms to conserve these areas across various tenures.

Climate change will affect land uses, affecting both function and productivity. Dunlop and Brown (2008) list a number of priorities for managing climate change with respect to changing land use, including to:

1 anticipate changing patterns of land use (including agriculture and urban/peri-urban)
2 consider the consequences of possible land use changes on biodiversity
3 plan strategic responses to land use change and develop priorities for protected areas and the design of off-reserve conservation to ensure key ecosystems are protected.

The RCP's adoption of an improve or maintain approach to biodiversity conservation and management in itself assists in addressing impacts from climate change by ensuring ecosystems are healthy and resilient. They are thus more able to adapt to, for example, the predicted changes in temperature and rainfall and consequential changes to flooding and fire regimes.

2.11 Aboriginal cultural heritage planning

Planning for Aboriginal cultural heritage requires a holistic approach to cultural heritage assessment and conservation. This holistic approach involves managing heritage places and landscapes for their social value (their significance to Aboriginal people), their scientific/archaeological value and their historical value (through linkage to written and oral history).

The identification and assessment of Aboriginal cultural heritage is based on a number of principles. Some of the key principles that have been broadly accepted in relation to Aboriginal heritage (DEC 2005) are:

- Aboriginal people are the primary determinants of their heritage.
- Aboriginal cultural heritage includes both tangible and intangible elements and includes places and values relating to traditional, historic and contemporary time periods.
- All natural landscapes have Aboriginal cultural heritage values.
- Aboriginal people do not recognise a distinction between the natural and the cultural in relation to heritage.
- Aboriginal people are the custodians of Aboriginal cultural heritage places, landscapes, 'Country' and cultural knowledge as part of their customary law, developing traditions, history and current practices.
- Aboriginal people are the primary sources of information on the value of their heritage.
- The intellectual property and moral rights of Aboriginal people with regard to Aboriginal cultural heritage information must be respected.
- Relevant Aboriginal communities must be active participants in the identification, assessment, interpretation and management of their cultural heritage and in any Aboriginal heritage planning process.
- Relevant Aboriginal communities must have a primary or collaborative decision-making role in any Aboriginal heritage planning process.
- Active Aboriginal community participation in Aboriginal cultural heritage makes for better planning outcomes.
- Social benefits flow to communities from participation in the management of their cultural heritage.

The Northern Rivers CMA CAP contains management targets and actions to support Aboriginal cultural heritage:

- By 2012, natural resources and Aboriginal cultural landscapes are managed sustainably in relation to urban/rural residential development and management mechanisms are integrated within regional and local land use planning frameworks.

It further states that to achieve this management target, the Northern Rivers CMA will facilitate activities which will work with Aboriginal communities to develop locally workable and culturally appropriate structures and mechanisms to facilitate genuine consultation early in the planning process.

There are a number of major issues associated with implementing Aboriginal cultural heritage in a planning context. Firstly, due to the richness of Aboriginal heritage in the Far North Coast Region, it is likely that urban growth and development has already impacted and will continue to impact on Aboriginal cultural values. The loss of cultural heritage is distressing to Aboriginal people, particularly the loss of, or damage to, places of cultural significance. Once lost, cultural heritage is irreplaceable. There is a need for effective mechanisms to enable consultation and involvement of Aboriginal people in the planning process in order to deliver improved outcomes for Aboriginal cultural heritage.

Secondly, due to continued development impacting on cultural heritage values, a strategic approach needs to be developed for deciding which places and sites must be protected, and which may be disturbed after proper identification, recording, assessment and consultation.

Thirdly, the NPW Act provides for the statutory protection of 'objects', sites and gazetted Aboriginal Places. The objects generally protected by the NPW Act are archaeological sites with tangible evidence of pre-contact presence. However, many places of significance to Aboriginal people are not 'objects' within the meaning of the NPW Act and may not be adequately protected.

Finally, there are many more sites across the landscape than are currently recorded and to minimise damage to these unrecorded sites, DECCW and councils provide advice to developers and have processes for ensuring that areas subject to development are adequately surveyed and assessed as part of the environmental assessment process. However, there are many developments, usually smaller ones, for which an individual cultural heritage assessment is not undertaken. Councils and other agencies such as CMAs would benefit from the provision of models which could predict the presence or absence of certain site-types to a reasonable accuracy. As a minimum, applicants proposing these smaller developments and Councils determining them should check the Aboriginal Heritage Information Management System (AHIMS) register and involve the local Aboriginal community in an assessment of the site.

Not only are Aboriginal people the primary determinants of their heritage, but as noted in section 2.2, Local Aboriginal Land Councils have a statutory responsibility to take action to protect Aboriginal culture and heritage in their area and to promote awareness in the community of Aboriginal culture and heritage. Accordingly, councils should engage in a partnership with the Aboriginal community to determine areas or sites of Aboriginal cultural heritage significance and develop appropriate management strategies for these areas.

If comprehensive strategic assessments have been undertaken and conservation outcomes achieved through the land use plan, this would also assist in streamlining the assessment and approvals process at the DA stage. Development of a shire-wide Aboriginal cultural heritage study and management plan, underpinned by a consultation protocol, is the first step in sound planning for conservation of Aboriginal cultural heritage.

The RCP supports the incorporation of Aboriginal heritage in landscape planning by its inclusion in appropriate zoning and the identification of appropriate permissible land uses (see section 6.1.1).

3 Conservation assessment

3.1 Regional overview

The Far North Coast Region covers an area of 10,293 square kilometres, extending from the Queensland/NSW border in the north along the coast to about 15 kilometres south of Evans Head and west to Woodenbong and Tabulam. It is the traditional lands of the Bundjalung Aboriginal Nation and covers six LGAs. The region includes parts of the NSW North Coast and South East Queensland biogeographic regions (DEH 2005), and part of the Tweed–Moreton marine, meso-scale bioregions (DEH 2006) (Figure 1).

The climate is generally subtropical, with warm humid summers and mild winters, a marked summer and autumn rainfall, relatively dry springs and fine sunny days with cool nights in winter. A major marine biodiversity influence is the warm, southward East Australian Current, enabling some corals and other marine life to exist along the coast.

From east to west, this region is characterised by coastal alluvial flood plains, rocky headlands, dune fields, lakes and estuaries, to midland hills and in the west and north, escarpment ranges. There is a general reduction in rainfall as distance from the coast increases, but the trend is modified by topography, with higher rainfall on the mountainous areas and lower in the low-lying valleys and the extensive floodplain areas. The highest rainfall is experienced in the Tweed and Nightcap Ranges, where annual falls of over 3000 millimetres may be experienced. In contrast, many valleys in the lee of the higher elevation ranges and mountains experience rain-shadow effects and have markedly lower rainfall than adjacent ranges to the east (Adam 1987).

The north eastern area is characterised by the eroded caldera of Mount Warning and the associated highly and moderately fertile volcanic-derived soils. This variable topography, rainfall and soils has enabled a high diversity of ecosystems, complex mosaics of vegetation communities and rich assemblages of species to evolve, leading to the formal recognition by the Federal Government in 2004 of much of the region as the Border Ranges South Biodiversity Hotspot (DEWR 2007). The Border Ranges Rainforest BMP provides more details on the significance of this region (DECCW 2010a). The Far North Coast Region also contains a number of DECCW reserves included within the Gondwana Rainforests of Australia World Heritage Area.

About 47% of the Far North Coast Region is covered with native vegetation in varying condition. Historically, large areas in the region have been cleared for agriculture and timber harvesting has occurred through much of the midslopes and ranges. Large areas of the region have been mapped as State or regionally significant farmland, in recognition of their importance to agriculture (DIPNR & DPI 2005). Areas around Cudgen, the Byron hinterland and the Alstonville Plateau are particularly significant for horticulture, while timber production, including plantation forestry and private native forestry, is an important industry on less fertile or steeper lands. Impacts from the timber industry range from minimal short term modification to clearing for plantations. Urban development covers relatively small areas, but is increasing, as the area is experiencing population growth rates among the highest in Australia. The significance of its impact on biodiversity is increased due to the general preference for development on the coastal strip, particularly regional centres. Human-induced climate change may exacerbate, or be exacerbated by, urban development impacts on biodiversity.

There are three major river systems in the Far North Coast Region: the Upper Clarence, the Richmond and the Tweed. All of the major rivers are stressed to some degree due to interference with flow patterns, water extraction, riparian degradation and reduced water quality.

The Far North Coast Region supports a diverse array of marine, estuarine and freshwater environments that are integral to the region's character and contribute significantly to the region's lifestyle, economy and attraction for residents and visitors alike. The region includes approximately 140 kilometres of varied coastline including islands and coastal reefs, cliffs and headlands, beaches, estuaries, coastal lagoons and wetlands. About 45% (about 63 kilometres) is protected in DECCW reserves, the largest being Broadwater and Bundjalung national parks in Richmond Valley LGA.

The Far North Coast Region contains seven coastal/estuarine lakes, the largest examples being the Terranora–Cobaki Lakes complex and Cudgen Lake. Cape Byron Marine Park, stretching from Brunswick Heads to Lennox Head, protects marine and estuarine areas and their biodiversity values, using a range of management/restricted use zones.

3.2 Identification of high conservation value biodiversity assets

Numerous datasets have been used for vegetation analysis and the identification of high conservation values for the Far North Coast Region. These include single-theme datasets such as vegetation types, DECCW reserves, old-growth forest, wetlands and aquatic habitat, and derived datasets such as DECCW's Biodiversity Conservation Lands (BCL) dataset. The BCL dataset was provided to Department of Planning to assist with the development of the FNCRS, and has also been provided to councils to assist with their land use planning and development of their comprehensive LEPs.

Following is a list of the datasets contained in the BCL dataset.

State significance:

- existing national parks, nature reserves, state conservation areas, Aboriginal Places and State forests
- high conservation value crown land areas identified in the regional forest agreements for addition to the conservation reserve system
- areas identified for protection in State Environmental Planning Policies Nos 14 (Coastal Wetlands) and 26 (Littoral Rainforest)
- EECs (TSC Act listed)
- regional wildlife corridors of Scotts (2003)
- key wildlife habitats of Scotts (2003)
- old-growth forest
- JANIS rare and endangered forest ecosystems
- JANIS vulnerable forest ecosystems
- identified or declared wilderness areas or land of recognised high wilderness quality
- primary wetlands (forest and non-forest)
- rainforest
- centres of endemism
- primary koala habitat (adapted from Lismore City Council)
- important shorebird habitats (mangrove and saline estuarine vegetation)
- threatened flora buffers (50–100m).

Regional significance:

- sub-regional wildlife corridors of Scotts (2003)
- Mitchell landscapes, greater than 70% cleared

- Under-target forest ecosystems (less than 15% of original distribution in reserves)
- 100 metre buffer on State Environmental Planning Policy (SEPP) 26
- 50 metre buffer on all state significant lands (except corridors, threatened flora buffers and patches <1 hectare in extent)
- additional forested and non-forest wetland vegetation
- secondary koala habitat (adapted from Lismore City Council).

Local significance:

- environment protection zones in LEPs
- other wetlands
- all remaining patches of native vegetation.

The BCL dataset is developed for use at a regional scale and, therefore, may require refinement and verification at a local precinct and/or site level scale. Its primary use is as a guide to the overall biodiversity significance of a landscape. The verification procedures set out in Table 3 are recommended for land where high conservation biodiversity values have been predicted by the BCL dataset.

The FNCRS states that land with State or regionally significant values should be protected and zoned. It may be impractical to zone some attributes contained in the BCL dataset as listed here (for example, buffers to flora or already-developed SEPP 26 buffers) and some high conservation values may be included in more than one attribute (for example centres of endemism are largely included in key habitats, and many wetland vegetation types are also EECs). DECCW has reviewed the dataset and identified those attributes that are more readily aligned with legislation and policy.

3.3 Overview of high conservation value biodiversity assets

Although all biodiversity is important to protect and enhance, several categories of biodiversity values are considered to warrant special priority for conservation through legislation or Government policy. Some of these, which are included in the BCL dataset, are highlighted below.

Vegetation types considered to be of high conservation value for their biodiversity and support of threatened species include the following:

- EECs
- threatened species habitat, including SEPP 44 koala habitat
- over-cleared vegetation communities
- native vegetation in over-cleared Mitchell landscapes
- all types of rainforest
- old-growth forest
- riparian, wetland (including coastal wetlands) and estuarine vegetation
- JANIS rare, endangered and vulnerable forest ecosystems.

Only a sample of these biodiversity assets is already protected in DECCW reserves, marine parks, State forest flora reserves and Crown conservation reserves.

An overview of the high conservation value biodiversity assets of the Far North Coast Region is provided below.

Table 3: Verification rules for land predicted to contain high conservation value biodiversity assets

Value	Verification rules
Vegetation-related values such as EECs, over-cleared vegetation types, vegetation in over-cleared landscapes, rare forest types, rainforest	Vegetation is not of high conservation value if it is in low condition* as defined for the NV Act. The vegetation community descriptions and listing of diagnostic species and associated environmental parameters in the CMA vegetation types database[4] should be consulted for on-ground verification of vegetation type. The final determinations for EECs under the TSC Act and EPBC Acts are the key documents in deciding whether or not a patch of vegetation is an EEC.
Old-growth vegetation	Old growth is largely defined[5] by the current canopy structure, which should largely consist of senescing or mature trees. Regrowth should be less than 30% of the canopy. There should be negligible evidence of disturbances such as logging or catastrophic fires. The occurrence of mapped old growth should be confirmed by ground survey.
Rainforest	Rainforest is defined according to the PNF** protocol.[6] Most rainforest types are an EEC. These are defined by the determination under the TSC Act as either preliminary or final determinations.[7]
Threatened fauna	The BCL dataset predicts these through the wildlife habitats dataset and the koala habitat dataset. The Wildlife Atlas[8] can also be consulted to determine which threatened fauna records are involved. Until an appropriate survey demonstrates otherwise, the habitat supporting records should be regarded as important habitat. The Threatened Species Tool in the BioBanking Credit Calculator will provide further assistance in habitat identification and advice on which other fauna species should be considered.
Threatened flora	The BCL dataset includes records of threatened flora occurrence, including a buffer. The Wildlife Atlas[5] can be consulted to determine which threatened flora records are involved. Until an appropriate survey demonstrates otherwise, the habitat supporting records should be regarded as important habitat. The Threatened Species Tool in the BioBanking Credit Calculator will provide further assistance in habitat identification and advice on which other flora species should be considered.
Significant aquatic habitats, including nationally important wetlands, habitat of migratory wetland species, ICOLLs*** and their catchments	The BCL dataset includes forested, shrubby and herbaceous wetlands and wader habitat. Assessment should include whether or not a planning or development decision is within, or affects, the catchment of the aquatic-related environmental assets, and whether this impact will have a neutral or beneficial effect.
Statutory conserve-tion or protection, for example conserve-ation and property agreements, SEPP 14 wetlands, SEPP 26 littoral rainforest	These assets have surveyed or described tenure boundaries. Verification is a matter of determining whether or not the planning or development decision occurs within that defined area.

* Native woody vegetation is in low condition if:

- the overstorey percentage of foliage cover is less than 25% of the lower value of the overstorey percentage foliage cover benchmark[9] for that vegetation type, and
- less than 50% of vegetation in the ground layer is native or more than 90% is ploughed or fallow.

Native grassland, shrubland or wetland is in low condition if less than 50% of vegetation in the ground layer is native or more than 90% is ploughed or fallow.

** private native forestry

*** Intermittently closed and open lakes and lagoons

[4] www.environment.nsw.gov.au/biobanking/VegTypeDatabase.htm
[5] www.environment.nsw.gov.au/resources/pnf/proldgrowth07370.pdf
[6] www.environment.nsw.gov.au/resources/pnf/prrainforest07371.pdf
[7] www.environment.nsw.gov.au/committee/ListofScientificCommitteeDeterminations.htm
[8] http://wildlifeatlas.nationalparks.nsw.gov.au
[9] www.environment.nsw.gov.au/biobanking/VegBenchmarkDatabase.htm

3.3.1 Endangered ecological communities

In the Far North Coast Region, 12 vegetation communities have been listed as EECs under the TSC Act (Table 4). Some of these have very restricted ranges while others are widespread but fragmented. These include floodplain or coastal lowland/wetland communities, while almost all types of rainforest in the Far North Coast Region are included in an EEC.

As a general rule, areas of EECs not in low condition[10] should be retained wherever possible as their loss cannot be offset by positive actions elsewhere.

3.3.2 Threatened species, populations and their habitat including SEPP 44

Since Australia was colonised by Europeans in 1788, some 125 plant and animal taxa are known to have become extinct. Changing land use and other human induced threatening processes are known to have played a large part in rendering these species no longer able to live in altered ecosystems. In New South Wales, more than 950 plants and animals are considered to be threatened with extinction if processes are not put in place to reverse their population declines.

Table 4: Endangered ecological communities

EEC	LGAs	% cleared	Det*
Byron Bay Dwarf Graminoid Heath Community	Byron	>90%	F
Coastal Cypress Pine Forest	Ballina, Byron, Richmond Valley, Tweed	~77% (in Det) but broader veg type ~30%	F
Coastal Saltmarsh	Ballina, Byron, Lismore (minimal), Richmond Valley, Tweed	75%	F
Freshwater Wetlands in Coastal Floodplains	Ballina, Byron, Lismore, Richmond Valley, Tweed	70–75%	F
Littoral Rainforest	Ballina, Byron, Richmond Valley, Tweed	90%	F
Lowland Rainforest	All	70–75%	F
Lowland Rainforest on Floodplains	All	70–75%	F
Subtropical Coastal Floodplain Forest	All	>70%	
Swamp Oak Floodplain Forest	Ballina, Byron, Lismore, Richmond Valley, Tweed	75–90%	F
Swamp Sclerophyll Forest on Coastal Floodplains	Ballina, Byron, Lismore, Richmond Valley, Tweed	70–75%	F
Themeda grassland on Seacliffs and Coastal Headlands	Ballina, Byron, Richmond Valley, Tweed	90%	F
White Gum Yellow Gum Blakely's Red Gum Woodland	Kyogle	80%	F
White Gum Moist Forest	Kyogle, Richmond Valley	33–50% but restricted distribution	F

Det = Determination by the Scientific Committee under the TSC Act; F = final determination made

[10] See definition in Table 3.

About 132 vertebrate fauna species, five invertebrate species and 133 flora species listed on the Schedules of the TSC Act occur in the Far North Coast Region. Of these, four are marine mammals, three are sea turtles and 13 are oceanic sea birds recorded along the coast. In addition, in the region's aquatic areas, one shark and three freshwater fish species are listed as endangered, and one shark and one marine fish species are listed as vulnerable, under the FM Act.

Of the above 275 species, 28 individual species NSW recovery plans (two for fish) have been finalised, three draft and 25 adopted Commonwealth recovery plans have been written (not necessarily for the same species) and there are five draft NSW recovery plans. The Border Ranges Rainforest and Northern Rivers Regional Biodiversity Management Plans are multispecies Commonwealth recovery plans which address recovery actions for 297 and 298 species respectively, most of which are listed under either the EPBC Act and/or the TSC Act. Also included in the Border Ranges Rainforest BMP are numerous 'species of significance' to Queensland and NSW that are not listed in either Act (see discussion on BMPs in section 2.3.3). Both BMPs cover a much larger area than the Far North Coast Region, hence the numbers of species addressed by them is greater than that supported by the Region.

Critical habitat for Mitchell's rainforest snail on Stotts Island Nature Reserve (NR) has been listed under the TSC Act, while there is a preliminary listing of critical habitat for Oxleyan pygmy perch under the FM Act (confined to public lands). In addition, species profiles have been written for all listed terrestrial and aquatic threatened species. Separate Priorities Action Statements have been prepared for terrestrial and aquatic species under the TSC Act and FM Act respectively.

Two endangered fauna populations are listed for the Far North Coast Region. These are the:

- emu population in the NSW North Coast Bioregion and Port Stephens LGA
- long-nosed potaroo Cobaki Lakes and Tweed Heads West population

The emu population consists of three subpopulations of which two are represented in the Far North Coast Region, concentrated on Bundjalung National Park and the Main Camp area including east and northeast of Whiporie.

Thirty key threatening processes are currently listed under the TSC Act. Not all are directly relevant to the Far North Coast Region. Some are difficult to address in a land use planning sense. Major threats that are relevant to the FNC planning process include clearing, dead wood and dead tree removal, bushrock removal, climate change, degradation of hill-topping sites and loss of hollow-bearing trees. An additional seven key threatening processes relevant to threatened fish species are listed under the FM Act, including degradation of native riparian vegetation along NSW watercourses, which is relevant to land use planning.

The koala is the only threatened species to have its habitat protected by a SEPP. SEPP 44 was developed to encourage the conservation and management of native vegetation that provides habitat for koalas, to ensure that permanent free-living populations of this threatened species will be maintained over its present range. The policy applies to all LGAs in the Far North Coast. Local governments cannot approve development on an area covered by the policy without an investigation to determine if potential and/or core koala habitat is present. Primary and secondary habitat included in the BCL dataset was based on land where at least 35% (primary) or 15% (secondary) of the total number of trees present were usually of a species that is known to be preferentially used by koalas. In addition, areas where detailed surveys had been undertaken and koala scats were present within the tree cluster were mapped as primary habitat.

Many threatened species cannot withstand further loss due to having few remaining populations, restricted distribution, naturally rare, poorly known habitat requirements or are endangered. Threatened species habitat generally should be retained to avoid further loss of species.

3.3.3 Overcleared vegetation communities

Nine out of 12 major NSW vegetation formations are recorded as occurring in the Far North Coast Region as outlined below. Overcleared means that more than 70% of the original extent of the vegetation types has been cleared.

- Rainforests – out of 12 rainforest vegetation types in the Far North Coast Region, four are considered overcleared, with three more considered to be 70% cleared.
- Wet sclerophyll forests (shrubby and grassy subformations) – of 12 shrubby and five grassy wet sclerophyll forest types, none are considered to be overcleared.
- Dry sclerophyll forests (shrubby and shrub/grass subformations) – of 10 shrubby and 14 shrub/grass subtypes, two shrub/grass types are considered overcleared, while one more is 70% cleared.
- Grassy woodlands – of four grassy woodland vegetation types, none are considered over-cleared while one is considered to be 70% cleared.
- Grasslands – one type recorded for the region, *Themeda australis* sod tussock grasslands of the coastal areas of the North Coast, is considered to have 90% of its pre-1750 extent cleared; this vegetation type is an EEC.
- Heathlands – of five types none is considered overcleared, although one is 70% cleared.
- Forested wetlands – of six categories, five are considered to be overcleared, and one is 70% cleared.
- Freshwater wetlands – Of three categories of freshwater wetlands, one is considered to be over-cleared and another is 70% cleared.
- Saline wetlands – this consists of five mangrove vegetation types and one saltmarsh complex, all of which are considered to be overcleared (75% of their pre-1750 extent cleared)

Descriptions of these formations may be found in Keith (2004), and full descriptions of vegetation types in the Northern Rivers CMA area are documented.[11]

Overcleared vegetation communities not in low condition[12] are considered non-offsettable and are not allowed to be cleared in rural landscapes under the NV Act in conjunction with a (PVP). Areas of these vegetation types should also be retained in urban or peri-urban interfaces due to their significant reduction in areal extent. Where these are retained, appropriate conservation and management measures are required to ensure their continued persistence.

3.3.4 Native vegetation within overcleared landscapes

Following the same reasoning that 30% of the pre-1750 extent of a vegetation type should be retained, the NV Act also restricts the clearing of native remnant vegetation if it occurs in landscapes that are >70% cleared, and it is not in low condition. Mitchell (2002) identified 571 landscapes across NSW, based on geology, topography, lithology, landform and climate.

Of the 16 Mitchell Landscapes identified for the Far North Coast Region, four are considered overcleared (>70% of their pre-1750 extent cleared). These generally comprise the alluvial flats of the major rivers and fertile basalt-derived soils (Table 5). Remnant vegetation within these landscapes should have priority for protection or rehabilitation, and re-establishment of riparian and other connectivity networks.

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[11] www.environment.nsw.gov.au/resources/nature/BioMetric_Vegetation_Type_CMA.xls

[12] See definition in section 3.2.

Table 5: Overcleared Mitchell landscapes in the Far North Coast Region

Mitchell Landscape	% cleared	LGA
Byron–Tweed Alluvial Plains	81	Tweed, Byron
Byron–Tweed Coastal Barriers	72	Tweed, Byron
Clarence–Richmond alluvial plains	73	Kyogle, Richmond Valley, Lismore, Ballina, Byron
Upper Clarence Channels and Floodplains	93	Kyogle

In addition, two landscapes, the Lamington volcanic slopes (in all LGAs) and Mount Warning exhumed slopes (Tweed and Lismore LGAs), are recorded as 57% and 60% cleared respectively. Although further clearance of this landscape is consistent with the provisions of the NV Act, care needs to be taken to ensure the clearing percentage is not exceeded.

3.3.5 Rainforests

Rainforests are very productive and generally complex ecosystems characterised by a closed and continuous tree canopy composed of relatively soft, horizontally held leaves (Keith 2004). Five broad rainforest classes have been recorded in the Far North Coast Region: subtropical, northern warm temperate, cool temperate, littoral, and dry. Four vegetation types spread over three classes are considered to be over-leared in the Far North Coast Region; only cool temperate and northern warm temperate rainforests are estimated at less than 75% cleared in the region. A detailed discussion of Far North Coast Region rainforests is in DECCW (2010a).

Three rainforest communities have been listed as endangered ecological communities under the TSC Act due to the extent of historical clearing and timber getting. The rainforest areas of the Scenic Rim and Nightcap Range have also been identified as 'important bird areas' (internationally important areas for bird conservation and known to support key bird species) by Birds Australia for key rainforest species assemblages, including eastern bristle birds (Dutson et al. 2009). Due to their support of biodiversity and threatened species, DECCW advocates protection of all rainforest, and rainforest is protected on private land in the Private Native Forestry (PNF) Code of Practice (DECC 2008c). Rainforest is also protected in State forests.

In the Far North Coast Region, about 170 hectares of littoral rainforest, in remnants ranging in size from 0.16-42.6 hectares, are protected by SEPP 26, mainly as scattered fragments. Many of these areas (and other littoral rainforest remnants not mapped for the purposes of SEPP 26) are now within coastal national parks or reserves. The largest remnant outside DECCW reserves is near Lennox Head in Ballina LGA (16.3 hectares). In addition to the State listing, the ecological community 'littoral rainforest and coastal vine thickets of Eastern Australia' has recently been listed as critically endangered under the EPBC Act.

3.3.6 Old-growth forests

Old-growth forests are those where the overstorey or canopy trees are in the late mature to senescent stage of growth. These are larger older trees, many with die-back in the crown and hollows in branches and the trunk. The forest also generally exhibits a diverse structure and composition of species in the subcanopy and understorey while dead standing stags and fallen trees may also be present. Additionally, there are very few younger, regrowth trees and little evidence of disturbance (DEC 2004a). The accepted definition of old-growth forests is 'an ecologically mature forest where the effects of disturbances are now negligible' (Commonwealth of Australia 1997).

Old-growth forests have been identified as irreplaceable (RAC 1992) and are recognised as having high aesthetic, cultural and nature conservation values. These forests are extremely important in the maintenance of biodiversity and ecological functions. More than 78 species of fauna, including many threatened species, are known to be dependent on tree hollows and other key resources found in old-growth forests.

Undisturbed old-growth forests have also been found to be the most effective forest type for storing carbon, significantly more than rainforests, which could prove important in climate change mitigation.

In the Far North Coast Region, old-growth forests are generally found in steep land, escarpments or wilderness areas, but there are some areas scattered throughout the region and over 70 hectares of old-growth forests have been predicted to occur in zoned, but as yet undeveloped, urban land (Figure 6). Mapped old-growth forest is protected on private land under the PNF Code of Practice (DECC 2008c), subject to on-ground validation. Old-growth forests are also protected in State forests.

3.3.7 Riparian, wetlands, estuaries and intermittently closed and open lakes and lagoons

Riparian corridors

Riparian areas, as well as the various water bodies and wetlands throughout the landscape, are integral components of the catchment framework. They provide a host of values and functions that maintain and support the health of the natural environment. An improvement in waterway and aquatic ecosystem condition will not be achieved if land-use change or intensification of existing use does not protect riparian vegetation.

Riparian corridors provide a natural network of connectivity through the landscape, improve stream bed and bank stability, and enhance vegetation and ecosystem qualities, including improved water quality. As a general principle for planning purposes, DECCW advocates a 50-metre riparian zone on either side of the watercourse protected from development or clearing. This cannot be satisfactorily mapped at regional scale, but councils are encouraged to develop local provisions with an accompanying map in their EPIs that establish protective mechanisms for these riparian zones.

Wetlands

The Far North Coast Region contains six listed nationally important wetlands (EA 2001). These include Ukerebah Island and Stotts Island NRs in the Tweed River system, Cudgen NR (including Cudgen Lake but covering a larger area than the DECCW reserve), Tuckean Swamp (partly protected by Tuckean NR) and the Lower Bungawalbin Catchment Wetland Complex, a series of scattered and fragmented wetlands. The latter wetland is only minimally protected in Bungawalbin NP and NR, and Yarringully State Conservation Area, and of all the Far North Coast Region's important wetlands remains the most vulnerable to degradation through land-use change. The final listed wetland consists of a series of coastal wetlands in Bundjalung NP.

About 11,070 hectares of coastal wetlands in the Far North Coast Region have been identified and mapped as SEPP 14 coastal wetlands. They are distributed along the coast with numerous examples in poorly drained coastal areas behind coastal dunes as well as on major floodplains, including the Tweed and Richmond River systems. The largest, at 1630 hectares, is protected in Bundjalung NP. In general, all wetland areas should be protected due to their importance in ecosystem function, scarcity due to historic modification and loss and as threatened species habitat.

Estuaries and coastal lagoons

Williams et al. (2006) list nine estuaries in the Far North Coast Region and five of these are quite small. The most important estuary for threatened migratory shorebirds is the Richmond River estuary, particularly the feeding grounds on the sandflats in that river and in North Creek. Migratory shorebirds recorded there include great knots, greater and lesser sand plovers, terek sandpipers and sanderlings.

Others of minor, and in decreasing order of importance, are the Tweed River, supporting great knots, greater sand plovers and terek sandpipers particularly in the Terranora Broadwater area, and Brunswick River, where terek sandpipers have been recorded (AR&S 2006).

Ocean beaches, particularly from South Ballina to Broadwater, are of critical importance for pied oystercatchers, a sedentary threatened shorebird species listed as endangered under the TSC Act (Nolan 2007).

The Healthy Rivers Commission public inquiry into coastal lakes (HRC 2002) classified and assessed three coastal lakes in the Far North Coast Region: Cobaki–Terranora, Cudgen and Ainsworth. It categorised Cudgen and Ainsworth lakes as having extreme natural sensitivity and their condition as severely affected. It recommended that Cobaki–Terranora and Cudgen lakes should be managed for healthy modified conditions, while Lake Ainsworth should be managed for targeted repair. Management regimes were provided to assist in meeting these targets.

Water quality is an ongoing issue also in the larger rivers such as Tweed and Richmond, with periodic fish kills occurring due to de-oxygenation of the water or other water quality issues during floods or occasional polluted runoff. Conservation initiatives aimed at rehabilitating degraded areas and enhancing remnant riparian vegetation can assist in maintaining or improving water quality and improving overall catchment health. The Northern Rivers CMA CAP has programs and targets aimed at addressing these issues over time in rural areas, but urban areas also have a role to play in ensuring the water quality of stormwater runoff does not degrade watercourses and rivers.

According to Williams et al. (2006), the largest areas of seagrass beds in the Far North Coast Region are in the Tweed River estuary, with smaller areas in the Richmond River estuary. In these estuaries the extent of seagrass has increased by about 140% (to 80 hectares) and about 70% (to 32 hectares), respectively, since 1986, but is still relatively small in extent. There are small occurrences of 0.6–1.8 hectares in the other estuaries. Overall, there has been a net increase of nearly 120% in the area of seagrass in estuaries along the Far North Coast Region between 1985 and 2005, mainly attributable to the increase in the Tweed River estuary.

Saline wetlands

The largest concentrations of mangroves were recorded by Williams et al. (2006) in the Richmond River estuary (602 hectares) and the Tweed River estuary (398 hectares). In 2006, the largest areas of saltmarsh were beside the Tweed (76 hectares), Richmond (60 hectares) and Brunswick rivers (31 hectares). It is considered that around 75% of the extent of mangrove and saltmarsh communities has been removed since non-indigenous settlement. However, between 1985 and 2005 there was a net increase of about 27% in the extent of mangrove communities in Far North Coast Region estuaries, albeit from a greatly reduced previous extent. The largest increases were recorded in the Richmond and Tweed rivers, and also the Brunswick River (derived from Williams et al. 2006).

There is evidence of the invasion of saltmarsh by mangroves across the whole of southeast Australia, but the causes are as yet unclear. Downslope incursion into saltmarsh by the reed *Phragmites* has been observed in some NSW locations and

an important question for future management is whether *Phragmites* is invading saltmarsh, as has occurred elsewhere in the world. For this reason and for anthropogenic modification, coastal saltmarsh was listed as an EEC under the TSC Act. Although between 1985 and 2005 the net area of coastal saltmarsh in the Far North Coast Region increased overall by about 60%, there have been large increases in the Tweed and Richmond rivers estuaries, with equally large losses from Cudgen Lake and a lesser, but still significant, loss from the Brunswick River estuary (derived from Williams et al. 2006). Thus assessment and protection on a case-by-case basis is warranted.

The predicted sea level rise due to human-induced climate change will have a significant impact on the distribution of plants that live around and in estuaries. Terrestrial vegetation, such as swamp she-oak and paperbark, is predicted to be forced further upstream and upslope by the rise in mean sea level. Intertidal vegetation, such as saltmarsh and mangrove, and submerged vegetation, such as seagrass, will also move further upslope of their present locations, as well as extend further up-river as a consequence of sea level rise. The future distribution of saltmarsh and mangrove will be limited by topography and structures such as roads, buildings, seawalls, floodgates, levees and agricultural land. Saltmarsh communities, in particular, are predicted to decrease in extent as sea level rises.

Mangroves, saltmarsh and seagrass areas are protected under the FM Act.

3.4 Protected areas

Various types of protected area or conservation reserve can be established to protect natural and cultural heritage values. The standard adopted by the federal and NSW governments for identifying the most secure types of protection for areas set aside primarily for nature conservation are those areas which meet the definition of protected area set out by the International Union for the Conservation of Nature (IUCN). An IUCN Protected Area is defined as:

> A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.

Protected areas which meet this standard in Australia are considered to be part of the National Reserve System. The key determinants for their inclusion are the purpose for which the area is set aside, the security of that protection both in terms of longevity and ease of extinguishment, and management effectiveness.

Discussed below are three categories of public protected areas. DECCW also acknowledges that the establishment and management of public reserves alone cannot ensure the achievement of healthy and sustainable landscapes (DECC 2008a). This can only occur through a broad range of conservation activities across the whole landscape on both public and private land.

3.4.1 DECCW reserves

The State Government has adopted the NRC's state-wide improve or maintain targets for NRM, including an increase in extent and improvement in condition of native vegetation across the landscape (section 2.8.1). The selection of areas to provide a comprehensive, adequate and representative sample for the reserve system uses different criteria, including the JANIS reserve targets adopted by the Government for forest ecosystems and others enunciated in the NSW National Parks Establishment Plan 2008 (Commonwealth of Australia 1997; DECC 2008a; section 2.9).

The NSW National Parks Establishment Plan lists priorities for building the DECCW reserve system over the next 10 years. These priorities are ecosystems poorly represented in reserves, wetland systems, critical landscape corridors, important

water catchments that protect aquatic ecosystems, culturally important places and areas important for effectively and efficiently managing existing reserves.

The DECCW reserve system has expanded significantly since 2000 and now protects over 139,000 hectares (13.5%) of the far North Coast Region (Table 6). However, further protection is needed to help build a comprehensive, adequate and representative reserve system. For example, JANIS targets for 33 of a total of 82 forest ecosystems in the Far North Coast Region have been met. Five per cent of the Southern Coastal Lowlands Interim Biogeographic Regionalisation for Australia (IBRA) subregion is represented in DECCW reserves.

DECCW reserves include a range of protection categories from minimal use in wilderness areas to multiple use in a state conservation area or regional park.

DECCW reserves in the Far North Coast Region are concentrated in the steep mountainous areas of the Great Escarpment and the Border Ranges, but also protect some ridgelines and large stretches of the coastline. The flat or lower relief areas are not well represented in reserves, as they are suitable for agricultural production, are wholly or partly cleared, and are largely in private ownership.

Forests are the major vegetation type protected in DECCW reserves but there are also large tracts of coastal heath and wetland types reserved in the southern part of the region. Grassland communities and some woodland and open forest types are not well represented in DECCW reserves in the Far North Coast Region.

Areas of DECCW reserves with higher protection include wilderness and world heritage areas and these are discussed below.

Wilderness: In the Far North Coast Region, only areas within DECCW reserves have been declared as wilderness, although some adjacent areas have similar characteristics. Most of the wilderness areas are in steep escarpment country in northern parts of the region at the head of catchments, where the Border Ranges NP and Limpinwood NR on the Queensland–NSW border encompass the Levers, Lost World and Warrazambil wilderness areas. Only one, the Bundjalung Wilderness Area, is on the coastal plain in Bundjalung NP south of Evans Head.

Gondwana Rainforests of Australia World Heritage Area: The Far North Coast Region includes arguably the most important and diverse section of the Gondwana Rainforests of Australia World Heritage Area: the Tweed Shield Volcanic Group (Hunter 2004). The area is regarded as one of the two major rainforest refugia on continental Australia, the other being Queensland's Wet Tropics. It supports both warm and cool subtropical rainforests, and warm and cool temperate rainforests. Thus it is a major refuge for Gondwanan rainforest and is the central core of subtropical rainforest in Australia, and at the northern and southern axis of temperate and dry rainforests, respectively. It provides habitat for a highly diverse range of vertebrate species and is at or close to the centres of highest species diversity in Australia for birds, marsupials, frogs and snakes. There is a concentration of primitive, relictual endemic and threatened species of flora and fauna that clearly justifies its World Heritage listing.

Table 6: Area of DECCW reserve type

DECCW reserve type	Area (hectares)
Nature reserve	20,725
National park	108,780
State conservation area	9670
Regional park	0
Historic site	8.4
Aboriginal area	12.6
Total DECCW reserve	**139,196**

Under the *Aboriginal Land Rights Act 1983* Local Aboriginal Land Councils can claim Crown lands in certain circumstances. Where the lands have special nature conservation value the Crown may require the negotiation of a lease-back arrangement with DECCW, so that the lands are reserved under the NPW Act and co-managed. To date there are no finalised lease-back arrangements in the Far North Coast Region.

Native title claimants or native title holders pursuant to federal legislation (*Native Title Act 1993*) can negotiate a co-management arrangement for a park through the negotiation of an indigenous land use agreement with the NSW Government.

An indigenous land-use agreement (ILUA) is a voluntary agreement between a native title group and others about the use and management of land and waters. ILUAs can be made separately to the formal determination of a native title claim or they can be a stepping stone towards or part of a formal native title determination by the Federal Court. The NSW Government can negotiate an ILUA with native title claimants regarding the management of public land in their claim area. The NSW Government would usually negotiate an ILUA that covered the whole native title claim, which may cover many different land tenures and cover land managed by more than one government agency.

In the Far North Coast Region there are two areas of DECCW reserve which are covered by ILUAs:

The **Arakwal ILUA**, the first agreement of its kind in Australia, was made in 2001. It created and funded the Arakwal National Park, jointly managed by the Bundjalung People of Byron Bay (Arakwal) and NPWS. An Arakwal National Park Management Committee, made up of three Bundjalung People of Byron Bay (Arakwal) and representatives of NPWS and the Byron Shire Council, was established to advise NPWS on the management of the park. A second ILUA has led to additional lands being added to Arakwal NP. A third ILUA, the Ti Tree Lake ILUA, will create a new 50-hectare reserve, the Ti Tree Lake Aboriginal Area, which encompasses forests and a lake sacred to Bundjalung women.

The **Githabul ILUA** was signed by the Githabul People, the Githabul Nation Aboriginal Corporation and the NSW Government in February 2007. This ILUA covers over 112,000 hectares of national parks and state forests in the Kyogle, Woodenbong and Tenterfield areas including Mount Nothofagus, Yabbra, Toonumbar, Border Ranges and Richmond Range NPs in the Far North Coast Region.

3.4.2 Crown and State forest protected areas

Both the CL Act and the *Forestry Act 1916* have, as a primary objective, land and resource use for the benefit of the people of NSW. They include provisions for sustainable development and biodiversity conservation.

Crown reserves

As summarised in section 2.6, Crown land is an important asset in managing and protecting the State's resources for multiple uses, responding to the needs of the community. Part 5 of the CL Act deals with dedication and reservation of land for multiple or particular uses. Crown reserves within the Far North Coast Region include 519 hectares within 29 reserves where the primary purpose of dedication is preservation of native flora and/or fauna. An additional four reserves protect about 1148 hectares of coastal landscapes.

Most of these reserves are small (for example the Broadwater Koala Reserve is 2.6 hectares and Cumbebin Wetlands is 2.5 hectares) and thus management for biodiversity is challenging. However many of these fragments adjoin larger tracts of remnant native vegetation and so can play an important role in overall biodiversity protection.

Other reserves protect SEPP 14 wetlands and SEPP 26 littoral rainforests. A few, such as Dirawong Reserve at Evans Head (270 hectares) which is managed for conservation of natural and Aboriginal cultural heritage as well as public enjoyment, are large enough to retain the conservation values for which they were dedicated. This reserve is adjacent to Bundjalung NP, and thus also complements the national park.

Many of the individual reserves are aggregated into much larger units for planning and management purposes. In the Far North Coast Region, these include the Tweed Coast Regional Crown Reserve (RCR), Byron RCR, Ballina RCR and Richmond Coast RCR. All RCRs are gazetted for the purpose of public access and rural services, tourism, environment and heritage conservation and other public requirements.

Flora reserves

The Forestry Act also provides for the preservation and enhancement of natural resources and ecologically sustainable use of State forests for the purpose of forestry and of flora reserves for promotion of recreation and the preservation of native flora and fauna. Section 25A of the Forestry Act provides for the dedication of flora reserves with the specific objective of preservation of the flora. The working plan for the area reflects that objective. More recently under the Regional Forest Agreements for NSW, State forests (SF) are managed according to a classification system called Forest Management Zones (FMZs). Both FMZ1 and FMZ2 are considered to meet the requirement of JANIS formal and informal reserves respectively in the National Forest Policy Statement.

FMZ 1 Special Protection areas are designed to meet the definition of JANIS dedicated reserves in the National Forest Policy Statement. This zone is applied to Flora Reserves, of which there are two in the Far North Coast Region: Selection Flat (145 hectares) in Myrtle SF, and Pyrocarpa (67 hectares) in Doubleduke State forest. Both are in Richmond Valley LGA. Although small in area, their values are supported by the surrounding State forest environment. This is the highest level of protection that is found in State forests and allows only minimal uses generally similar to those allowed in national parks. Currently, no sections of State forests in the Far North Coast Region are being managed as FMZ2.

3.4.3 Marine parks

The *Marine Parks Act 1997* establishes the legal basis for creating a system of marine parks in NSW. Principles set down by the Australian and New Zealand Environment and Conservation Council (ANZECC) are used to select areas that are considered comprehensive, adequate and representative in reflecting and supporting the biological diversity of the particular marine bioregion. Marine parks may encompass coastal waters, estuaries, coastal lakes and waterways, beaches, islands, headlands and reefs.

A zoning plan for each park is developed according to the particular needs of that park. The zones offer different levels of protection for marine life, ranging from mixes of commercial and recreational activities to full protection, thus achieving protection by management rather than by tenure. There are four zones:

- sanctuary zones that provide the highest level of environmental protection, allowing neither recreational nor commercial fishing, but permitting recreational activities that do not harm animals (including fish) or plants (including marine algae)
- habitat protection zones that offer a high level of protection but allows recreational and some commercial fishing
- general use zones allowing sustainable recreational and commercial activities
- special use zones that are set aside for specific uses, for example oyster leases.

The one marine park declared in the Far North Coast Region, Cape Byron Marine Park, was established in November 2002. It extends from the Brunswick River (including tributaries such as Marshalls Creek) to the southern extent of Lennox Head and includes offshore waters to the three nautical mile limit. It includes the Brunswick River and its tributaries to the tidal limit, and Belongil and Tallow creeks near Byron Bay. The park covers approximately 22,000 hectares and protects diverse marine life, threatened species, migratory species, oceanic rocks such as Julian Rocks, and estuarine wetland and creek systems through a system of zoning and management. This marine park samples the biodiversity of the Tweed–Moreton Shelf marine bioregion.

Parts of the Brunswick River system (including Marshalls and Simpsons creeks) are protected in sanctuary zones, as are extensive stretches of Belongil and Byron beaches, including Julian Rocks (Julian Rocks NR), Broken Head including Cocked Hat Rocks (part of Broken Head NR), and Lennox Head including The Moat/Bream Hole area.

The park is multiple-use and protects marine habitats and species while catering for a wide range of sustainable activities, ranging from eco-tourism to commercial fishing. Sites within the marine park that have been identified as particularly culturally significant to Indigenous people include Julian Rocks, Cocked Hat Rocks, Cape Byron and beaches around Broken Head.

Fishing is a major activity in NSW coastal parks and reserves. It is engaged in by different cultural groups, and is closely linked to other forms of park use, including camping and four-wheel driving. It is therefore an important management issue for land managers.

A new research project undertaken by DECCW's Country, Culture and Heritage Division aims to develop an Aboriginal fishing atlas. Working closely with Aboriginal communities in specified NSW marine parks, including Cape Byron Marine Park, the atlas will map Aboriginal fishing interests with a view to facilitating improved participation by these communities in fisheries resource management. There is a focus in the project of providing capacity building opportunities for participating communities and individuals.

Through the Aboriginal fishing atlas, DECCW will facilitate communities to improve their participation in fisheries resource management. The atlas will provide Aboriginal coastal communities with a tool for identifying and illustrating their fishing interests. It will map Aboriginal fishing practices and knowledge systems along NSW coastal and estuarine waters. It will identify histories of attachment to particular fishing locales, and the effect of land-use changes and loss of access on Aboriginal fishing.

3.5 Compilation of values

Figure 2 combines the distributions of all individual environmental assets of State-significant and regionally significant conservation values as listed in section 3.2. The map informed the FNCRS.

Although significant areas of biodiversity values are protected within DECCW reserves, there are substantial areas, particularly in the northeast and south of the region, that are in private ownership. While the Richmond Valley and coastal plain have been extensively cleared and modified for urban and rural land uses, fragments of remnant native forest are still quite significant in retaining connectivity across the valley floors. LEPs should direct development away from the high conservation value areas shown on Figure 2 towards cleared or low conservation value areas. As previously noted, the areas should be verified by targeted surveys prior to making significant planning or development decisions.

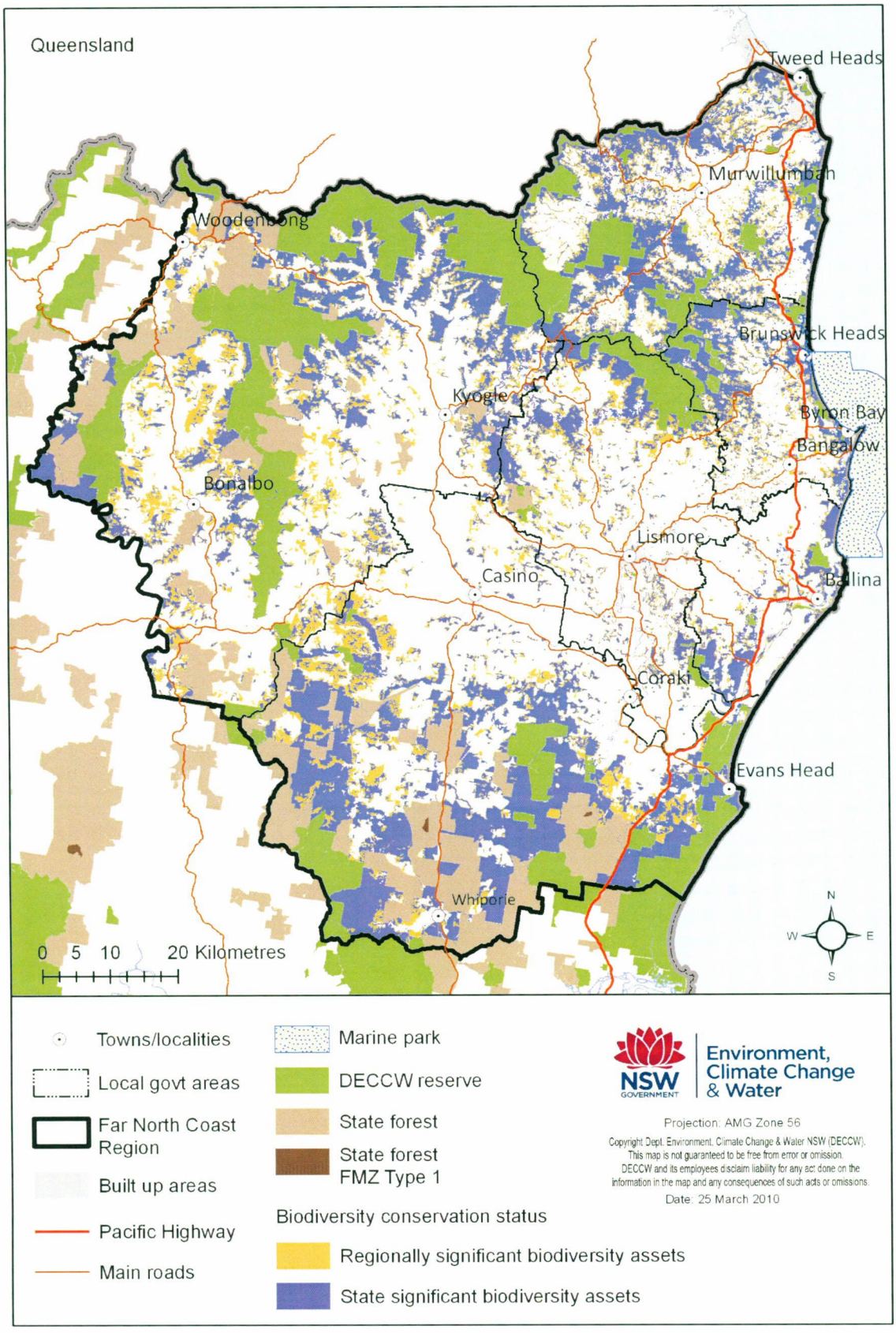

Figure 2: Distribution of lands supporting State- and regionally significant biodiversity assets

3.6 Matters of national environmental significance

The Australian Government's EPBC Act aims to protect MNES, which fall into seven categories (section 2.7). MNES identified in the Mid North Coast Region include the following:

- listed threatened species and ecological communities –
  - 2 critically endangered ecological communities
  - 1 threatened invertebrate
  - 5 threatened amphibians
  - 4 threatened reptiles
  - 4 threatened fish
  - 15 threatened birds
  - 1 threatened marine mammal
  - 7 threatened terrestrial mammals
  - 63 threatened plant species.
- migratory species protected under international agreement –
  - five marine mammals, three reptiles (turtles)
  - two sharks
  - 56 terrestrial, wetland, shore and sea birds (some vagrant).
- one World Heritage Area (Gondwana Rainforests of Australia World Heritage Area, spread across Tweed, Lismore and Kyogle LGAs)

If development proposals are likely to have a significant impact on MNES, an approval under the EPBC Act, administered by the Federal Department of Environment, Water, Heritage and the Arts, may be required.

3.7 Connectivity conservation and the role of corridors

Landscape connectivity has been defined as the degree to which the landscape facilitates or impedes movement of organisms between resource patches. This definition emphasises that the types, amounts and arrangement of habitat (for example vegetation patches) or land use in the landscape influences species' movement and, ultimately, population dynamics and community structure. Landscape connectivity thus combines both the physical structure of the landscape and the organism's response to it (Taylor et al. 2006).

Habitat fragmentation and connectivity is a fundamental concern in conservation biology as it affects species' vulnerability to extinction (Frankham 2006). Threatening processes arising from habitat fragmentation, such as habitat isolation, habitat degradation, edge effects or predator/prey ratios, are being compounded by the increased needs for adaptation by wildlife to the potential pressures and threats presented by climate change (see box below).

Landscape context is very important in evaluating how land-use change will affect landscape connectivity within key movement corridors used by animals and some plant propagules. Each species' ability to traverse the landscape, and the degree to which habitat alteration limits their access to forage, shelter or nest sites (whether in remnant patches or scattered relicts) thus affects a population's long term viability. Managing the matrix of vegetation and habitat, within a knowledge of species' movement patterns and behaviour and the size and arrangement of resource patches, can offer an effective means of managing 'permeability' of the landscape to preserve or restore functional connectivity. However, a focus on landscape connectivity alone will not guarantee population persistence or maintenance of biodiversity (Taylor et al. 2006).

Importance of linkages in a time of climate change

DECC (2007c) considered that climate change is the most pressing environmental issue facing us. It is one of the major threats to biodiversity on a global scale, and is now listed as a key threatening process under the TSC Act.

The main threat from anthropogenic climate change is the magnitude and rate of change which exceeds the capacity of species and ecosystems to survive. Individual species have two possible survival mechanisms in response to changes in climate: adaptation or migration (Hinckley and Tierney 1992). However, evolutionary responses to environmental change are rare, as the speed at which environmental change is predicted to occur means that adequate response through adaptive evolution is unlikely for most species in the short term (Hughes 2003).

Ecosystems that have been identified as particularly vulnerable to the impacts of climate change are coastal ecosystems, alpine areas, fragmented terrestrial ecosystems (including forests), freshwater wetlands and areas vulnerable to high fire intensity and frequency, or low freshwater availability.

Furthermore, the likelihood that species will be able to shift their range may be compromised by extensive changes to the natural environment from the loss, fragmentation and isolation of habitat and reduced genetic diversity of species. These changes reduce the natural adaptive capacity of ecosystems and native species. In particular, habitat fragmentation impedes the growth rate and resilience of populations to large-scale disturbances. Fragmentation multiplies the impacts of climate change through several mechanisms, including the following.

1 The shifting of species' ranges is inhibited in landscape zones in which the degree of habitat fragmentation allows persistent metapopulations, and blocked in areas where spatial connectivity of the habitat is below the critical threshold for metapopulation persistence.

2 An increased frequency of large-scale disturbances caused by extreme weather events will cause increasing gaps and an overall contraction in the distribution range, particularly in areas of relatively low levels of spatial cohesion.

Conversely, regions with highly connected landscapes support on average the highest abundance levels of species and ecosystems. The variety of vegetation types and ecosystems (spatial heterogeneity) may dampen the effects of local ecological disturbance, such as fire (Opdam and Wascher 2004).

The retention of large natural areas across public and private lands (an approach widely referred to as connectivity conservation), prevention of further fragmentation and degradation and increased linkages across landscapes are acknowledged to be effective measures for the conservation of biodiversity. These measures should be incorporated into natural resource planning.

Increasing habitat connectivity in planning for climate change is both an essential tool and a risk, due to the potential for increased competition and predation on less opportunistic or resilient species occupying discrete niches. Connectivity will not guarantee the survival of all species or ecosystems, but does greatly increase the chances that a large range of species will survive climate change, changing fire regimes, invasive species and altered rainfall patterns (DECC 2007f). An added complexity is the interaction between climate change and the availability of habitat in existing networks; if more vegetation types become suitable, spatial connectivity may increase allowing metapopulations to respond quicker to climate change (Opdam and Wascher 2004).

Connectivity can be regarded at various scales. Connectivity across the Far North Coast Region is mapped in Figure 3 at national, State, regional and subregional levels. Corridors are thought to represent an important subset of overall connectivity and a part of the wider landscape matrix, where conservation efforts may be focused in order to maintain, or enhance, regional conservation potential. One conceptual model for regional landscape conservation planning proposes corridors to link protected area networks, thus integrating large core areas, buffers and overall landscape connectivity (Scotts 2003).

The spatial layer for regional and subregional corridors is available through DECCW's website[13] or by direct request.

Although connectivity is mapped for the above range of scales, implementation occurs mainly at the local scale, through local government land-use planning mechanisms and community engagement and support. The larger scales provide an overarching context that helps to ensure that local connectivity is maintained between catchments and local government areas, and between regions and States. Thus the larger scale connectivity maps are conceptual only.

3.7.1 National scale

In recent years, the scientific community has increasingly recognised the importance of planning and acting at scales much larger than those adopted for previous catchment or regional conservation efforts. A range of ecological or other environmental processes operate at scales transcending regional and State (and in some cases even continental) boundaries. Increasingly, emphasis is shifting towards planning for impacts of climate change on regional rainfall, temperature and fire patterns. Equally important is an understanding of migratory species movements, and the cumulative impacts of past land use decisions on availability of habitat across regions.

In 2007, DECCW in conjunction with leading non-government conservation organisations established the Great Eastern Ranges Initiative (DECC 2008d, based on DECC 2007f). This continental-scale initiative aims to connect and conserve ecosystems along more than 2800 kilometres of the great eastern ranges from Walhalla in Victoria to Atherton in far north Queensland.

The Great Eastern Ranges Initiative resulted from a growing recognition of the strategic importance of the ranges as a refuge during periods of climate stress, a refuge for the highest concentrations of species in eastern Australia, a critical movement pathway for the many species that migrate on a seasonal basis, and the source of essential ecosystem services (Mackey et al. 2010). Its mission is to engage the NSW community in an effective long-term partnership to conserve, connect, protect and rehabilitate plant and animal habitats and catchments of the great eastern ranges of Australia along the 1200 kilometres of the NSW section of the great eastern ranges conservation corridor.

3.7.2 State scale

To provide a linkage between the national scale and the regional scale corridor mapping, a data analysis was conducted for the Far North Coast Region. It is based on Scotts (2003) and incorporates climatic gradients and habitat mosaics.

Broad linkages derived in this way indicate priority corridor complexes extending north to south along the escarpment on the western side of the region, south along the Richmond Range, west to east along the Border Ranges and through the Bungawalbin area in the south, and linkages from the Border Ranges southeast towards the coastal plain north of Brunswick Heads and around Byron Bay.

[13] http://maps.nationalparks.nsw.gov.au/keyhabs/default.htm

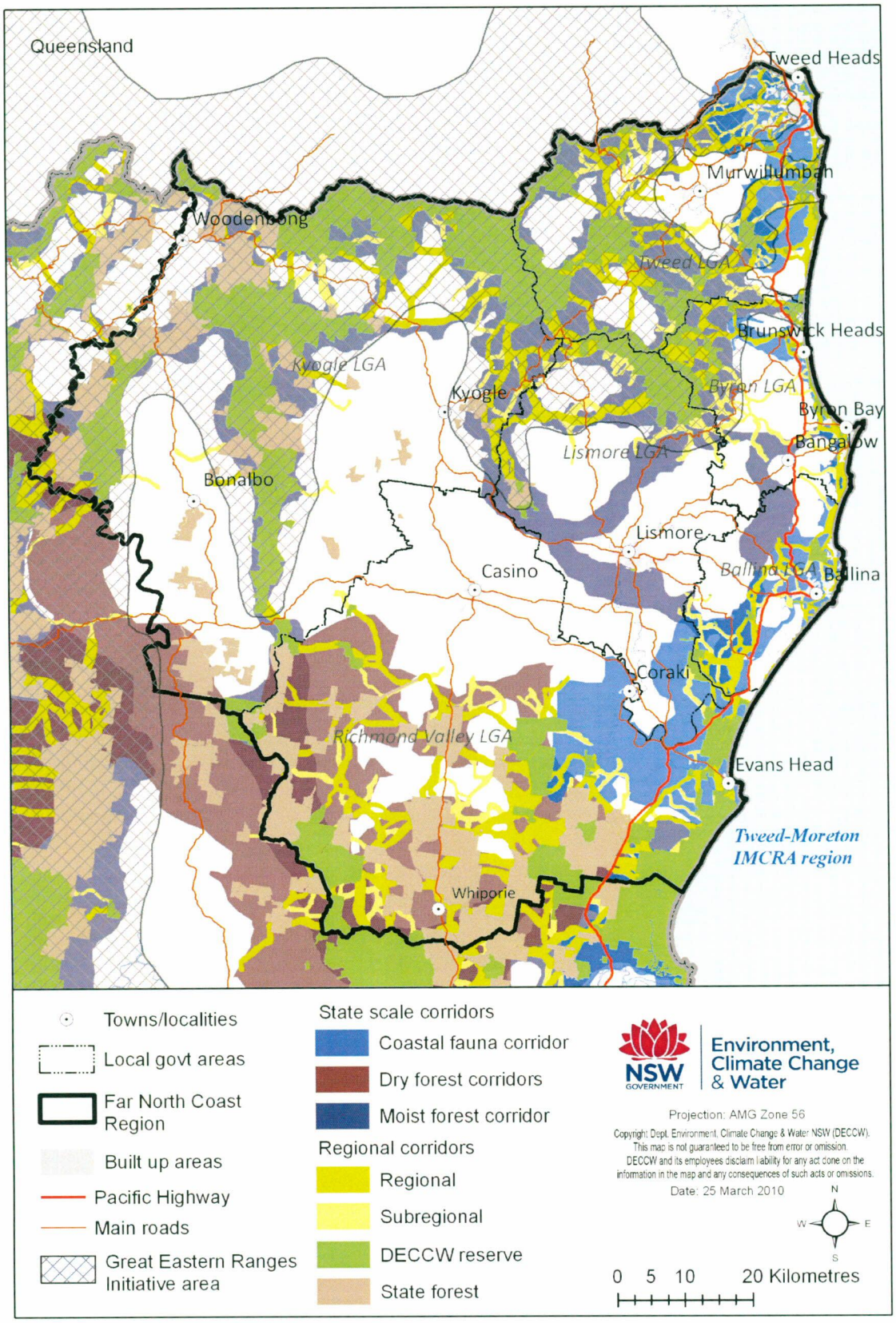

Figure 3: Corridors and habitat networks

Although much of the coastal plain and river valleys is cleared, there are still fragments forming important vegetated 'stepping-stone' linkages from the ranges to the coast which should be maintained and enhanced.

In some of the escarpment areas, connectivity between reserves is already quite extensive. However, the key coastal areas and escarpment foothills lack such connectivity between formal reserves. In these areas, opportunities exist for protecting larger patches of remnant vegetation through voluntary conservation or other measures.

3.7.3 Regional and subregional scale

The FNCRS (and the superseded North Coast Regional Environmental Plan) has, as one of its actions, that LEPs will include provisions to encourage habitat and corridor establishment in future zoning of land with environmental and rural values. Councils sought guidance on where such corridors could most effectively be placed in the landscape.

Drawing on regional biodiversity datasets built over a decade of forest assessment, Scotts's (2003) key habitats and corridors project aimed to develop a conservation framework across the landscape at a regional scale to address this need. Both the key habitats and the corridors component have been included in the BCL dataset as lands having high conservation value, as habitat for key forest fauna assemblages and appropriate linkages for that habitat.

As a generalisation, the highest priority corridors are mapped along natural gradients (for example, altitudinal and latitudinal gradients) or as links between major areas of public land supporting native vegetation. These were intended to assist councils in identifying and placing appropriate local linkages in a landscape context.

Although unbroken linkages may be preferable for the movement of many species, Fischer et al. (2006) suggested that the stepping stone or matrix model of connectivity can also provide biodiversity benefit in an overcleared landscape. Large remnants form a protected chain between 'core' vegetation (such as found in DECCW reserves) and the remnants are large enough and close enough to serve as habitat for most of the species native to the areas. This model may result in smaller edge effects and larger niche diversities and territory sizes.

In landscapes where native vegetation is overcleared and connectivity is poor, programs need to be put in place to protect key remnants and restore the areas most critical for the re-establishment of landscape function. Thus any conservation efforts will benefit connectivity. Application of the mapped corridors at local scale should always be cognisant of the constraints and limitations imposed by a regional mapping exercise. Scotts (2003) sets out the decision rules pertaining to the key habitats and corridors project.

3.7.4 Local scale

Local connectivity is essential for the functioning of the landscape ecosystem and is where implementation of a system of corridors most often occurs. Council-identified and verified linkages, based on the regional model developed by Scotts (2003), will support and consolidate the broad linkages addressing climate change adaptation requirements.

Important local-scale corridors can be established via the riparian zones of the Far North Coast Region's many creek and river systems. Unbroken vegetation corridors established along creeks and rivers are significant for many reasons, including:

- providing bed and bank stability
- protecting water quality
- maintaining aquatic and terrestrial fauna habitat and movement

- maintaining the viability of riparian communities
- protecting floodplain processes
- managing edge effects at riparian agricultural and riparian/urban interfaces.

The importance of riparian vegetation is highlighted by the listing under the FM Act of degradation of native riparian vegetation and removal of large woody debris along NSW watercourses as key threatening processes for aquatic threatened species.

In addition, steep lands or ridgelines protected for scenic amenity can also provide for habitat connectivity, particularly through urban areas, to link with hinterland or rural lands. Ridge lines were often travelling routes for Aboriginals and thus may have important cultural links.

In conserving biodiversity through management of the vegetation matrix, it is critical to not limit the opportunity for species interaction and any movement required for this. Where vegetated corridors are mapped across the landscape and their biodiversity values verified, there should not be an intensification of land use. Where modelled corridors pass over cleared rural land, these areas may, with landholder engagement and appropriate incentives, be restored over time where it is not detrimental to rural enterprise and is beneficial for land management, for example, on steep slopes or along watercourses. It is important also to retain connectivity through urban areas, and urban and ancillary development should not further encroach on open space, particularly along watercourses.

3.8 Aboriginal cultural heritage values of the Far North Coast Region

AHIMS is a database of recorded Aboriginal objects, based on heritage surveys for environmental assessments and other surveys undertaken to identify and protect specific heritage values. Unfortunately most areas are only systematically surveyed when urban development is imminent, thus the database does not reflect the broad distribution of Aboriginal cultural heritage across the Far North Coast Region. Information held by the local Aboriginal community must be gathered and included if cultural knowledge is to be comprehensive and a piecemeal approach to cultural and heritage is to be avoided.

As at April 2010, 888 Aboriginal object sites were recorded in AHIMs in the Far North Coast Region (Table 7).

The considerably larger number of recorded object sites in the Tweed LGA is considered to be both a reflection of the richness of past Aboriginal occupation in the Tweed Valley and also a reflection of the survey effort, largely resulting from the number and extent of urban developments in that LGA intersecting with areas of high cultural significance.

In addition to Aboriginal objects being recorded, eight Aboriginal Places have been gazetted (Table 8).

Table 7: Aboriginal object sites recorded in AHIMS

Local government area	Number of AHIMS-recorded object sites
Tweed	289
Byron	127
Ballina	152
Kyogle	116
Lismore	51
Richmond Valley	153

Table 8: Aboriginal Places

Local government area	Aboriginal Place	Protected by DECCW reserve?
Tweed	Ukerabah Island	Yes – Ukerabah NR
Byron	Cocked Hat Rocks	Yes – Broken Head NR
Bryon	Ti Tree (Taylors) Lake	Partly – proposed Ti Tree Lake Aboriginal Area
Kyogle	Capeen Mountain	No
Kyogle	Yabbra Spring	No
Lismore	Cubawee	No
Lismore	Parrots Nest (Goorumbil)	No
Richmond Valley	Casino Bora Ground	No

There are also well-known landscape features such as Mount Warning (Wollumbin) which are highly significant to Aboriginal people. However, there are many significant objects and places which are not formally recorded, and in an attempt to be more strategic about protection a number of research studies have been undertaken.

As part of the Comprehensive Coastal Assessment, DEC (2005) undertook an Aboriginal cultural heritage data audit and wrote LGA profiles outlining the information available to councils to commence their Aboriginal cultural heritage planning. Also, as part of the Assessment, Andrews et al. (2006) attempted to map predicted Aboriginal cultural heritage landscapes of the coastal LGAs.

Both of these studies provide useful starting points for identifying Aboriginal cultural heritage values for the Far North Coast Region. However, because there are both physical and spiritual connections to Aboriginal heritage, it has not been possible to rely on these alone for strategic local government planning.

DECCW is developing a new methodology called an Aboriginal Regional Assessment (ARA) which is a landscape level, broad-scale approach to consideration of the range of Aboriginal cultural values within the environment. An ARA also considers the interests and priorities of Aboriginal people as they relate to these values. It therefore provides a framework and approach to identification and consideration of these values, interests and priorities. One of its principal objectives is to be more outcomes focused and better aligned with other forms of broad-scale regional assessment that feeds into environmental and land use decision making.Aboriginal cultural values is a term to describe the range of heritage, natural, spiritual, social and economic values that Aboriginal people might prescribe to land and environment. These values are often seen as culturally indivisible and align with Aboriginal stewardship and belonging to Country. Therefore values are recognised and experienced through access to land and water to practise culture (a range of activities on Country) such as an ability to sustainably collect resources, manage and protect Country and share information about heritage and culture.

A guideline is under development to provide an overall policy framework and approach for ARA, primarily within DECCW. An ARA is established as a landscape level (regional) approach to assess and better understand Aboriginal cultural values within the environment as part of DECCW's increasing role in engaging with Aboriginal people to better manage and protect the environment.

The guideline establishes four basic requirements in regard to its charter for protecting and managing the environment.

These requirements provide direction on how to:

1 identify an Aboriginal context to any environmental issue that may require the use of an ARA
2 appropriately assess Aboriginal cultural values in the environment when an Aboriginal context has been recognised
3 recognise and use ARA results to identify Aboriginal community interests that protect and conserve Aboriginal culture and heritage within the environment
4 incorporate agreed priorities (actions) into a range of environmental planning and management decision-making mechanisms to ensure positive outcomes for Aboriginal culture and heritage, as part of DECCW's broader environmental responsibilities.

Comprehensive shire-wide studies under taken by councils are likely to be compatible with this approach. The fishing atlas, discussed in section 3.4.3, could be extended to cover non-park areas, as part of the above ARAs.

Comprehensive cultural and archaeological studies undertaken at the local level, as recommended above and in section 2.11, will enable sound strategic planning to minimise impacts to important Aboriginal heritage values. Some Far North Coast councils have commenced development of comprehensive shire-wide Aboriginal cultural heritage management plans, including a predictive element based on current and historical records, cultural knowledge and topography. These types of studies, based on traditional knowledge and comprehensive research, provide the best way to protect Aboriginal cultural heritage.

4 Audit of biodiversity assets

4.1 Identification of future urban release and employment lands

The FNCRS supports the maintenance and enhancement of the region's biodiversity. Its stated outcome is to direct urban development away from areas considered important for conservation. Where development, including new land release, may affect biodiversity, it will be designed to minimise these affects by protecting and enhancing the long-term viability of priority vegetation and habitat corridors, as well as rehabilitating degraded priority areas. Infill redevelopment will be encouraged and controlled to ensure additional pressure on the environment is minimised. Through these approaches, the clearing of native vegetation should be minimised.

To meet the predicted population growth requirements of the Far North Coast Region, the FNCRS identified approximately 130 development clusters (consolidated or adjacent blocks) covering a total of approximately 8650 hectares of land. Areas of high biodiversity value and other planning constraints were considered by the Department of Planning when identifying the proposed development areas, and efforts were made to identify areas for future development that are relatively unconstrained by biodiversity features. These are mapped in Figure 4.

Nevertheless, some of the potential development areas include features of high conservation value, as do some areas that are already zoned for urban development. This section summarises the potential implications on key conservation values if the areas identified in the FNCRS are developed.

The degree of protection for biodiversity assets, afforded by zoning and planning agreements, cannot be ascertained until the rezoning and subdivision layouts are finalised. Where biodiversity impacts cannot be avoided, some guidance is provided in section 5.2 on where any required offsets and/or rehabilitation may best be placed to maximise long-term protection and viability of biodiversity assets.

4.2 Biodiversity assets within current undeveloped and future urban release and employment lands

The extent of high conservation value biodiversity assets within the already zoned but undeveloped and future urban release areas and zoned but undeveloped and proposed employment lands contained in the FNCRS was estimated from the overlay of individual mapped areas with the mapped distributions of vegetated lands, and lands predicted to support high conservation value biodiversity assets.

A number of analyses were undertaken. Firstly, the quantity of native vegetation contained in both the existing zoned but as yet undeveloped, and the areas identified for potential future urban and employment lands, was determined compared with their total area (Figure 5). This graph shows that, although a large proportion of the future urban release areas and proposed employment lands areas are mostly cleared and thus unconstrained by vegetation, they still support a substantial area of native vegetation.

About 15.3% (1330 hectares) of the areas identified in the FNCRS for future development support native vegetation. It can be seen in Figure 5 that potentially the greatest coincidence of vegetation with potential growth areas is in residential lands that are already zoned for urban development, but as yet are undeveloped. Nearly 29% of these areas support native vegetation. In comparison, only 6.4% of unzoned potential employment lands support native vegetation.

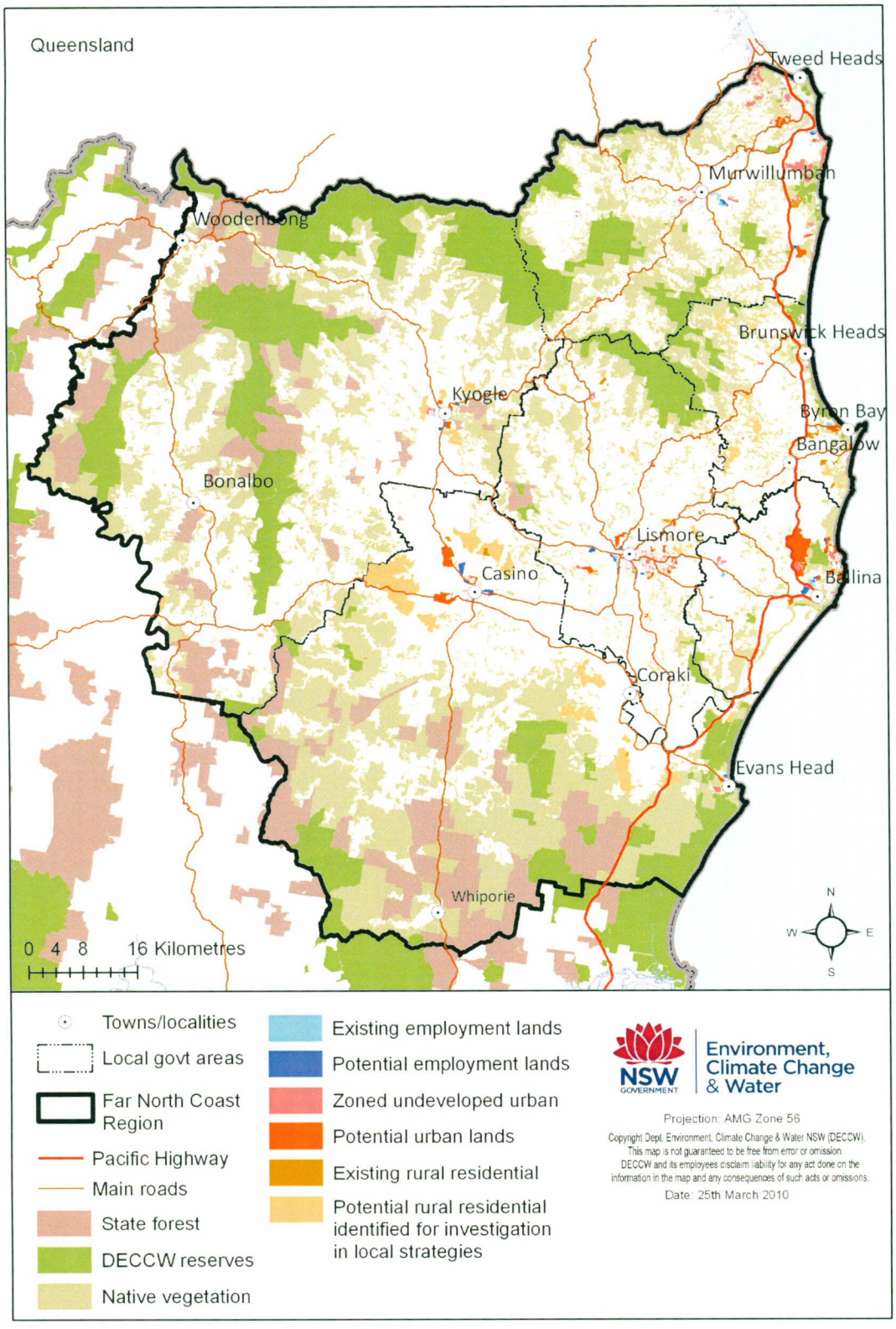

Figure 4: Existing and potential urban and rural growth areas identified in strategies

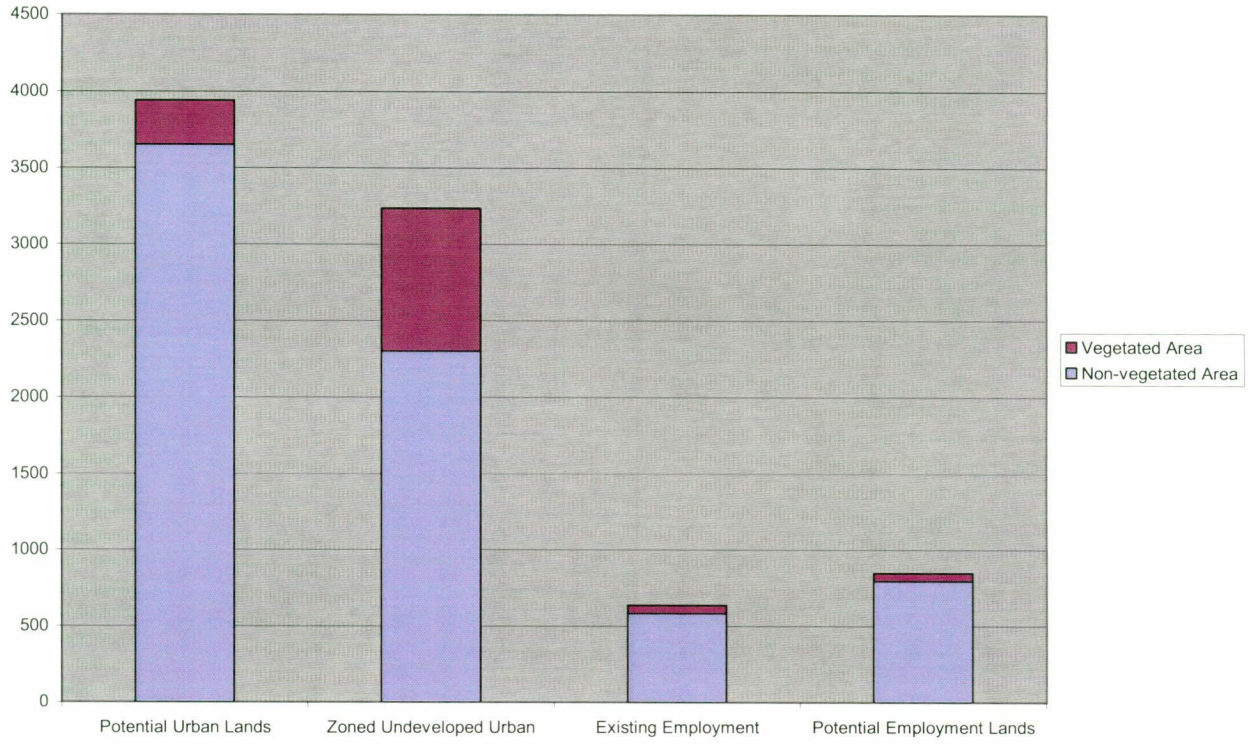

Figure 5: Native vegetation included in the four FNCRS development scenarios

Councils should aim to avoid any clearing in connection with urban development. In addition, the conservation values that occur in vegetation remnants retained within and adjacent to areas that are developed may be reduced over time through a number of processes associated with the urban environment (such as weeds, fire, pets and human activities). These vegetation remnants are important for a range of values including biodiversity (although potentially reduced), scenic, open space, connectivity of habitat and buffering to areas of higher conservation value. They require active management to prevent degradation over time. In general, larger patches of retained vegetation are preferable to smaller patches due to reduced edge effects and greater resilience.

A further analysis was undertaken to determine the predicted occurrence of high conservation value biodiversity assets within the four FNCRS land categories. These biodiversity values were derived from those used in the BCL dataset and include lands mapped as SEPP 14 coastal wetlands and SEPP 26 littoral rainforests, rainforest and old-growth forest, EECs and areas potentially impacting on wildlife habitats. Figure 6 illustrates this analysis.

As identified in the vegetation analysis above, lands currently zoned for residential development purposes, but as yet undeveloped, support the largest area of predicted high conservation value lands. Potential urban lands also are predicted to support large areas of high conservation value biodiversity.

The land included in the combination of all four land categories is predicted to support over 54 hectares of mapped SEPP 14 coastal wetlands and over 260 hectares of predicted EECs. Nearly 70 hectares of candidate old-growth forest is predicted to occur in currently zoned but as yet undeveloped urban lands. In addition, the surrogates for threatened species, such as key fauna habitat, koala habitat (SEPP 44), wetlands and estuarine habitat, also occur in planned release areas.

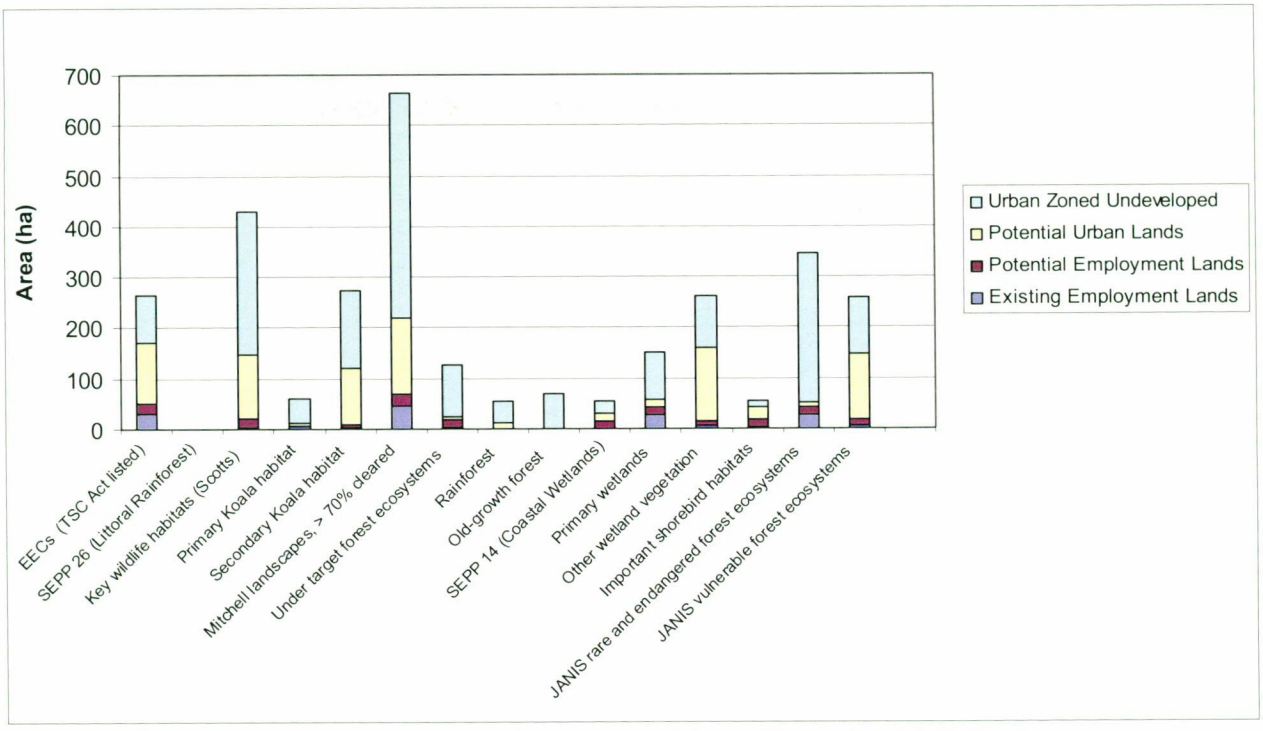

Figure 6: High conservation value biodiversity assets predicted in the four FNCRS development scenarios

A further analysis of the specific types of coastal floodplain EECs potentially affected by the various development scenarios is provided in Figure 7. Of the seven EECs predicted to occur in the four land categories, Swamp Oak Floodplain Forest is potentially impacted most as over 200 hectares is predicted to occur within the development scenarios, 93 hectares in potential future urban lands. The area covered by Swamp Oak forest area may not all be an EEC, but Swamp Oak forest excluded from the legal determination is still recognised as an overcleared community, so should be protected. Overall, more area of EECs (120 hectares) is predicted to occur in potential future urban lands than any other category.

Other EECs in future urban growth areas include small fragments of lowland rainforest and Callitris forest. (Only a minimal amount of subtropical floodplain forest was predicted to occur within potential future urban growth areas.) Development of land supporting EECs or overcleared vegetation types not in low condition should be avoided.

An analysis was also undertaken of the extent of predicted wildlife corridors over existing and future urban and employment lands, both cleared sections and those supporting native vegetation. These results are provided in Table 9. Note the figures are not mutually exclusive, and thus not additive.

As discussed in section 3.7.4, it is important to retain connectivity through urban areas, and urban and ancillary development should not further encroach on open space, particularly along watercourses. Vegetated sections of predicted wildlife corridors should be protected in the rezoning and subdivision process to ensure that movement between key habitats and reserves, and along climatic gradients, can continue in the long term. This approach is consistent with the FNCRS, which states that urban development should be directed away from areas of known or likely conservation importance, including corridors which allow wildlife to connect with or migrate to other habitat areas and climatic zones.

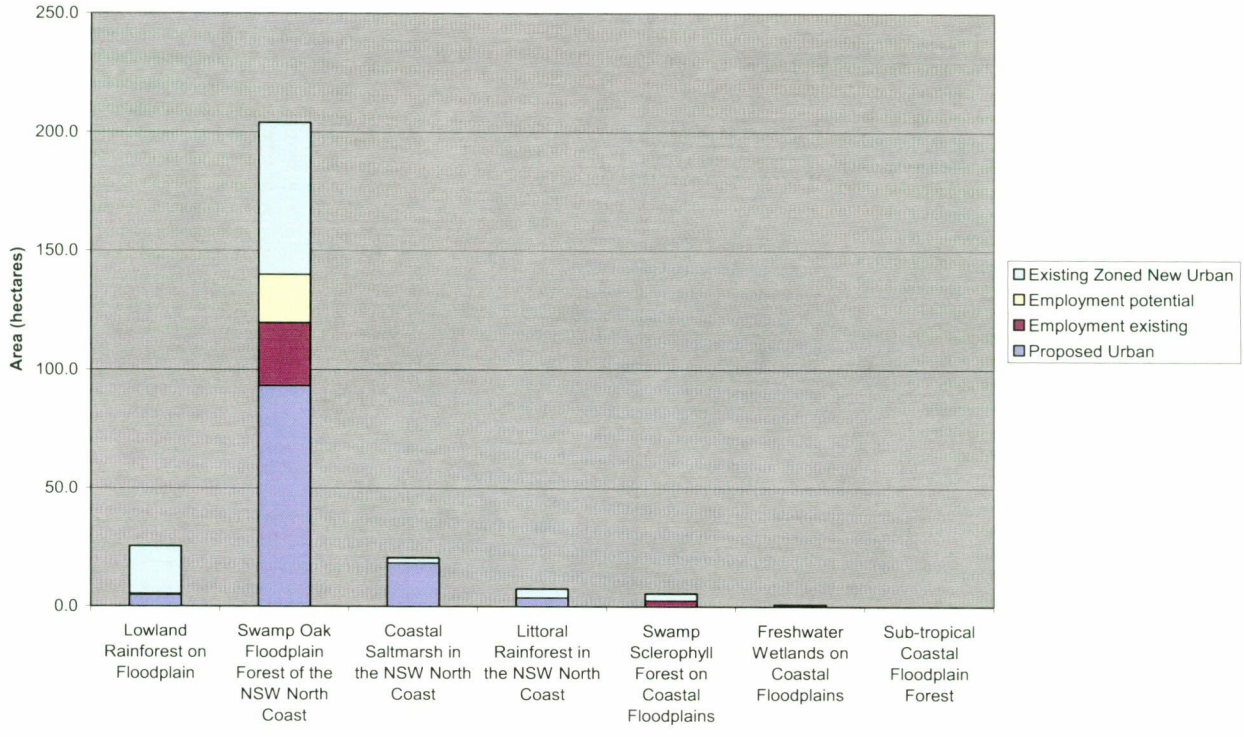

Figure 7: Floodplain/coastal EECs predicted in the four FNCRS development scenarios

Table 9: Extent of predicted wildlife corridors over current and proposed future urban and employment lands (vegetated and cleared)

Land use category	Vegetated (hectares)	Cleared (hectares)
Potential future residential	184	554
Potential future employment	50	50.5
Town/village growth boundary	1,732	2,417.5

Avoidance of biodiversity impacts should be possible with careful land-use planning. Where this is not possible, or where indirect impacts are predicted (for example, edge effects, incursion of weeds and pests, light, noise and odour, changed hydrology) then offsets may be appropriate. Section 5 provides guidance for where offsets may be found, for these areas as well as the future urban release areas and future employment lands.

4.3 Potential implications of rural residential lands

There are approximately 15,600 hectares of possible future rural residential land identified within approved local rural residential land release strategies in the FNCRS area. A high proportion of this land is identified as investigation area only and is not likely to be zoned rural residential (as advised by the Department of Planning). There are currently 3990 hectares of zoned rural residential land. As the FNCRS does not identify specific areas for rural residential development, with the identification of these areas to come through subsequent processes, a preliminary analysis of the potential areas of biodiversity habitat that would need to be addressed in any subsequent planning process for rural residential development has been conducted, the results of which are summarised in Table 10.

Table 10: Areas of potential rural residential land identified in strategies coinciding with biodiversity habitat

Category	Proposed rural residential (hectares)	Existing undeveloped rural residential (hectares)
Total area of coincidence	15,600	685
Native vegetation	3,180	120
Lands of State significance	2,180	150
Lands of regional significance	2,170	120
EEC	180	10

It is noted that, without avoidance or mitigation, the development of all the proposed rural residential areas would result in the loss of an additional 3180 hectares of native vegetation, with a further loss of 120 hectares of native vegetation in land currently zoned but not yet developed. The majority of potential modelled effects on EECs are in the Coraki area (largely Swamp Sclerophyll Forest on Coastal Floodplain) and also in the Mullumbimby area (largely Lowland Rainforest).

Although some future rural residential subdivisions may be subject to the NV Act, depending on the zones applied, others may be classed as large lot residential, with potential implications on biodiversity values. Any rezoning of proposed rural residential lands should avoid impacts on the abovementioned habitat and, similarly, have regard for other biodiversity features and also features of Aboriginal cultural importance. This above process may result in the need for a strategic review of the proposed rural residential areas to ensure that areas of high conservation value and Aboriginal cultural significance are not developed.

4.4 Additional potential development not assessed in the Regional Conservation Plan

The FNCRS identifies areas for development (urban release and employment lands) until 2031. These have been endorsed by the State government. Future development should therefore be located in these areas.

The FNCRS does, however, provide a mechanism to consider rezoning land to urban purposes outside of these areas via Sustainability Criteria (section 6.3.1). Due to the sensitivity of the coastal area (defined in the FNCRS) these Sustainability Criteria are not applicable in the area east of the new alignment of the Pacific Highway. Any intensification of land use beyond that provided for in the FNCRS will be limited to west of the realigned Pacific Highway.

Such proposals have not been spatially defined and thus a biodiversity audit could not be undertaken. Intensification of land use should avoid the areas identified in the biodiversity conservation guide (section 5.2.3) and any area identified as supporting high conservation value biodiversity or cultural heritage assets.

Other categories of development likely to result in pressures on biodiversity, but as yet unquantified, include the following types of ancillary development:

- any infrastructure requirements located outside the town and village growth boundaries as a result of the FNCRS, for example, sewage treatment plants or electricity substations
- State-significant projects that may be developed within the 25-year timeframe, for example the upgrade of the Pacific Highway

- development associated with the Tweed Coast Regional Crown Reserve Plan of Management or other Crown land development.

Any future development or Part 3A applications must address threatened species and Aboriginal cultural heritage issues as part of the assessment process. Any lands proposed for development under the Department of Planning's Sustainability Criteria must address the environment protection criterion discussed in section 6.3.1.

4.5 Potential implications for Aboriginal cultural heritage

As stated in sections 2.11 and 3.8, due to the richness of Aboriginal heritage in the Far North Coast Region, it is inevitable that urban growth and development will impact on existing and yet to be identified cultural heritage sites and places. An analysis of Aboriginal site records contained in AHIMS was undertaken for the Far North Coast Region in April 2010. Within those areas identified for future development (that is, those areas currently zoned for urban purposes, as well as those areas proposed to be rezoned for urban purposes, excluding rural residential areas) approximately 174 Aboriginal sites have been recorded.

LGAs experiencing substantial growth, such as Tweed and Ballina, have recorded the vast majority of sites, due in part to the detailed surveys that have been undertaken to inform development and rezoning proposals. For example, a search of records in 2007 revealed only 44 sites in the same area. Thus the numbers provided are indicative only. Furthermore, these records only represent physical elements of Aboriginal cultural heritage, which form only a small part of the significance of the Far North Coast Region to Aboriginal people.

Prior to any rezoning or development proposal being determined, a detailed Aboriginal cultural heritage assessment should be undertaken in an attempt to determine the Aboriginal values assigned to these areas by Aboriginal people. In turn, the information collected should be used to develop appropriate planning and management actions for implementation. These actions must be guided by the recommendations of the Aboriginal community.

A strategic approach needs to be developed for deciding which places and sites must be protected, and which may be disturbed after proper identification, recording, assessment and consultation. Councils and other agencies, such as CMAs, would benefit from the development of models which could predict the presence or absence of certain Aboriginal heritage site-types to a reasonable accuracy. Until then, DECCW and councils will provide advice to developers and have processes for ensuring that areas subject to development are adequately surveyed and assessed as part of the environmental assessment process.

For those areas that will require rezoning, councils should ensure that the Aboriginal community participates in decisions regarding the protection and culturally appropriate management of areas of Aboriginal cultural significance. Although directly applicable to the assessment of Aboriginal cultural impact permits under Part 6 of the NPW Act, the *Aboriginal consultation requirements for proponents* provides guidance on appropriate consultation with Aboriginal communities (DECCW 2010b).[14]

[14] www.environment.nsw.gov.au/resources/cultureheritage/commconsultation/09781ACHconsultreq.pdf

5 Biodiversity conservation guide for the Far North Coast Region

5.1 Conservation, restoration and enhancement

About 13.5% of the Far North Coast Region is already protected in conservation reserves. However, biodiversity cannot be protected through formal reservation alone, as the primary purpose of formal reservation is to develop a comprehensive, adequate and representative sample of ecosystems and biodiversity values, rather than protect all biodiversity. There is a general need across LGAs to provide for landscape protection, enhancement and repair of biodiversity assets for long-term sustainability.

Resources for either land acquisition or restoration, and opportunities for the enhancement of lands supporting high conservation values on private lands, are limited. Accordingly, conservation efforts must be targeted to ensure the most cost-effective results.

5.1.1 Biodiversity Forecasting Tool

To identify where general conservation works could be undertaken most usefully for landscape conservation, DECCW's Biodiversity Forecasting Tool (BFT) was used to define and map priority 'conserve' and 'repair' areas across the Far North Coast Region. The BFT provides a landscape analytical-based approach to regional conservation assessment. The tool uses information on the extent, condition and connectivity (serving as broad surrogates for biodiversity), coupled with available data and expert knowledge on various ecological processes and threats (for example, clearing, grazing, timber harvesting, current and proposed zoning).

This information was used to model the 'regional persistence' of biodiversity in the region and subsequently propose priority areas for conservation and restoration of biodiversity.

- BFT 'conserve' areas identify those priority areas that, if lost, would have the greatest impact on the region's biodiversity. These priority areas generally contain high conservation value vegetation in good condition.
- BFT 'repair' areas identify those priority areas that, if restored, would contribute the greatest biodiversity gains to the region. These priority areas generally contain overcleared or poorly conserved vegetation communities.

The outputs from the BFT have been used in the Border Ranges Rainforest and Northern Rivers Regional BMPs to define where conservation and repair works could most usefully be undertaken for threatened species conservation at both a landscape and species-specific scale. However, this is also useful for general guidance for council biodiversity conservation plans and for CMAs in identifying appropriate areas for investment, as well as to guide the development of LEPs with respect to identification of high conservation value lands and predicted wildlife corridors. Rather than reproducing these maps in the RCP, practitioners are directed to the maps in the BMPs and the conservation actions recommended therein.[15]

5.1.2 Priority actions – principles

The actions needed to achieve the maintenance and improvement of biodiversity within priority areas will vary according to the category and condition of the

[15] www.environment.nsw.gov.au/biodiversity/biomangmntplanning.htm
www.environment.gov.au/biodiversity/threatened/publications/recovery/northern-rivers.html
www.environment.gov.au/biodiversity/threatened/publications/recovery/border-ranges/pubs/brrb-management-plan.pdf

environmental asset. Although detailed actions are contained in the BMPs, in general there are three broad types of action that are needed to achieve the environmental outcomes sought by the RCP: protect, enhance, restore.

Protection: The most important action is to protect identified areas of high conservation value from threats and from further degradation. This requires both:

- legal or regulatory protection, such as appropriate zoning in an LEP and, where possible, an appropriate agreement such as a voluntary conservation agreement or planning agreement, or through purchase or acquisition by a public or private conservation organisation
- physical protection of the site, as appropriate – this could include fencing, signage, and changes to access points, roads or track networks.

Enhancement: Even sites of high conservation value may not be in 'pristine' condition. The site may have been declining in condition over time due to various threatening processes such as weed infestations, populations of feral pests, inappropriate fire or grazing regimes preventing regeneration of some species, rubbish and litter, and inappropriate recreational use. It is usually necessary to prepare a management plan that sets out the management actions that need to be implemented to ensure that the site's values are enhanced. Various funding sources can then be approached to assist implementation, such as 'Caring for our Country' funding, or funding through CMAs.

Restoration: Restoration refers to the reinstatement of environmental values that may have previously existed on a site. Revegetation of a site is one example of a restoration activity. Principles for restoration sites include the following:

- Sites that have some inherent 'resilience' (or capacity to recover) are appropriate sites for restoration. For example, a site with a predominantly native understorey will be easier and more cost-effective to restore than a site that is composed mainly of weeds or exotic (introduced) grasses.
- Sites for restoration should build on the existing network of vegetation in a district, either expanding an existing remnant, widening key linear habitats or corridors (for example roadside or streamside vegetation), or making a connection between two or more previously isolated remnants.

Generally, it is more cost-effective, in terms of both financial resources and time scale, to protect and enhance existing biodiversity assets than to attempt to restore them.

5.1.3 Priority actions for high conservation value biodiversity assets

Section 3.3 discusses different types of biodiversity assets with high conservation values. These types may require different emphases and different sets of priority actions. Generally, each site will require a mix of the three types of actions (protection, enhancement and restoration), and these should be set out in a management plan.

The following summary of the preferred strategy for addressing land-use planning issues for each of these high conservation value biodiversity assets discussed is provided below. This is a guide only; each site will be different, and management should follow a plan that recognises the unique characteristics of each site.

Endangered ecological communities: Identified sites should be protected, but other efforts are also needed to abate the threatening processes that have led the community to become endangered. The Priorities Action Statement[16] for an endangered community includes a list of priority actions (DECC 2007e). These should guide the management of particular sites.

[16] www.threatenedspecies.environment.nsw.gov.au/tsprofile/home_PAS_new.aspx

Guidance on threat abatement is also provided in the BMPs.

Sites with threatened flora and habitat for threatened fauna: As above. The BMPs and the Priorities Action Statement include priority actions for species. These should guide management of particular sites.

Vegetation (overcleared, or in overcleared landscape; or JANIS rare, endangered and vulnerable ecosystems): Identified sites with such vegetation should be protected and enhanced, but in order to achieve the targets set out in the Northern Rivers CMA CAPs to improve or maintain biodiversity it will be necessary to identify appropriate sites for restoration. The highest priority areas have been identified by the BMPs.

Rainforests: The emphasis is on protection of identified areas and managing such areas to maintain landscape processes as discussed in the Border Ranges Rainforest BMP.

Old-growth forest: The emphasis is on protection and management of identified areas to maintain landscape processes. Guidance can be obtained from the BMPs.

Riparian, wetlands and coastal lakes: The emphasis is on protection of existing habitats within the catchment, and enhancement and restoration of key habitats, particularly riparian (streamside) and wetland vegetation. There is also an emphasis on protection of identified coastal wetlands, with enhancement and restoration of key habitats (for example saltmarsh). Protection of catchments of coastal lakes through protection of existing vegetation and treatment of stormwater runoff from urban areas within the catchment is also required. Minimal interference with natural processes with respect to ICOLLs, consistent with estuary management plans, is emphasised. In particular, artificial opening of ICOLLs is discouraged outside of a formulated entrance management plan.

Wildlife corridors: Most existing vegetation and habitat within identified regional wildlife corridors, including riparian areas, should be protected and enhanced, but it will also be necessary to restore certain areas to improve connectivity and to enable movement and dispersal of flora and fauna populations. Land use should not be intensified in identified wildlife corridors.

National parks and reserves (including flora reserves): The emphasis is on protection, in accordance with the plan of management.

Marine parks: The emphasis is on protection and sustainable use in accordance with the zone plan.

5.2 Biodiversity conservation in the planning system

The protection, maintenance and improvement of biodiversity is incorporated within relevant NSW Government policies, strategies and legislation (section 2). Traditionally, the planning system has considered impacts on biodiversity in a reactive way – that is, in response to development applications – and has accepted that loss is inevitable.

Although development assessment will remain a critical tool in protecting biodiversity, ways have been developed to consider biodiversity proactively. The regional strategies are one approach to guide strategic land-use planning at a regional scale. By identifying biodiversity assets early in the strategic planning process, it is possible to zone these areas appropriately. In so doing, it is possible to direct development away from these assets and onto less constrained lands.

DECCW has reviewed the proposed urban growth areas in the FNCRS. As discussed in section 4.2, the RCP foreshadows that projected urban development proposed for the Far North Coast Region may impact up to 1330 hectares of remnant native vegetation including high conservation value biodiversity assets as defined in section 3.3.

Where appropriate infrastructure and services are available, development should be directed towards those areas which are not constrained by biodiversity assets or natural hazards. High conservation value biodiversity assets, after validation, should be zoned for retention and protection as proposed by the FNCRS. Development of the future urban growth areas would benefit from a 'master planning' approach to facilitate the strategic consideration of biodiversity values.

The planning system needs to be used to help protect the habitat of threatened species. One example of this is the koala which, in spite of being one of the best known Australian species and the subject of extensive research compared to other species, still challenges efforts to protect and plan for its coexistence with urban development. A discussion of the issues involved and the complexity of providing an improve or maintain outcome is provided in the box below. Note that this is only one of numerous species facing the same challenge of coexisting with increasing urban development.

Notwithstanding the desire to limit urban sprawl by nominating development clusters, it is unlikely that the entire extent of any identified urban growth area can or should be totally developed due to a range of constraints, including biodiversity values. This should be taken into account by developers when assessing potential yields.

However, where sound planning and socioeconomic objectives justify it, development may be approved in vegetated areas and thus may impact on biodiversity assets. This biodiversity conservation guide then applies to the mitigation of impacts and identification of appropriate offsets to achieve an improve or maintain outcome for specific biodiversity assets for the Far North Coast Region.

Conservation of koalas

The koala is listed as a vulnerable species under the TSC Act. This is due to the severe decline in koalas across NSW, having disappeared from between 50–75% of their former range. Koalas in NSW now occur mainly on the north coast and are uncommon, rare or extinct in most other parts of the State.

There is in place a National Koala Conservation and Management Strategy 2009–2014 (NRMMC 2009), a State koala recovery plan (DECC 2008f) and SEPP 44, all designed to protect koalas and their habitat. However, the species continues to decline. Additionally, the species is a habitat specialist and has a low breeding rate, which suggests a poor recovery potential (DEC 2004b). Koalas are also subject to many ongoing threats, including clearing of habitat, car strike, dog attack and *Chlamydia* infection.

Current research demonstrates that koalas are concentrated on usually flat, fertile, low-elevation soils and are not widely found in public forests, particularly national parks (DECC 2008f). While there are some good populations of koalas in parks and reserves, there are key populations across the broader private landscape. It is important to protect these populations by ensuring appropriate planning processes and management regimes are in place for these private lands.

Key koala populations occur around Lismore and southeast to Broadwater-Wardell-Tintenbar areas, the Murwillumbah-Kingscliff-Pottsville areas, northeast of Lismore along the Wilson and Brunswick River valleys, with smaller populations scattered over other parts of the region including northeast of Kyogle. These populations are under threat. For example, over 300 koalas were admitted into care at the Friends of the Koala facility at Lismore in 2008-09. Of these, 79 were dead on arrival or died soon after, and a further 137 had to be humanely euthanised. Between 65% and 70% were suffering from disease (FoK 2009).

The koala is also at risk from rapid human-induced climate change. This is because of its limited capacity to adapt due to its highly specialised diet. It is predicted that elevated carbon dioxide levels may reduce the nutritional quality of eucalypt leaves, causing nutrient shortages in animals that rely on them for food (IUCN 2009). Additionally, a predicted increase in extreme weather conditions such as heat waves and storms, as well as potentially more frequent and severe wildfires may also significantly impact on koala populations, particularly those in fragmented or isolated habitats.

The mapping of koala habitat is problematic. Although habitat can be predicted based on the presence of koala feed trees as dominant species in the vegetation community, many areas of predicted habitat may be unoccupied by animals due to a number of reasons. These include historical stochastic events such as wildfire causing a local extinction, but also because koalas live in established home ranges which can be many hectares in area, depending on habitat quality. Therefore, any section of the home range may be occupied only part of the time.

Consequently, fauna surveys of only a few days duration for a development proposal are often inadequate as they may not find evidence of koalas at the time of survey, even though there are historical records in the locality. Development of that area without further investigation may inadvertently diminish the size of a koala's range, rendering it unviable. This outcome has been demonstrated by radio-tracking experiments where the determination of a koala's home range has been established over longer periods. This uncertainty also makes koala translocation problematic.

Although in some areas koalas do appear to coexist with urban encroachment, death and injury due to cars, dogs and stress-related disease is generally high and populations either decline over a number of years or need to have a steady migration from a neighbouring core population to replace losses. This is demonstrated by records collected by koala care organisations which suggest that the animals are under increasing stress, including from the direct and indirect threats associated with urban areas.

The key objective of the NSW Recovery Plan for Koalas (DECC 2008f) and SEPP 44 is to conserve koalas in their existing habitat and reverse the present decline in populations. This is consistent with the principle of avoiding biodiversity impacts. Areas supporting known koala populations should not be developed for urban purposes and in rural areas land use should not be intensified, as research clearly demonstrates that this results in koala deaths, population declines and local extinctions. Councils should zone land known to support viable populations of koalas for environmental protection. Appropriate management of private lands will be critical to koala conservation.

To promote a strategic approach to koala management, comprehensive koala plans of management should be developed according to SEPP 44. To date, no Far North Coast councils have an adopted comprehensive koala plan of management, although some have instigated preliminary studies. Several proposed urban development precincts are adjacent to, or encroach upon, known or predicted koala habitat. Development of these areas should be reviewed to ensure that core koala habitat, as defined by SEPP 44, is excluded and that indirect impacts on the mobility and viability of the population due to the position and intensity of the development are fully mitigated.

5.2.1 Priority conservation areas where offsets for urban development may be found

Where it can be demonstrated that opportunities to avoid impacts on biodiversity have been exhausted and mitigation and offsetting are required, biodiversity offsets may be proposed. A biodiversity offset is one or more appropriate actions that are put in place to counterbalance specific impacts on biodiversity. BioBanking is one new mechanism for delivering offsets. Offsets can also be individually negotiated and put in place through planning agreements or conditions of consent. Appropriate offset actions are long-term management activities to improve biodiversity conservation. This would normally include:

- protecting and enhancing the condition of an area of existing native vegetation or other habitat for threatened species
- legally protecting this land to ensure security of management actions and to remove threats.

DECCW prefers protection and enhancement of high conservation value biodiversity assets, rather than restoration, in the first instance. This is because it is generally more cost-effective to conserve biodiversity assets in good condition than repair cleared or highly modified areas. However, there are occasions where critical linkages for landscape connectivity may be highly degraded and repair or restoration of these linkages will yield the greatest landscape benefit for conservation.

Maintaining the level of biodiversity in the Far North Coast Region will require offsetting to become standard practice in land-use planning and development. To enable a strategic, shire-wide approach to be taken, councils should investigate opportunities to include offset provisions in their LEPs. These provisions will need to ensure that any loss of native vegetation from an approved development is offset to the extent that the State government's target of an improvement in the extent and condition of native vegetation is met across the LGA as a whole.

Offset provisions should guided by and encompass the following principles:[17]

1 Impacts must be avoided first by using prevention and mitigation measures.
2 All regulatory requirements must be met.
3 Offsets must never reward ongoing poor performance.
4 Offsets will complement other government programs.
5 Offsets must be underpinned by sound ecological principles.
6 Offsets should aim to result in a net improvement in biodiversity over time.
7 Offsets must be enduring—they must offset the impact of the development for the period that the impact occurs.
8 Offsets should be agreed prior to the impact occurring.
9 Offsets must be quantifiable – the impacts and benefits must be reliably estimated.
10 Offsets must be targeted – they must offset impacts on a basis of like-for-like or better conservation outcome.
11 Offsets must be located appropriately – they must offset the impact in the same region.
12 Offsets must be supplementary – they must be beyond existing requirements and not already funded under another scheme.
13 Offsets and their actions must be enforceable – through development consent conditions, licence conditions, conservation agreements or a contract.

5.2.2 A 25-year conservation strategy

The principles guiding the development of a 25-year conservation strategy for the Far North Coast Region were taken from the State and Australian government policies for building a comprehensive, adequate and representative reserve system (Commonwealth of Australia 1997) discussed in section 2.9. The conservation strategy focuses on identifying high priority regional conservation areas, which are major contiguous areas of high conservation value vegetation. These areas would be suitable for incorporation into the DECCW reserve system or conserved by a range of other appropriate mechanisms, such as those discussed in section 6.

The BCL dataset discussed in section 3.2 was used to identify areas where conservation efforts generally should be focused over the next 25 years. However, these are equally useful in the context of regional offsetting as discussed below.

The preference is for offsets to be sourced locally wherever practicable, but it is acknowledged that there may be better long-term security for offsets, or better conservation outcomes, when offsets are located further from urban or intensive rural development pressures. Thus, in some cases, a regional approach may result in a better conservation outcome. Note that the priority offset areas identified in the 25-year conservation strategy are not intended to coincide with any proposed future release areas or future employment lands mapped in the FNCRS.

It should be noted that these conservation value assessments were underpinned by predictions of high conservation value irrespective of tenure. They are intended to guide consideration of where councils or developers may look for offsets and do not imply any compulsory acquisition or fettering of existing land-use rights. DECCW

[17] See www.environment.nsw.gov.au/biocertification/offsets.htm for expansion of these principles.

does not have compulsory acquisition powers and any offset negotiations would be subject to normal market processes.

Although areas where offsets may be usefully targeted are proposed in this RCP, there is no guarantee that the lands will be available for this purpose. Thus efforts should primarily be directed at avoiding biodiversity impacts in the first place.

5.2.3 Regional conservation priority areas

As previously discussed, while it is preferable to locate offsets in close proximity to a development impact, it may be more strategic to search further afield, and locate the desired offsets in a regional context. Offset principle 11 allows for offsetting in a regional context, provided that the same values are protected.

Accordingly, DECCW undertook an analysis to identify priority offset areas containing the same or similar biodiversity values as those predicted within proposed future urban release areas and employment lands. The regional analysis used the following range of datasets:

- proposed future urban release areas and proposed employment lands for the Far North Coast Region (to derive the values potentially to be offset)
- BFT 'priority for conserve' and 'priority for repair' analyses (section 5.1.1)
- under-target forest ecosystems (as a biodiversity surrogate)
- key habitat and old-growth mapping (as a biodiversity surrogate)
- EECs (landscape context)
- 25-year conservation strategy as discussed above (landscape context).

The contributing datasets were used to focus offsets both in areas of relevant biodiversity values and also in a landscape context suitable for long-term conservation management. These regional priority offset areas are considered to have a higher potential for long term conservation management and also contain vegetation values the same as or similar to those within the proposed future urban release areas and employment lands identified in the FNCRS. At the ecosystem level, the level of correlation between the values predicted on potential urban lands and those predicted in the proposed regional priority areas, particularly for Group 1, is high.

The regional priority areas for offsets are identified in Figure 8. A summary of each is provided below. The areas are not in order of priority, and the numbers provided are for ease of location of the areas only, and do not denote any additional priority. It is anticipated that offsets would be sought in the priority areas closest to the development impacts in the first instance, where the same or similar vegetation types are most likely to be located. Many councils also prefer that development and corresponding offset areas are within the same LGA.

Group 1

Typically, these areas form significant contiguous areas of high conservation value native vegetation. These areas are relatively large, well connected and contain a range of ecological communities in moderate to high condition. Conservation of these areas is critical in terms of offsetting the impacts of the FNCRS and achieving an overall improve or maintain outcome. The emphasis on coastal conservation areas is because most proposed development areas are also near the coast. If the analysis had included potential rural residential areas, it is likely that additional inland conservation priorities would have been identified.

Not only is the conservation in perpetuity of land supporting high biodiversity values important, but also, as discussed in offset principle 6, management actions addressing repair of vegetation communities is fundamental to obtaining a 'improve or maintain' outcome for biodiversity values across the Far North Coast Region. Thus the BFT has been used to inform not only conservation priorities but also repair priorities, as discussed above.

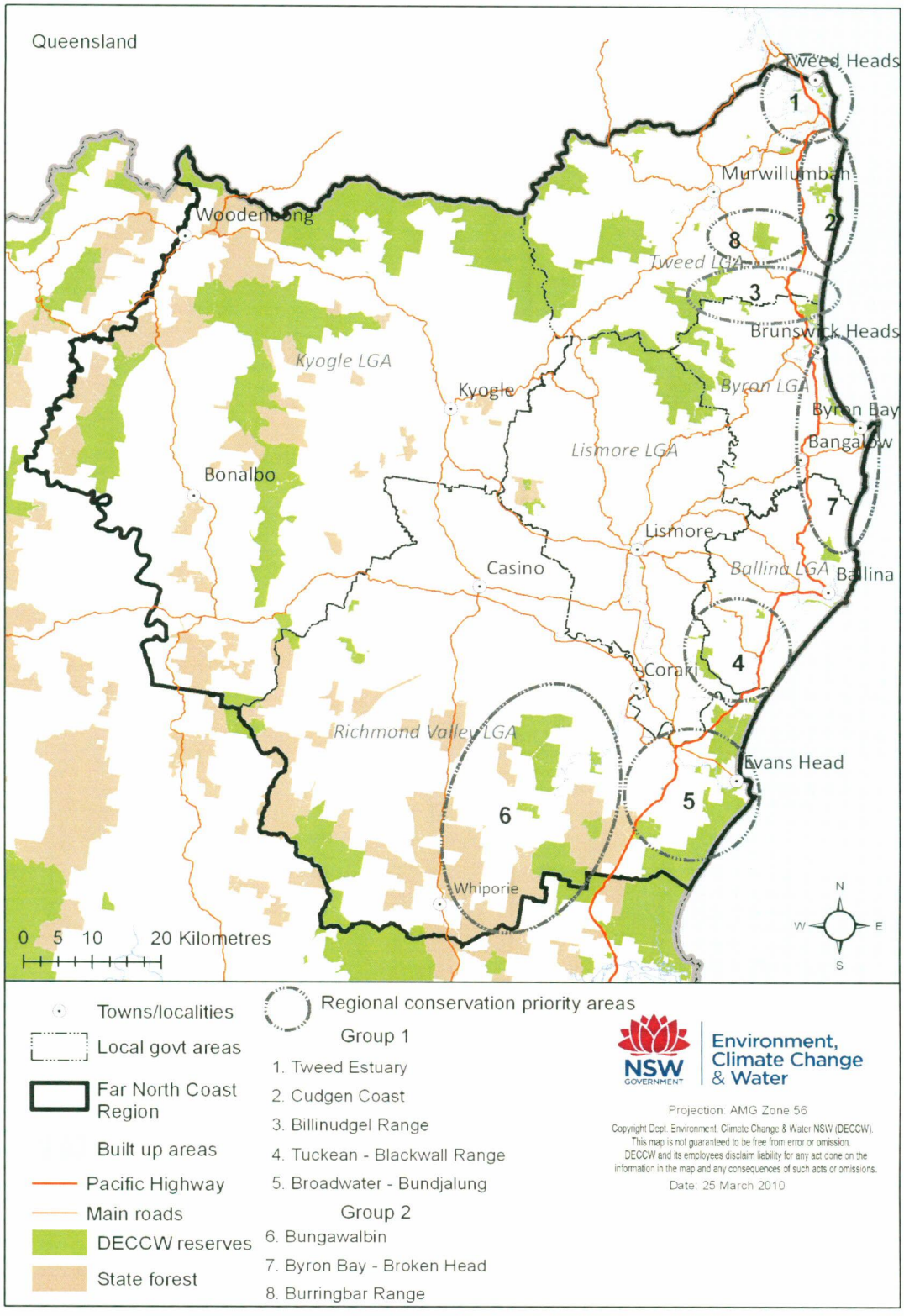

Figure 8: Regional conservation priority areas

1 Tweed Estuary: Comprising predominantly estuarine and coastal low-lying wetlands and forests, the Tweed Estuary priority area focuses on high conservation lands around the Cobaki Broadwater, Terranora Broadwater and lower Tweed River. The priority area contains a rich array of fauna including a number of threatened wading birds, the endangered black-necked stork, wallum froglet, koala and the endangered long-nosed potoroo population at Cobaki Lakes and West Tweed. The area is also likely to contain significant Aboriginal heritage values.

This area is also the only area of the Southern Coastal Lowlands IBRA subregion included in New South Wales. The area covered by this subregion is already highly urbanised and only 5% of its extent is formally reserved.

2 Cudgen Coast: Extending from the southern side of the township of Cudgen in the north to Wooyung NR in the south (just north of Wooyung township), this priority area adjoins Cudgen NR and Wooyung NR. The area is contiguous with these reserves and provides high conservation value linkages between existing reserves and adjacent land. The priority area exhibits a range of flora and fauna values of significance, including 167 hectares of Swamp Oak Floodplain Forest EEC and a number of other EECs. A large number and variety of threatened species also inhabit this area and it is likely that the area contains significant Aboriginal heritage values.

3 Billinudgel Range – corridor between Mount Jerusalem and Billinudgel NR: This area focuses on the prominent east–west coastal range that extends from Mount Jerusalem in the west to the Billinudgel NR in the east. It is one of the few remaining coast to ranges habitat corridors in the Far North Coast Region and is home to a number of threatened species, EECs and large areas of old-growth forest, which is a relatively rare occurrence in the Far North Coast Region. The corridor will be critical in terms of adaptation to climate change and linkages with the great eastern ranges corridor (DECC 2008d).

The Billinudgel Range corridor provides significant Aboriginal cultural heritage linkages that are part of the natural landscape. These connections include movement routes, opportunities for recreation, and ceremonial, spiritual and natural heritage values (for example, food and medicine).

4 Tuckean–Blackwall Range: From the Tuckean Broadwater in the south and following the Blackwall Range north to Uralba NR, this priority area represents highly significant remnants of a largely depleted landscape. The area also includes high conservation value lowland heaths and swamp sclerophyll forests east and west of the Blackwall Range.

A number of the few remaining mapped Big Scrub remnants occur in the area, as well as large areas of Swamp Sclerophyll Forest on Coastal Floodplains and Lowland Rainforest EECs. A large number and variety of threatened fauna are known to occur throughout the area including owls, doves, wader birds and mammals. The area provides a high degree of connectivity between the existing and future conservation areas.

5 Broadwater–Bundjalung: The Broadwater–Bundjalung priority area includes high conservation value land between New Italy in the west and Evans Head in the east. It provides important linkages for the migration of species (fauna corridors) and between existing DECCW reserves (Tabbimobile NR, Broadwater NP and Bundjalung NP). This area would conserve a number of threatened species and vegetation communities. Importantly, it will assist in conserving the largest east–west habitat linkage in the Far North Coast Region.

The conservation of this area would also consolidate strategic areas of the landscape between Broadwater and Bundjalung NPs. These areas have long been recognised for their high significance to the Aboriginal people who have connections with Country.

Group 2

This group is more important to support connectivity across the Far North Coast landscape. Although they may support similar conservation values to those potentially lost due to development, there is not the same level of correlation as for Group 1.

6 Bungawalbin: The Bulgawalbin priority area supports extensive areas of Subtropical Coastal Lowland Forest EEC and many poorly reserved vegetation communities. Conservation efforts directed into this area would consolidate coastal lowland to range wildlife linkages, particularly coastal State and regional scale corridors as demonstrated in Figure 3.

7 Byron Bay–Broken Head: The Byron Bay–Broken Head priority area includes large areas of Swamp Oak Floodplain and Lowland Rainforest Floodplain EECs as well as paperbark forests and coastal banksia and scribbly gum forests. It would contribute to the maintenance of coastal State and regional scale corridors. It also supports substantial areas of koala habitat around Broken Head.

8 Burringbar Range: This priority area includes the Burringbar Range northeast from Mount Jerusalem NP to Mooball NP, and then continues east to Cudgera Creek and the paperbark wetlands near Pottsville. The Burringbar Range is only one of a few east–west habitat linkages between the upland forests of Nightcap NP and Mount Jerusalem NP and the coast. It is regarded as being a key fauna corridor (Figure 3) and is a mapped key fauna habitat. Ten species of threatened flora have been recorded, including the only natural occurrence of the giant fern *Angiopterus evecta* in NSW.

5.3 Mitigation measures for Aboriginal cultural heritage

As previously stated in section 2.11, once destroyed, Aboriginal cultural heritage cannot be replaced; hence the importance of avoiding impacts to significant Aboriginal heritage objects and places. Where some loss of less significant areas is unavoidable, the Aboriginal community may be open to discussion of ways to mitigate some of the losses. It is important to be innovative about meeting the needs of individual communities, as each community has a unique appreciation of the cultural values in its area. The community places a value on the significance of the loss, based on its appreciation and connection with the site. Thus any decisions regarding loss and mitigation must be made in partnership with the community.

Examples of mitigation activities could include the following.

- Appropriate areas within (for example where items and places of Aboriginal cultural significance have been located), or adjacent to, a development footprint could be set aside so that Aboriginal people can continue their cultural practices and connection with that Country. Uses could include repatriation of objects from the development area to a safe 'keeping area' within the protected area, or areas set aside for 'cultural camps', including an appropriate curtilage around such areas as ceremonial rings or scarred trees to ensure the cultural context is maintained and privacy is also respected. Such areas must be protected in perpetuity with agreements in place for long term conservation and management. In some cases it may be necessary to enhance the site, for example revegetation with culturally appropriate species to restore an area to its former appearance to retain its significance.
- The community should be involved in planning for the site to avoid, as far as is possible, impacts on Aboriginal objects. For example, the Aboriginal community may prefer a development footprint to be filled, so as objects can be left in situ, rather than levelled or excavated, which would lead to destruction of the archaeological deposit.

- Prior to any works commencing the local community should be given, and supported in, the opportunity to record their connection with the site, both orally and visually. Such recording and filming of the historical connection to a site assists in ensuring that the culture 'stays alive' even though the site is no longer in its original form. The provision of small parks or access points corresponding to areas filmed and spoken about may also be able to be used in future, in education or cultural tourism activities, supported by this archival record.
- Site awareness training for all workers on a development site should be provided. This is essential to ensure that unrecorded objects are not inadvertently destroyed during construction activities. Generally the local Aboriginal community is best placed to speak about culture and connection with the site and the land, and should be approached to participate in or deliver this training. Any examples of Aboriginal objects and stories used during induction should be approved by the Aboriginal community as appropriate for this use. The provision and frequency of induction and awareness training should also be documented, to ensure that all workers receive it.
- A region-wide or shire-wide 'sinking' fund to pay for shire-wide cultural heritage studies (not development site specific) and to fund activities supporting Aboriginal people in practising their culture could be established, as has been done in the Upper Hunter Valley.
- There could be recognition within the development of the significance of the area to Aboriginal people, in parks, interpretive trails, street names in local languages, approved by and developed with the local Aboriginal community. Each community will have preferences for recognition and thus what is developed in one setting may not be appropriate in another.
- Formal offsite 'keeping places', meeting places or museums with ongoing funds for maintenance and management, to provide a sense of place to the local Aboriginal community could be established. Broader benefits and opportunities to the Aboriginal community through support for their activities, traineeships and business opportunities may also be appropriate depending on circumstances (see also section 6.10).

6 Implementation mechanisms

The biodiversity conservation guide identifies local offset options and strategic regional conservation priorities for the Far North Coast Region. If these priorities are addressed they will make a significant contribution to offsetting biodiversity loss that may be experienced as a result of urban growth or of land-use change in response to future social and economic imperatives, for example climate change.

There are numerous mechanisms which can be used to improve the level of protection afforded to biodiversity assets in order to deliver an improve or maintain outcome for biodiversity. These can be used singly or in combination. Several of the more commonly used mechanisms are discussed below.

6.1 Strategic planning

The FNCRS includes the following actions.

- LEPs will protect and zone land with State or regional environmental, agricultural, vegetation, habitat, waterway, wetland or coastal values.
- LEPs will not zone land within the Environmental Assets and Rural Land area to permit urban purposes, other than rural residential development. Existing and future rural residential development will be located in this area, but not where it conflicts or coincides with the attributes or values listed above.
- LEPs will include provisions to encourage habitat and corridor establishment in future zoning of Environmental Assets and Rural Land area.
- Councils are to ensure that Aboriginal cultural and community values are considered in the future planning and management of their LGA.
- New development adjoining or adjacent to farmland, extractive resources, waterways, wetlands and areas of high biodiversity value will incorporate buffers to avoid land-use conflict.

In order to achieve the actions prescribed by the FNCRS, it is critically important that the review of LEPs by the North Coast Region's councils results in appropriate zonings and land use for environmental assets, as set out below.

6.1.1 Environmental protection zones

On 31 March 2006, the Standard Instrument – Principal Local Environmental Plan (SI–LEP) was gazetted, prescribing a standard form and content for a principal LEP. The SI–LEP sets out a range of standard environmental zones, E1 to E4. The Department of Planning has prepared an LEP Practice Note on Environmental Protection Zones giving the direction on what E-zones should apply in what circumstances (DoP 2009). Planning authorities should refer to the current Practice Note for guidance.

Environmental protection zones should be generally consistent across all LGAs in the Far North Coast Region, taking into account the preservation of existing use rights and activities that may be permissible with consent.

Proposed new areas of E-zonings should be supported by field verification, as regional-scale maps may indicate high conservation value features that are not found in some local circumstances and boundaries would need to be validated. As outlined in this RCP and in the FNCRS, areas of validated high conservation value land should be protected in new LEP provisions.

Environmental protection zones also allow for the protection of Aboriginal cultural heritage. Significant Aboriginal places and cultural landscapes identified in local or regional studies should also be zoned for environmental protection, with a limited number of appropriate permissible uses. Wherever possible, Aboriginal cultural

heritage values should be protected in situ and must always be managed in culturally appropriate ways in consultation with the local Aboriginal community.

6.1.2 Additional local clauses

While the focus of strategic planning should be assigning an appropriate zone to an area of land, Clause 5 of the SI–LEP allows for the use of local provisions that are consistent with both the instrument and other directions in the LEP. These may include provisions, with an accompanying map, addressing major biodiversity issues covered by this RCP as well as the range of NRM issues as they occur in, or are relevant to, particular LGAs.

A land-use table will set out the overall objective of land use and establish the overall permissibility of uses. A local provision with an accompanying map will set out the matters that require consideration in development assessment and the required environmental outcomes of any approved development. They do not prohibit any activity already permissible in a zone and do not trigger referral to any agency.

It is intended that provisions will be linked with other planning mechanisms, such as development controls, to achieve desired development and conservation outcomes.

The range of environmental and NRM issues can be extensive. Planning authorities should refer to the Department of Planning's NRM model clauses and Practice Notes. These model clauses ensure that the consent authority will consider all potential adverse impacts of development proposals on these mapped environmental assets and that approved developments will avoid, minimise and mitigate these adverse environmental impacts.

DECCW supports the use of clauses that protect lands with high conservation value biodiversity assets. DECCW will continue to work with councils and Department of Planning to achieve appropriate zones and protective mechanisms for land supporting high conservation values.

In regard to Aboriginal cultural heritage, Clause 5.10 of the SI–LEP provides additional requirements for heritage, including Aboriginal cultural heritage. Heritage items, heritage conservation areas and archaeological sites (if any) should be shown on the Heritage Map. The location and nature of any such item, area or site can be described in Schedule 5. This provides the opportunity for councils to identify areas or sites of Aboriginal cultural heritage significance and bring them under the provisions of their LEPs, rather than rely on consideration at development assessment stage under the provisions of Section 79C under the EPA Act, or under Part 6 of the NPW Act, after a consent has been granted. This is the only clause which instructs councils to notify and take into account the opinions of the Aboriginal community. Although some councils are developing Aboriginal cultural heritage protocols, they are not statutory requirements.

Aboriginal communities have been reluctant to adopt this protection mechanism, as they are concerned that if the location of sites is made public they may be damaged or destroyed. There are also strong cultural reasons for not revealing the location and nature of some sites. However, if a comprehensive Aboriginal cultural heritage management plan is developed in partnership with the Aboriginal community, a way forward may be negotiated to sensitively address this issue. Some councils have already managed, in collaboration with the Aboriginal community, to both zone a buffered area around an object of significance and separately identify it for the purposes of Clause 5.10 in a non-revealing manner, thus bringing it into the LEP and under the consideration of both the land use tables and Clause 5.10.

6.1.3 Development control plans

LEPs guide planning decisions for local government areas. Through zoning and development controls, they allow councils to supervise the ways in which land is

used. Development control plans (DCPs), prepared in accordance with Part 3 Division 6 of the EPA Act, are also used to help achieve the objectives of the LEP by providing specific, comprehensive requirements for certain types of development or locations, for example for urban design, and heritage precincts and properties. DCPs may also be prepared to specify environmental outcomes for a planning precinct.

DCPs can apply to a site, precinct or the entire LGA, or councils may develop a number of site-specific DCPs as well as a single DCP that contains generic, issues-based controls. DCPs most commonly specify building and landscape controls, but also may include specific directions for vegetation management or a tree preservation order, or may specify riparian buffer widths and rehabilitation requirements in an issues-based approach.

6.1.4 Biodiversity certification

As discussed in section 2.3.1, planning authorities may apply for biodiversity certification to streamline development consent and approval processes for an area of land with respect to threatened species issues. A proposal for biodiversity certification will include at least three elements:

- protection of areas of high conservation value, generally through environmental protection zoning and conservation agreements
- provision that any clearing outside protected areas is appropriately offset consistent with an improve or maintain outcome
- links between the LEP and strategies, policies, plans and guidelines that define the ongoing management of protected and offset areas and that provide for monitoring of biodiversity condition.

DECCW is preparing a biodiversity certification methodology that will describe the requirements and methods for assessment and development of a biodiversity certification proposal.

6.2 Council biodiversity strategies and conservation plans

National, State and regional biodiversity strategies and management plans were discussed in section 2.8, with multispecies recovery plans discussed in section 2.3.3. Councils may also develop shire-wide biodiversity strategies to adapt these overarching documents to the circumstances of their LGA. Implementation of biodiversity strategies and action plans can be simplified and more targeted when applied to the smaller area, and councils can allocate resources more cost effectively.

These strategies can involve detailed vegetation, flora and fauna survey and assessment to inform zoning in the LEP, specific requirements for DCPs in relation to tree protection and vegetation management, and also conserve and repair actions across the LGA. Examples include Tweed Shire Council's vegetation management strategy and Lismore City Council's biodiversity policy. Single-species strategies, such as one for pied oystercatcher management (Nolan 2007), may be prepared with the collaboration of State and local government and span more than one LGA.

6.3 Settlement planning guidelines

The Department of Planning's Settlement Planning Guidelines provide further detail for councils, developers and the community on the character and design standards contained in the FNCRS (DoP 2007). For example, these guidelines provide explicit requirements on where development should not occur, due to the presence of particular high conservation value biodiversity assets or areas of Aboriginal cultural heritage significance.

The guidelines reflect DECCW's policy to clearly specify the need for any development to be guided to areas away from those identified as having high biodiversity significance or Aboriginal cultural heritage significance.

6.3.1 Sustainability Criteria

As discussed in section 4.4, new urban development may be proposed via the Department of Planning's Sustainability Criteria. The relevant criterion which must be met for environmental protection is as follows:

> Environment Protection – Protect and enhance biodiversity, air quality, heritage and waterway health.
> Measurable explanation of criteria:
> a) consistent with Government approved Regional Conservation Plan, and
> b) maintains or improves area's regionally significant terrestrial and aquatic biodiversity (as mapped and agreed by [former] DECC). This includes regionally significant vegetation communities; critical habitat; threatened species; populations; ecological communities and their habitats.

To demonstrate consistency with the RCP, a rezoning proposal using the Sustainability Criteria must recognise the biodiversity value of the areas identified above and avoid these values.

The improve or maintain outcome must be applied to all proposals being considered under the Sustainability Criteria. This may affect any area of biodiversity value, in particular those areas identified as conservation priorities outside the DECCW reserve system or areas identified as having State or regional biodiversity significance (see section 3). For any area where a proponent is addressing the sustainability criteria in support of a rezoning proposal, the proposal must demonstrate that it will result in an improve or maintain outcome in a manner consistent with DECCW's principles for biodiversity planning (section 1.3, Table 1).

6.4 Planning agreements

Recent amendments to the EPA Act introduced a statutory system of planning agreements (Section 93F). Planning agreements provide a voluntary facility for planning authorities and developers to negotiate flexible outcomes in respect to development contributions. They are a means to enable the planning system to deliver sustainable development through which key economic, social and environmental objectives of State and local government can be achieved.

Planning agreements aim to provide essential public services, including infrastructure, as well as the conservation or enhancement of the natural environment. As such, planning agreements are currently being viewed as one of a series of methods to be utilised to ensure that the environmental impacts of a development are taken into account, and that appropriate impact mitigation, site amelioration and/or offsets are provided by the developer. Planning agreements may be additional to, or replace, the relevant EPA Act Section 94 Developer Contributions Scheme applying to a particular LGA.

While planning agreements will be instigated largely at the rezoning stage, the provisions of these agreements will be written in such a way that they will carry through to the development application phase. As such, planning agreements can be viewed as having a strategic planning basis which has statutory links with the development application process. This is anticipated to achieve far better results in terms of sustainable development outcomes, including biodiversity conservation.

Planning agreements are a mechanism which potentially could be used as an initial agreement, for example, to deliver land dedications by developers in relation to new reserve proposals (Section 93F(7)). DECCW is open to proposals to transfer appropriate offsets into the DECCW reserve system to deliver a secure conservation outcome in perpetuity. Alternatively, to protect conservation priorities outside the

DECCW reserve system, councils may be amenable to undertaking management of transferred land provided the issue of management funding can be addressed.

6.5 Environmental impact considerations

The primary objective of the RCP is to guide strategic planning processes under Part 3 of the EPA Act. However, it is also applicable to development assessment processes under Parts 3A, 4 and 5.

The environmental impact assessment process is used to ascertain the impacts on biodiversity, as part of determining whether or not consent should be granted for an application. As for Part 3, Part 3A, 4 and 5 processes should focus on avoiding impacts on biodiversity. Only after all reasonable efforts to avoid impacts have been undertaken, including minimisation and mitigation, should the focus turn to offsetting in accordance with the principles in section 5.2.1.

Typically, projects being assessed under the EPA Act involve a degree of biodiversity impact. Efforts are made to offset these impacts, particularly in relation to larger developments. In these instances, where it has been demonstrated that biodiversity offsetting is appropriate, section 5.2.3 should be used to guide where offsets should be targeted. Consent conditions can also provide for the protection, management, enhancement and restoration of biodiversity.

DECCW will continue to assist councils in identifying and assessing offset requirements, should loss of biodiversity assets be unavoidable.

6.6 Covenants

Legal restrictions on the use of land can be developed and implemented under the *Conveyancing Act 1919*. Restrictions on the use of land can be applied as a condition of consent at the subdivision stage of a development. Covenants can restrict land use and may be linked to management plans and other agreements (Fallding 2004).

Although some use is made of covenants protecting specific plants or areas of habitat within privately owned lots, their long-term effectiveness for protection has proved questionable due to ownership changes and landowner expectations of residential land use.

6.7 BioBanking

BioBanking[18] is being implemented by DECCW. It is a market-based instrument that provides a means of ensuring that biodiversity offsets are implemented consistently and strategically in advance of the impacts of development. This can generate better environmental outcomes at lower cost more quickly than conventional approaches to environmental management.

A rule-based biodiversity assessment tool has been developed by DECCW. It is based on the tools that have been developed for the property vegetation planning process under the NV Act (BioMetric tool and the threatened species tool). The tool is used to determine:

- the amount and significance of biodiversity loss that a development will cause
- the improvement in biodiversity value provided by the conservation management actions on the offset site(s).

Using the BioBanking assessment methodology is a voluntary alternative to the threatened species assessment of significance under section 5A of the EPA Act for species listed under the TSC Act. If a landholder obtains a BioBanking statement for their development, the development is regarded as not significantly affecting

[18] www.environment.nsw.gov.au/biobanking

threatened species. Thus councils are not required to further consider the impact of the development on TSC Act listed species. However, assessment is still required for species listed under the FM Act and/or, at present, the EPBC Act.

BioBanking has the potential to play an important role in conserving areas outside the DECCW reserve system identified as conservation priorities in the biodiversity offset guide. Due to the predominance of private land in these areas BioBanking is one of the few mechanisms which can improve the conservation status of these areas, while providing the landholder with an economic incentive.

DECCW's Land Alive program provides an opportunity for Aboriginal landholders to receive ongoing funding to manage their land for biodiversity conservation through BioBanking. It also provides an opportunity for Aboriginal ecological knowledge to be recognised alongside contemporary scientific approaches to land management.

6.8 Property vegetation plans

The NV Act regulates broad-scale clearing (clearing of native vegetation or protected regrowth) in NSW. The Act applies to all lands, other than State forest, urban land, national parks and other conservation reserves.

A PVP is a voluntary but legally binding agreement between a landholder and the CMA. PVPs will allow specified clearing, but only following the implementation of an appropriate offset regime to allow for the maintenance or improvement of specific environmental indicators such as biodiversity, salinity and water quality. A PVP may also be agreed to as part of a voluntary conservation action that attracts incentive payments or cost-share arrangements.

The RCP complements on-site planning for PVPs by providing information on biodiversity values at the regional and State scales. Because of data and mapping limitations, there are features of high conservation value discussed in this RCP (such as some patches of EECs) that have not been mapped. Owing to mapping constraints, there will be many features of high conservation value at the site scale, such as habitat trees, that are not taken into account in the RCP.

6.9 Conservation agreements

A conservation agreement (CA), which is a negotiated contract between landholders and the Minister for Climate Change and the Environment under Section 69B of the NPW Act, aims to conserve the natural, cultural and/or scientific values of a property or portion of a property, promoting land uses likely to maintain these values. Landholders may be individuals, groups, corporations or local governments.

The aim of a CA is to facilitate conservation on private and public land by working with people and communities in conservation management. This approach seeks to complement the formal reserve system, support recovery of threatened species, populations and communities, conserve Aboriginal cultural heritage, aid the movement of wildlife in the landscape and protect, restore and rehabilitate high conservation value areas.

Once signed by both the Minister and the landholder, the CA is registered on the land title, binding all 'successors in title' (future landholders) to its terms. CAs can be established on both freehold and, with the consent of the lessees and the Minister for Lands, leasehold land.

The CA program relies on the active management of the land by the landholder. DECCW consults with the landholder to develop a plan of management for the area covered by the CA. The plan is intended primarily for the landholder's use and establishes clear methods for conservation.

6.10 Aboriginal property management plans and conservation

Under the *Aboriginal Land Rights Act 1983*, Local Aboriginal Land Councils can claim, and have successfully claimed, Crown lands and thus own lands outright. Some of these lands support significant biodiversity and cultural values.

Historically there has been a forced disconnection between some Aboriginal communities and their opportunities to engage in natural resource, biodiversity and cultural heritage management. The return of claimed and purchased land to Aboriginal communities has provided a focus for the development of a range of practical mechanisms to support Aboriginal communities in ongoing land management, where the community wishes to manage its lands for biodiversity and cultural values.

These practical mechanisms have resulted in a 'cultural connections' model designed to provide information and promote opportunities to access NRM funding, employment, training, education and business opportunities through the conservation and management of biodiversity and cultural values (L Baker et al., in preparation). DECCW (2010a) further discusses how partnerships have been established with a number of Local Aboriginal Land Councils in the Far North Coast Region (describing the process as an 'Indigenous engagement strategy').

For example, the Casino Boolangle Local Aboriginal Land Council participated in the development of biodiversity restoration and management plans on community-owned property. After developing property plans which identified biodiversity and cultural assets, threats and management recommendations (with costing), the community successfully applied for funding to implement components of the plans.

The Ngulingah Local Aboriginal Land Council used property management plans to access funding to protect and manage the biodiversity assets on their Nimbin Rocks property, develop a native plant nursery and potentially engage in cultural tourism, while protecting their assets.

The Jali Local Aboriginal Land Council has also used property management plans to apply for an Indigenous Protected Area in the Clarence Lowlands IBRA subregion and has undertaken training and on-ground works to protect and manage their lands.

6.11 DECCW reserve establishment program

DECCW has a national park establishment program which voluntarily acquires high conservation value lands on the open market for incorporation into the reserve system (DECC 2008a). This program has a limited budget which must be prioritised across the State. The Far North Coast Region priority focus areas for offsetting urban development are only one criterion for consideration within overall regional conservation priorities, and will be assessed within that context.

These priority focus areas include a mix of public and privately owned land, and implementation mechanisms will vary depending on the ownership of the land. The focus areas are generally suitable for incorporation in the DECCW reserve system, but this will be subject to the normal reserve acquisition program.

6.12 NSW Nature Conservation Trust

The NSW Nature Conservation Trust was established under the *NSW Nature Conservation Trust Act 2001*. In addition to covenanting land with high conservation value, the Trust operates a revolving fund through which properties of high conservation value are bought, covenanted and resold. This RCP can inform the activities of the Trust, particularly with respect to identification of properties which may be suitable for purchase through the revolving fund.

7 Conclusion

The Far North Coast Region is an area of high biodiversity, important Aboriginal cultural heritage values and extensive natural resources. These values will be subject to increased development pressure over the foreseeable future.

The State Government's FNCRS sets the framework for sustainable development over this period. It identifies areas where urban and employment development will be focused.

The potential for loss of biodiversity due to urban development in the proposed future release areas and employment lands has been recognised and audited in the RCP. However, until these lands and existing zoned lands are subject to development and subdivision it will not be possible to ascertain how much biodiversity will be lost, and how much can be avoided or will require offsetting. The situation is similar for Aboriginal heritage values across the landscape.

The success or otherwise in meeting the State Government's natural resource (including biodiversity) targets, and thus the improve or maintain outcome, will be monitored through the Northern Rivers CMA's CAPs and reporting systems and DECCW's review of urban development avoidance and offset negotiations.

While there are several mechanisms to enhance the protection of biodiversity assets, DECCW's preference is for those that deliver the highest level of conservation security and management in perpetuity for the conservation outcome. Security and management, such as provided by inclusion in DECCW reserves or binding conservation agreements under a variety of legislation, may offer the greatest security for high conservation value biodiversity assets.

Areas with less certainty may require a greater level of management action to ensure the same improve or maintain outcome. Achieving an improve or maintain outcome in these circumstances becomes more complex and costly, due to the need to identify appropriate offsets and management actions, and to develop appropriate mechanisms to protect these offsets in perpetuity. However, if the principles of the FNCRS relating to avoiding high conservation value biodiversity assets are adhered to, then an improve or maintain outcome may be achieved cost effectively in the region while still enabling population increase, economic development and a healthier environment.

Our knowledge of the occurrence and significance of Aboriginal cultural heritage values is not as well documented. General principles for Aboriginal cultural heritage assessment and protection are provided, but until comprehensive Aboriginal cultural heritage management plans and consultation protocols are prepared and adopted in all LGAs, a region-wide analysis and plan cannot be developed. The principle of avoiding impacts, as far as possible, equally applies to Aboriginal cultural heritage. However, unlike biodiversity, where it may be possible to replace or restore degraded habitat over time and thus maintain biodiversity values, Aboriginal cultural heritage is irreplaceable. The loss of such an ancient culture impoverishes the whole of our society and it is critical that we value and protect the significant components of those values and sites that remain.

The long-term strategic protection and conservation of important Aboriginal heritage values will require careful planning and innovative approaches. Often, high biodiversity and important Aboriginal heritage values coincide on the landscape. Conservation through sound strategic planning for one may offer a level of protection for the other. Nonetheless, participation of the Aboriginal community in strategic planning at the LGA and local levels will be critical.

References

Adam, P 1987, New South Wales Rainforests: The Nomination for the World Heritage List, NSW National Parks and Wildlife Service, Sydney.

ALGA 1999, *National Local Government Biodiversity Strategy*, Australian Local Government Association, in conjunction with Biological Diversity Advisory Council.

Andrews, G, Daylight, C and Hunt, J 2006, *Aboriginal Cultural Heritage Landscape Mapping of Coastal NSW*, Prepared for the Comprehensive Coastal Assessment, Department of Planning, by the Department of Natural Resources, Sydney.

AR&S 2006, *Threatened migratory shorebird habitat mapping project,* Internal report prepared by Avifauna Research & Services for the Department of Environment and Conservation, Sydney.

Commonwealth of Australia 1996, *National strategy for the conservation of Australia's biological diversity*, Department of Education, Science and Training, Canberra.

Commonwealth of Australia 1997, Nationally Agreed Criteria for the Establishment of a Comprehensive, Adequate and Comprehensive Reserve System for Forests in Australia. A report by the Joint Australian and New Zealand Environment and Conservation Council/Ministerial Council of Forestry, Fisheries and Aquaculture National Forest Policy Statement Implementation Sub-committee (JANIS), Canberra.

DEC 2004a, *Old Growth Forests*, Natural Resource Information Notes North East New South Wales, Department of Environment and Conservation, Sydney.

DEC 2004b, *Koala Habitat*, Natural Resource Information Notes North East New South Wales, Department of Environment and Conservation, Sydney.

DEC 2005, *Comprehensive Coastal Assessment Aboriginal Cultural Heritage Data Audit*, Prepared for the Comprehensive Coastal Assessment, Department of Planning, by the Department of Environment and Conservation, Hurstville.

DECC 2007a, *Fauna corridors for climate change,* unpublished report, Department of Environment and Climate Change, Sydney.

DECC 2007b, *NSW Biodiversity and Climate Change Adaptation framework 2007-2008,* Prepared by the Inter-agency Biodiversity and Climate Change Impacts and Adaptation Working Group, Department of Environment and Climate Change, Sydney. www.environment.nsw.gov.au/resources/threatenedspecies/0762biodivccadapt.pdf

DECC 2007c, Adaptation Strategy for Climate Change Impacts on Biodiversity (2007–2008), Department of Environment and Climate Change, Sydney.

DECC 2007d, *Lord Howe Island Biodiversity Management Plan*, Department of Environment and Climate Change, Sydney.

DECC 2007e, *NSW Threatened Species Priorities Action Statement Database,* Department of Environment and Climate Change, Sydney. www.threatenedspecies.environment.nsw.gov.au/tsprofile/home_PAS_new.aspx

DECC 2007f, *Alps to Atherton Initiative: A continental-scale lifeline to engage people with nature, NSW Business Plan 2007–2010*, Department of Environment and Climate Change, Sydney. www.environment.nsw.gov.au/resources/a2a/alpstoathbuspl07408.pdf

DECC 2008a, *New South Wales National Parks Establishment Plan 2008*, Department of Environment and Climate Change, Sydney.

DECC 2008b, *Summary of Climate Change Impacts: North Coast Region*, Department of Environment and Climate Change, Sydney. www.environment.nsw.gov.au/climatechange/regionsummary.htm

DECC 2008c, *Private Native Forestry Code of Practice for Northern NSW*, Department of Environment and Climate Change, Sydney.

DECC 2008d, *Great Eastern Ranges Initiative*, Department of Environment and Climate Change, Sydney. www.environment.nsw.gov.au/ger/index.htm

DECC 2008e, *A new Biodiversity Strategy for New South Wales: Discussion Paper*, Department of Environment and Climate Change, Sydney

DECC 2008f, *Recovery Plan for the Koala (Phascolarctos cinereus)*, Department of Environment and Climate Change, Sydney. www.environment.nsw.gov.au/resources/threatenedspecies/08450krp.pdf

DECC 2009a, *Aboriginal New South Wales – 2009*, Poster, Department of Environment and Climate Change, Sydney.

DECC 2009b, *Derivation of the NSW Government's sea level rise planning benchmarks,* Technical note, Department of Environment and Climate Change, Sydney.

DECCW 2010a, *Border Ranges Rainforest Biodiversity Management Plan – NSW & Qld,* Department of Environment, Climate Change and Water, Sydney.

DECCW 2010b, *Aboriginal cultural heritage consultation requirements for proponents 2010*, Department of Environment, Climate Change and Water, Sydney. www.environment.nsw.gov.au/resources/cultureheritage/commconsultation/09781ACHconsultreq.pdf

DECCW 2010c, NSW Climate Impact Profile: The impacts of climate change on the biophysical environment of New South Wales, Department of Environment, Climate Change and Water, Sydney.

DECCW 2010d, Northern Rivers Regional Biodiversity Management Plan, National Recovery Plan for the Northern Rivers Region, Department of Environment and Climate Change, Sydney.

DEH 2005, *Interim Biogeographic Regionalisation of Australia – Version 6.1*, Department of the Environment and Heritage, Canberra. www.environment.gov.au/parks/nrs/science/bioregion-framework/ibra/index.html; and www.environment.gov.au/biodiversity/abrs/online-resources/fauna/afd/resources/images/maps/ibra61_reg_colour.pdf

DEH 2006, *A Guide to the Integrated Marine and Coastal Regionalisation of Australia – Version 4.0*, Department of Environment and Heritage, Canberra. www.environment.gov.au/coasts/mbp/publications/imcra/pubs/imcra4.pdf

DEWR 2007, *Australia's 15 National Biodiversity Hotspots, Border Ranges North and South (Queensland and New South Wales)*, Department of the Environment and Water Resources, Canberra. www.environment.gov.au/biodiversity/hotspots/national-hotspots.htm#3

DIPNR & DPI 2005, *Northern Rivers Farmland Protection Project Final recommendations February 2005*, Department of Infrastructure, Planning and Natural Resources, and Department of Primary Industries. www.planning.nsw.gov.au/LinkClick.aspx?fileticket=PWcbljr4DN4%3d&tabid=189 (report) www.planning.nsw.gov.au/LinkClick.aspx?fileticket=1IDNGsuBG%2bY%3d&tabid=189 (map)

DoP 2006, *Far North Coast Regional Strategy*, Department of Planning, Sydney.

DoP 2007, Settlement Planning Guidelines: Mid and Far North Coast regional strategies, Department of Planning, Sydney.

DoP 2009, *Environment Protection Zones*, LEP Practice Note PN 09-002, Department of Planning, Sydney. www.planning.nsw.gov.au/planningsystem/pdf/pn09_002_envt_protection_zones.pdf

DPC 2010, *NSW State Plan: Investing in a Better Future*, Department of Premier and Cabinet, Sydney.

Dunlop, M and Brown, PR 2008, *Implications of climate change for Australia's National Reserve System: a preliminary assessment*, Report by CSIRO Sustainable Ecosystems to the Department of Climate Change, and Department of the Environment, Water, Heritage and the Arts, Canberra.

Dutson, G, Garnett, S and Gole, C 2009, *Australia's important bird areas: key sites for bird conservation*, Birds Australia Conservation Statement No. 15, October.

EA 2001, *A Directory of Important Wetlands in Australia*, third edition, Environment Australia, Canberra. www.environment.gov.au/water/publications/environmental/wetlands/directory.html

Fallding, M, Kelly, AHH, Bateson, P and Donovan, I 2001, *Biodiversity planning guide for local government*, edition 1, prepared by Land and Environment Planning and Environs Australia for the NSW National Parks and Wildlife Service, Sydney.

Fallding, M 2004, 'Planning for biodiversity', in *Australian Planner* 41(4), 45–50.

Fischer, J, Lindenmeyer, DB and Manning, AD 2006, 'Biodiversity, ecosystem function, and resilience: ten guiding principles for commodity production landscapes', *Frontiers in Ecology and the Environment* 4(2), 80–6.

FoK 2009, *Annual Report 2008/2009*, Friends of the Koala Inc, East Lismore. www.friendsofthekoala.org/fok/treetopsandmedia

Frankham, R 2006, 'Genetics and landscape connectivity', in KR Crooks and MA Sanjayan (eds), *Connectivity conservation*, Cambridge University Press, Cambridge.

Hinckley, D and Tierney, G 1992, 'Ecological effects of rapid climate change', in SK Majumdar, LS Kalkstein, B Yarnal, EW Miller and LM Rosenfield (eds), *Global climate change: implications, challenges and mitigation measures,* The Pennsylvania Academy of Science, 291–301.

HRC 2002, Independent Public Inquiry into Coastal Lakes: Final Report, Healthy Rivers Commission.

Hughes, L 2003, 'Climate change and biodiversity in Australia', in *Climate impacts on Australia's natural resources: current and future challenges* conference workbook, Proceedings of a conference held 25–27 November 2003, Surfers Paradise, pp28–9.

Hunter, RJ 2004, *World Heritage and Associative Values of the Central Eastern Rainforest Reserves of Australia*, internal report to the NSW National Parks and Wildlife Service, Hurstville.

IPCC 2007, *Climate Change 2007: The Physical Science Basis. Summary for Policy Makers,* Intergovernmental Panel on Climate Change WGI Fourth Assessment Report.

IUCN 2009, *Species and Climate Change: more than just the Polar Bear*. Report to the International Union for the Conservation of Nature Climate Change Conference, Copenhagen, December 2009. cmsdata.iucn.org/downloads/species_and_climate_change.pdf

Keith, D 2004, Ocean Shores to Desert Dunes: The Native Vegetation of New South Wales and the ACT, Department of Environment and Conservation, Hurstville.

Mackey B, Watson J and Worboys GL of ANU Enterprises Pty Ltd 2010, *Connectivity conservation and the Great Eastern Ranges corridor*, an independent report to the Interstate Agency Working Group (Alps to Atherton Connectivity Conservation Working Group) convened under the Environment Heritage and Protection Council/Natural Resource Management Ministerial Council, Sydney.

Mitchell, P 2002, *New South Wales Ecosystems Database Mapping Unit Descriptions,* Report for NSW National Parks and Wildlife Service, Hurstville.

Nolan, R 2007, Threatened Species (Pied Oystercatcher) Management Strategy, Department of Lands.

NRC 2005, *Recommendations of State-wide standards and targets*, Document No DO5/4894, Natural Resources Commission, Sydney. www.nrc.nsw.gov.au/content/documents/Recommendations%20-%20State-wide%20s%20and%targets%20September%202005.pdf

NRC 2006, *State-wide targets for natural resource management,* Fact Sheet, Natural Resources Commission, Sydney.

NRCMA 2005, *Northern Rivers Catchment Action Plan,* Northern Rivers CMA, Grafton. www.northern.cma.nsw.gov.au/programmes.php

NRMMC 2009, *National Koala Conservation and Management Strategy 2009–2014*, Natural Resource Management Ministerial Council, Department of the Environment, Water, Heritage and the Arts, Canberra. www.environment.gov.au/biodiversity/publications/koala-strategy/index.html

NRMMC 2010, *Australia's Biodiversity Conservation Strategy 2010-2030*, Natural Resource Management Ministerial Council, Australian Government, Department of Sustainability, Environment, Water, Population and Communities, Canberra.

NPWS 1999, *NSW biodiversity strategy*, NSW National Parks and Wildlife Service, Sydney.

NSW Fisheries 1999, *Policy and Guidelines – Aquatic Habitat Management and Fish Conservation*, AK Smith and DA Pollard (eds), NSW Fisheries, Port Stephens Research Centre. www.dpi.nsw.gov.au/fisheries/habitat/publications/policies,-guidelines-and-manuals

NSW Government 2005a, *What clearing needs approval?* Native Vegetation Management in NSW Information Sheet 5, NSW Government, Sydney.

NSW Government 2005b, *NSW Greenhouse Plan*, NSW Government, Sydney.

NSW Government 2006, *State Plan: A new direction for NSW*, NSW Government, Sydney.

NSW Government 2010, *Draft New South Wales Biodiversity Strategy 2010–2015*, prepared by the Department of Environment, Climate Change and Water and Industry and Investment NSW for the NSW Government, Sydney.

NSW Heritage Office 1996, *A Guide to the Heritage System*, 2005 revised edition, NSW Heritage Office, Sydney.

Opdam, P and Wascher, D 2004, 'Climate change meets habitat fragmentation: linking landscape and biogeographical scale levels in research and conservation', in *Biological Conservation* 117(3).

Peck, S 1998, Planning for Biodiversity: Issues and Examples, Island Press, Washington DC.

RAC 1992, *Forest and Timber Inquiry*, Final report of the Forest and Timber Inquiry, Volume 2B, Resource Assessment Commission, AGPS, Canberra.

Scotts, D 2003, Key habitats and corridors for forest fauna: a landscape framework for conservation in north-east New South Wales, Occasional Paper 32, NSW National Parks and Wildlife Service, Sydney.

Taylor, PD, Fahrig, L and With, KA 2006, 'Landscape connectivity: a return to basics', in KR Crooks and MA Sanjayan (eds), *Connectivity conservation*, Cambridge University Press, Cambridge.

Williams, RJ, West, G, Morrison, D and Creese, RG 2006, *Estuarine Resources of New South Wales,* prepared for the Comprehensive Coastal Assessment, Department of Planning, by the Department of Primary Industries, Port Stephens, Department of Planning, Sydney.