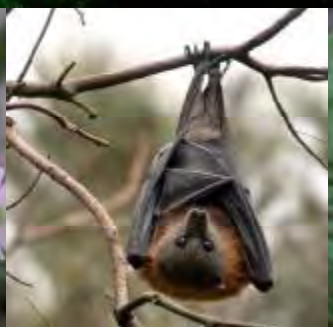
Illawarra Biodiversity Strategy

Vol. 2 Background Information

An initiative of
Wollongong City Council,
Shellharbour City Council
and Kiama Municipal Council



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Illawarra Biodiversity Strategy 2011
A joint project between the Illawarra Councils; Wollongong City Council, Shellharbour City Council and Kiama Municipal Council. Funded by the NSW Environmental Trust.

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1 SUMMARY

The Illawarra Biodiversity Strategy: Volume Two Background Information provides the background technical detail around the threats, values and major datasets available for the Illawarra Local Government Areas (LGAs) of Kiama, Shellharbour and Wollongong. It provides the background detail, and rationale for the Action Plan defined in Volume One of the Illawarra Biodiversity Strategy.

2 LAND TENURE

The Illawarra Councils are responsible for an area of approximately 108,987 hectares. Table 1 gives a summary of the different tenure classes across the three LGAs.

Table 1: Tenure across the Illawarra Councils

	Kiama		*Shellharbour*		*Wollongong*		*Illawarra Region*	
	ha	%	ha	%	ha	%	ha	%
LGA area total	25,791		14,759		68,437		108,987	
NPWS estate	5,324	21	1,074	7	5,493	8	11,891	11
Council reserve	373	1	942	6	2,305	3	3,620	3
Water catchment land	5,832	23	14	0	36,744	54	42,590	39
Other	14,261	55	12,730	86	23,895	35	50,886	47

Figure 1 shows the spatial distribution of the different tenure classes across the region.

3 STATUTORY FRAMEWORK FOR PROTECTING BIODIVERSITY

The legislative and policy framework for biodiversity conservation is vast and includes statutes, policy, plans and agreements at the international, national, state and regional level. This section outlines that framework with a summary of those most relevant to regional biodiversity conservation.

3.1 INTERNATIONAL AGREEMENTS

A number of international agreements provide a context for policies developed at the federal, state and regional level to foster biodiversity conservation and planning. These include:

- International Convention on Biological Diversity signed in 1996;
- Kyoto Agreement ratified by Australia in March 2008;
- Rio Declaration and Local Agenda 21, emerged from the Rio Summit of 1992; and
- The Ramsar Convention on Wetlands, signed in 1971.

Figure 1: Tenure classes in the Illawarra region.

3.2 Federal Legislation and Policy

A number of national statutes and policies further define Australia's commitment to biodiversity conservation. The most significant are outlined below.

3.2.1 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The EPBC Act provides a national scheme for environmental protection and biodiversity conservation. The Act identifies approved matters of National Environmental Significance (NES) and provides an assessment process for these. Matters of NES include:

- World Heritage Properties;
- National Heritage Places;
- Wetlands of International Importance (Ramsar wetlands);
- Threatened Species and Endangered Ecological Communities;
- Migratory Species - JAMBA / CAMBA /ROKAMBA Species;
- Commonwealth Marine Areas; and
- Nuclear Actions (including mining).

Impacts on matters of NES traditionally trigger a referral process to the Department of Environment, Water, Heritage and the Arts. However, since the Commonwealth and the NSW Government signed a Bilateral Agreement on 18 January 2007, pursuant to Section 45 of the EPBC Act, impacts on matters of national environmental significance are now assessed under the Impact Assessment Regimes of Part 3a, 4 and 5 of the EPA Act. This bilateral agreement will expire on 18 January 2012.

Appendices 3, 4, 5 and 6 highlight those species and communities in the Illawarra which are listed under the EPBC Act. Table 2: also lists the recovery plans made under the EPBC Act that are relevant to the Illawarra.

Table 2: National Recovery Plans for species occurring in the Illawarra

Flora	Fauna
Daphandra species C	Giant Burrowing Frog (in preparation)
Irenepharsus trypherus	Green and Golden Bell Frog (in preparation)
Zieria granulata	Stuttering Frog (in preparation)
Pterostylis gibbosa	Eastern Bristlebird (in preparation)
	Spotted-tailed quoll (in preparation)
	Grey-headed Flying-fox (in preparation)
	Broad Headed Snake (in preparation)

International migratory birds

The Australian Government has entered into three bilateral migratory bird agreements. These are:

- Japan - Australia Migratory Bird Agreement (JAMBA);
- China - Australia Migratory Bird Agreement (CAMBA); and
- Republic of Korea - Australia Migratory Bird Agreement (ROKAMBA).

All migratory bird species listed in the annexes to these bilateral agreements are protected in Australia as matters of NES under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (DEWHA, 2009). Those species which are likely to occur in the Illawarra are tabled in Appendix 7.

The agreements list terrestrial, water and shorebird species that migrate between Australia and the respective countries. The majority of listed species are shorebirds. The agreements require the parties to protect migratory birds by limiting trade of migratory birds; protecting and conserving important habitats; exchanging information; and building co-operative relationships (DEWHA 2009).

3.2.2 Australia's Biodiversity Conservation Strategy 2010-2020: Consultation Draft

Australia's Biodiversity Conservation Strategy 2010-2010: Consultation Draft (Commonwealth of Australia 2009) provides national direction for biodiversity conservation. Priorities shown in Table 3 are outlined to guide state, regional and local biodiversity planning.

Table 3: Australia's Biodiversity Conservation Strategy (Consultation Draft) priorities

Priority	*Actions*
Priority for change 1: Building ecosystem resilience.	Action 1.1.2: Prepare and implement plans for biodiversity conservation at all levels (local, regional, state and national) that maintain ecosystem health and protect threatened and endangered species.
	Action 1.1.3: Establish conservation linkages which provide connectivity across bioregions, including at a continental scale.
	Action 1.1.5: Establish a national framework for off-reserve conservation.
Priority for change 2: Mainstreaming biodiversity.	Action 2.1.1: Teach all primary school children about biodiversity and its benefits to their well being and the world at large.
	Action 2.1.2: Implement an ongoing national campaign that demonstrates the importance of biodiversity to the sustainability of communities and the quality of our lives.
	Action 2.3.3: Ensure arrangements for emerging markets for carbon and water take account of biodiversity risks and benefits.
Priority for change 3: Knowledge for all.	Action 3.1.1: Assess knowledge needs, identify gaps and set priorities at national, state and regional levels.
Priority for change 4: Getting results.	Action 4.3.2: Review and reform legislation to improve biodiversity conservation outcomes across all sectors.
Priority for change 5: Involving Indigenous peoples.	Action 5.1.2: Wherever possible and appropriate, recognise traditional Indigenous knowledge and environmental management expertise, and apply or extend such management for biodiversity conservation.
Priority for change 6: Measuring success.	Action 6.1.1: Build baseline datasets, including key indicators, to measure biodiversity condition and trends over time.
	Action 6.1.3: Implement and maintain a nationally representative set of long-term monitoring protocols and sites.
	Action 6.2.2: Incorporate biodiversity and ecosystem services into national accounts and corporate reporting.

*Sourced from Commonwealth of Australia (2009)

3.2.3 Intergovernmental Agreement on the Environment 1992

The Intergovernmental Agreement on the Environment 1992 (IGAE) committed all Federal, State/Territory and Local Governments to pursuing Ecologically Sustainable Development (ESD). This agreement was further refined by the 'Council of Australian Governments - Heads of Agreement on Commonwealth /State Roles and Responsibilities for the Environment 1997' (LGSA 2009).

3.2.4 National Local Government Biodiversity Strategy 1998

The National Local Government Biodiversity Strategy was produced in 1998. The main aim of the policy was to recommend that Councils develop and commit to implementation of policies on biodiversity conservation.

3.3 STATE LEGISLATION, PLANS AND POLICIES

3.3.1 Threatened Species Conservation Act 1995 (TSC Act)

The TSC Act and its amendments in 2002, 2004 and 2006, identify threatened species, communities and populations, critical habitat and provisions for managing and protecting them such as recovery plans, priority action statements and threat abatement plans. It also allows for the listing of Key Threatening Processes (KTPs). At present, no critical habitat has been listed in the Illawarra.

The *Threatened Species Legislation Amendment Act 2004* (TSLA Act) outlines provisions for the bio-certification of environmental planning instruments, including Local Environmental Plans (LEPs). The Illawarra Councils have not sought biocertification of their Local Environmental Plans (LEPs).

Threatened species recovery plans

Threatened Species Recovery Plans were a former requirement of the TSC Act 1995. Recovery Plans are now replaced by the NSW Threatened Species Priorities Action Statement (PAS). Existing recovery plans that apply to the Illawarra still provide valuable direction and information for those species and are listed in Table 4.

Table 4: State Recovery Plans have been prepared for the following species occurring in the Illawarra

Flora	*Fauna*
Pimelea spicata (Draft)	Little Tern
Daphandra species C Illawarra	Large Forest Owls
Irenepharsus trypherus	Yellow-bellied Glider
Zieria granulata	Koala
Pterostylis gibbosa	Green and Golden Bell Frog (Draft)
Cynanchum elegans	Barking Owl - Draft

Priority actions for all threatened species and endangered ecological communities in the Illawarra are available on the PAS database at:
http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/pas_search.aspx

BioBanking

BioBanking is a market-based offsetting scheme established under the *Threatened Species Conservation Amendment (Biodiversity Banking) Act 2006* that allows 'biodiversity credits' to be generated by landowners. Developers can purchase these credits to offset the impacts on biodiversity values associated with development. Biodiversity offsets are traded on a like for like basis. For example, a

developer seeking approval to clear vegetation will be required to purchase credits from a site with the same or similar vegetation community.

More information on BioBanking can be sought at http://www.environment.nsw.gov.au/biobanking/

3.3.2 Environmental Planning and Assessment Act 1979 (EPA Act)

This is the principal planning legislation for NSW, providing a framework for the overall environmental planning and assessment of development activities. The EPA Act provides for the development of Local Environmental Plans (LEPs), State Environmental Plans (SEPPS), and Regional Environmental Planning Policies (REPs). Under Parts 4 and 5 of the Act, Councils are required to assess the impact on threatened species of developments arising from both applicants on private land and its own activities on public land. This is done through the Assessment of Significance (Section 5a).

Whilst applicants are required to submit assessments to this effect, Council has the primary responsibility for determining whether a significant effect is likely to occur. If the assessment shows a significant impact on threatened species or an EEC is likely to occur then a Species Impact Statement (SIS) is required to be prepared under directions from the Director General of the Department of Environment, Climate Change and Water. Alternatively, the proposal may be modified such that a significant effect on threatened biodiversity is unlikely (DEC 2004).

Councils have a responsibility to ensure that they make decisions relating to threatened species, communities and populations on the best available information. One aim of the Strategy is to improve the application of environmental assessment under the EPA Act.

3.3.3 Local Government Act 1993 (LG Act)

The LG Act sets out the responsibilities of Councils including public land management, activity approvals, corporate and operation planning, orders and enforcement powers, setting rates and charges (LGSA 2009).

Section 7(e) of the Act requires Councils, Councillors and Council employees to have regard to the principles of ecologically sustainable development in carrying out their responsibilities. The Charter (Section 8) also requires Councils to properly manage, develop, protect, restore, enhance and conserve the environment of the area for which it is responsible, in a manner that is consistent with and promotes the principles of ecologically sustainable development. Under this Act, Councils are required to have Plans of Management for all Council owned land.

3.3.4 Native Vegetation Act 2003 (NV Act)

The *Native Vegetation Act 2003* (NV Act) regulates vegetation clearing in non-urban areas. This Act applies to the Illawarra Councils in all areas, except where land is zoned "residential" (but not "rural-residential"), "village", "township", "industrial" or "business" under an environmental planning instrument (Schedule 1, part 3 of the Act). A range of specific Routine Agricultural Management Activities (RAMAs) and some other types of clearing are also exempt from this Act. These activities could however, still require consent for clearing under a Council's LEP.

A person seeking to clear native vegetation under the NV Act needs to apply to the relevant Catchment Management Authority. They may also simultaneously need consent by the local Council. The CMA may require a Property Vegetation Plan (PVP) to be developed. A PVP is a negotiated, legally binding agreement between the landholder and the local Catchment Management Authority. Development consent or an approved PVP is required to clear remnant native vegetation and protected regrowth. Clearing of other regrowth (post 1 January 1990) does not require consent or a PVP. Approval of clearing will only be given if clearing of the vegetation will improve or maintain environmental

outcomes as assessed by the PVP Developer, the decision support tool used by the CMAs (Eco Logical Australia, 2007). The NV Act is currently undergoing review.

3.3.5 Fisheries Management Act 1994 (FM Act)

Part 7a of the FM Act contains provisions similar to the TSC Act 1995 in relation to aquatic animals and marine vegetation. It provides for the listing of threatened species, populations, ecological communities and KTPs, critical habitat and preparation of recovery plans and threat abatement plans.

3.3.6 Water Management Act 2000 (WM Act)

This is the main piece of water legislation for NSW ensuring that water is provided for the environment and more secure access to water users. The provisions of the WM Act are being progressively implemented in NSW. Across the entire State, works within 40 metres of a river, lake or estuary require a Controlled Activity Approval under this Act. The recently repealed Rivers and Foreshores Improvement (RFI) Act has been integrated into the *Water Management Act 2000*.

3.3.7 Noxious Weeds Act 1993 (NW Act)

Administered by Industry and Investment NSW (formerly the Department of Primary Industries), this Act allows for the listing of five categories of declared noxious weeds. It provides for the specification of control measures and public and private land responsibilities. Noxious weeds occurring in the Illawarra are listed in Appendix 2.

3.3.8 National Parks and Wildlife Act 1974 (NPW Act)

This Act is administered by the Department of Environment, Climate Change and Water (DECCW) and provides for the establishment of National Parks, other conservation reserves, and the protection of flora and fauna. The NPW Act contains provisions under Section 132, for the licensing of activities for scientific, educational or conservation purposes that may lead to harm of flora or fauna. Bush regeneration activities in threatened species habitat need to seek licensing under Section 132 of the NPW Act. The Act also contains provision for the protection of native flora and fauna.

3.3.9 NSW State Plan 2006

The NSW State Plan (Department of Planning 2006) sets the direction for New South Wales over the next ten years. The Plan includes 34 priorities and 60 targets designed to deliver better services and improve accountability across the public sector.

Priorities relevant to biodiversity include:

- Priority E4: Better outcomes for native vegetation, biodiversity, land, rivers and coastal waterways sets the following targets for Biodiversity;
    - 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 an increase in the recovery of threatened species, populations and ecological communities; and
    - By 2015 there is a reduction in the impact of invasive species.

3.3.10 NSW Invasive Species Plan 2008 - 2015

Outlines a coordinated response to minimise the impact of weeds and pest animals and is linked to national prevention systems (LGSA 2009).

3.3.11 NSW Wetlands Management Policy 1996

This policy outlines a whole of government approach toward the conservation and sustainable management of NSW wetlands (LGSA 2009).

3.3.12 State Environmental Planning Policy No. 14 Coastal Wetlands

SEPP14 aims to protect coastal wetlands. Wetlands protected under SEPP14 in Kiama include Minnamurra estuary, Werri Lagoon, and Spring Creek. Koona Bay wetlands, Minnamurra estuary, Killalea Lagoon and parts of Lake Illawarra entrance are listed in Shellharbour. Haywards Bay wetlands are listed for Wollongong.

3.3.13 State Environmental Planning Policy No. 26 Littoral Rainforest

The aim of this Policy is to provide a mechanism for the consideration of applications for development that are likely to damage or destroy littoral rainforest areas with a view to the preservation of those areas in their natural state.

3.4 Regional and Local Plans

3.4.1 Illawarra Regional Strategy 2006

The Illawarra Regional Strategy was prepared by the NSW Department of Planning (DoP) to guide growth and infrastructure development over a 25 year period (2006 - 2031) in the Wollongong, Shellharbour and Kiama LGAs. Recommended Actions listed under the natural environment theme are shown in Table 5.

Table 5: Illawarra Regional Strategy Actions for the Natural Environment

Actions
Wollongong City Council will incorporate the planning control recommended in the Illawarra Escarpment Strategic Management Plan into its LEP.
WCC and DoP will continue to work with DECCW and SRCMA towards achieving biodiversity certification of the West Dapto LEP.
Opportunities for the long term survival of *Melaleuca armillaris* shrubland EECs will be considered through the planning review of the Shellharbour / Kiama hard rock resource and implemented in the Shellharbour and Kiama LEPs.
LEPs are to maximise protection of 'Significant Native Vegetation', 'Indicative DEC Regional Habitat Corridor' and 'Other Indicative Habitat Corridors'.
Department of Primary Industry (now Industry and Investment NSW) to identify regionally significant aquatic habitats and associated riparian buffers to inform preparation of LEPs and consideration of development.
Councils will manage the impact of land use change and development in the catchments of high value coastal lakes, estuaries and wetlands. Councils will consider the NSW Government-endorsed Estuary Management and Coastal Zone Management Plans in undertaking this task.
When planning new urban areas, the Strategic Assessment of Riparian Corridors Methodology developed by the Department of Natural Resources (now DECCW) in conjunction with the DoP will be used by: - incorporating the assessments into structure plans. - appropriate zoning. - appropriate management through a development control plan.
Development proposals affecting riparian lands will be required to suitably protect the values of riparian lands by methods such as maximising the retention of native vegetation, especially in riparian

corridors and rehabilitating disturbed areas.
Require LEPs to zone all SEPP14 Wetlands and SEPP26 Littoral Rainforest to achieve environmental protection through zones such as E2 or W1.
Councils to consult with SRCMA to ensure the appropriate integration of Catchment Action Plan (CAP) and LEPs.

3.4.2 Southern Rivers Catchment Action Plan 2006

Southern Rivers Catchment Action Plan (CAP) (Southern Rivers CMA 2006) details key priorities for the whole of the Southern Rivers CMA for the next ten years (2006-2016) from Wollongong LGA in the north to the Victorian border, including the Illawarra Councils. Table 6 lists biodiversity targets relevant to the Illawarra.

Table 6: The CAP Biodiversity Targets

Community and landholder knowledge and skills	B1	By 2016 there will be an increase in the number of land managers who adopt management practices that conserve biodiversity and promote sustainable production.
Native vegetation conservation	B2	By 2016 through voluntary participation by land managers, the area of land actively managed to conserve priority vegetation types will increase from 11,000 hectares to at least 41,000 hectares.
	B3	By 2016 through voluntary participation by land managers, an additional 10,000 hectares of native vegetation will be actively managed to build a resilient landscape with good connectivity which conserves biodiversity.
Native species conservation	B4	By 2016 the priority recovery actions identified in the Southern Rivers threatened species strategy will have been implemented.
Invasive species	B5	By 2016 vertebrate pest species will be controlled in key locations.
	B6	By 2016 priority weed species will be controlled in key locations.

The intent of targets B2 and B3 is to ensure priority vegetation types are targeted, that is, those with less than 30% of their original distribution currently being managed for conservation. Or, if they are already cleared below 30% of their original distribution, to ensure the rest is managed for conservation (Southern Rivers CMA 2006).

3.4.3 Local Environment Plans

Local Environment Plans (LEPs) are the principal legal document for controlling development at the Local Government level. Local Environment Plans identify the zoning provisions for all land within a Local Government Area that establish permissible uses and standards that regulate the use of that land. They are prepared by council and approved by the Minister for Planning after public exhibition.

The three Illawarra Councils have revised their Local Environmental Plans. Within Wollongong LGA, the Wollongong LEP 2009 and Wollongong LEP (West Dapto) 2010 are in force. Within Kiama LGA, the draft Kiama LEP has been publicly exhibited and submitted to the NSW Department of Planning for approval. Within Shellharbour LGA, the draft Shellharbour LEP has been approved by the Department of Planning and Infrastructure for exhibition and will be publicly exhibited in the near future. New Development Control Plans (DCPs) will be developed alongside the LEPs to provide more detailed guidance on land use activities and development assessment processes.

3.4.4 Illawarra NRM Plan 2010

The Illawarra NRM Plan was finalised in 2010 by the Southern Rivers CMA. It sets out a ten year program of actions which contribute to meeting the 2006 Catchment Action Plan (CAP) targets in the Illawarra region. The plan identifies existing programs, and highlights additional potential projects that would contribute to targets.

3.4.5 Illawarra Sustainability Roadmap 2008

The Sustainability Roadmap (2008) is a partnership of the Illawarra Councils which outlines a program to embed sustainability into all areas of Council, including decision-making, processes, planning, reporting and operations.

4 DATA AUDIT

A review of biodiversity data was undertaken of both spatial (GIS) and non spatial biodiversity data held by the three Councils. The objective of the data audit was to establish a knowledge base to ensure the Strategy considered all available and up to date information. The collation of this information also enabled the identification of knowledge gaps so that future data collection work can be targeted to priority areas. Assessing biodiversity knowledge needs, identifying gaps and setting priorities are also one of the priority actions in Australia's *Biodiversity Strategy-Consultation Draft* (Commonwealth of Australia 2009).

The review targeted the following biodiversity information, including:

- Threatened species records;
- Vegetation mapping;
- Flora and fauna studies;
- Conservation assessments;
- Corridors; and
- Wetlands;

Appendix 1 provides a summary of the major data sources reviewed.

4.1 VEGETATION MAPPING

There have been challenges in developing this Strategy due to non - standardisation of regional vegetation mapping. Classifying and mapping vegetation communities has been undertaken using a range of methods in NSW and the Illawarra. Each methodology comes with their varying strengths and weaknesses (NPWS 2002a). This has presented challenges in the preparation of the Illawarra Biodiversity Strategy.

In the Illawarra, there are six major vegetation maps that cover all or parts of the Illawarra region. Unfortunately, they each come with different terminology for plant communities, and have mostly been derived from different methods. As such, they do not align well to each other. The data audit in Appendix 1 provides more detail about each mapping dataset.

The key vegetation maps for the Illawarra are:

- Tozer *et al.* (2006) Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. NSW Department of Environment and Conservation and NSW Department of Infrastructure, Planning and Natural Resources, Sydney.
- Mills and Associates (2006a) The Natural Vegetation in the Municipality of Kiama, NSW.
- NPWS (2003b) Native Vegetation of the Woronora, O'Hares and Metropolitan Catchments.

- NPWS (2002a) Native Vegetation of the Illawarra Escarpment and Coastal Plain. NSW National Parks and Wildlife Service.
- Mills and Associates (2001) The Natural Vegetation in the City of Shellharbour, NSW.
- DECCW (2009) Draft Native Vegetation of the Sydney Metropolitan Catchment Management Authority Area.

The South Coast-Illawarra Vegetation Integration (SCIVI) (Tozer *et al.* 2006) is the most recent map that gives the only consistent classification across the Illawarra region. The other maps are limited to specific LGAs or parts thereof. They have also taken different approaches to vegetation classification, hence they can not be aligned easily for a regional assessment of biodiversity values. The biodiversity strategy has therefore partly relied upon SCIVI mapping for its assessment of biodiversity priorities.

Limitations with SCIVI mapping

The SCIVI mapping is produced at a scale of approximately 1:100 000; this is somewhat broader than the LGA specific mapping which varies between 1:14,000 and 1:25,000. Some local vegetation assemblages are not well defined in the SCIVI mapping. The following vegetation assemblages, and possibly others, are not well defined amongst the map units in the SCIVI mapping:

- Spotted Gum Forest of Mangerton and Tarrawanna escarpment footslopes
- Brown Myrtle Forest - Stanwell Park
- Redgum/ Red Mahogany association - Helensburgh (C. deLacey pers. comm.)
- *Melaleuca armillaris* shrubland (EEC) located at Dunmore is mistakenly mapped in part as Morton Mallee Heath (G. Daly 2009, pers. comm.)
- Southern Sydney Sheltered Forest (EEC)

4.2 DATA GAPS

The data audit highlighted the following data gaps and knowledge management issues across all three councils. These are outlined in Table 7.

Table 7: Data gaps and priorities

Theme	Gap	Priority to address
Vegetation and mapping	Mapping inaccuracies. Some smaller communities including EECs are not mapped in Kiama and Shellharbour LGAs. Any further survey work should target EECs.	ü
	Lack of data on pre-European extent of vegetation communities.	
	Vegetation mapping inconsistencies between Councils.	
	Some local vegetation communities not well described in regional mapping (Tozer *et al*. 2006).	
	Lack of knowledge on appropriate fire regimes for local vegetation communities, especially for areas managed for asset protection.	ü
	Vegetation communities not always aligning clearly to EEC determinations.	
	Vegetation condition.	ü
	Absence of more recent GIS data delineating extant (existing) vegetation.	
Threatened species	Lack of records, particularly in Shellharbour and Kiama LGAs.	ü
	Lack of targeted surveys.	ü
	Poor management of new survey data. Not always included in the Wildlife Atlas Database.	ü
Aquatic data	No regional datasets. Limited site specific surveys only.	
Flora and fauna general	Non vascular plants such as bryophytes (mosses, liverworts and hornworts), and algae are not generally recorded. Poorly known.	
	Fauna survey data poor, particularly in Shellharbour and Kiama LGAs.	
	Incompatible mapping systems and data management systems which limits data sharing between councils.	
	Fauna habitat modelling not available for Kiama and Shellharbour.	
	Inconsistent reporting on key indicators between Councils in State of Environment Reporting.	ü
Invertebrates	Few site specific studies only. Very poorly known.	
Genetic diversity	No data available.	

As stated in Volume One, it is recommended that the Illawarra Councils work toward addressing these data gaps over time when funding and resources are available. Projects addressing data gaps should focus on priority areas, species or communities where limited resources are available.

5 THREATS TO BIODIVERSITY

Destruction and disturbance of native vegetation represents the greatest threat to biodiversity (Coutts-Smith *et al.* 2007). The introduction of pest species (exotic animals and weeds) poses the second greatest threat, and is also recognised globally as a major cause of biodiversity decline (Coutts-Smith *et al.* 2007). The following section describes the various threats to biodiversity in the Illawarra.

5.1 KEY THREATENING PROCESSES

The Commonwealth EPBC Act, the *NSW Threatened Species Conservation Act* (TSC Act, schedule 3), and *Fisheries Management Act* (FM Act, Schedule 6) allow for the listing of KTPs as outlined in Section 3. In general, threats are listed when they cause an adverse affect to threatened species, populations or ecological communities; or it could cause species, populations or ecological communities that are not threatened to become threatened. Table 8 lists those listed threats that are relevant to the Illawarra and indicates under which legislation.

In addition to listed KTPs, there are a number of other threats impacting on biodiversity in the Illawarra. Through engagement with key regional stakeholders, identification of additional threats was undertaken. These are also included in Table 8. All threats were then classified into major threat categories recognised by Coutts-Smith *et al.* (2007) as shown in Table 8.

Table 8: Key threatening processes relevant to the Illawarra

Threat category	Regional Threat	TSC Act	EPBC Act	FM Act
Anthropogenic destruction and disturbance of native vegetation	Clearing of native vegetation.	*	*	
	Extinctions of local populations of species (due to lack of recruitment, inbreeding depression, fragmentation or other).			
	Grazing and disturbance by stock.			
	Hard rock extraction/ quarrying activities.			
	Loss of hollow bearing trees.	*		
	Roadside mowing (weed dispersal, and impacts on native vegetation wetlands).			
	The degradation of native riparian vegetation along NSW water courses.		*	*
Anthropogenic destruction and disturbance of native fauna	Fishing and harvesting of aquatic resources (including fish, shellfish and crustaceans).			
	Roadkill.			
	Bushrock removal.	*		
Anthropogenic modification and degradation of physical factors	Alteration of habitat following subsidence due to longwall mining.	*		

	Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands.	*		
	Bushrock removal.	*		
	Dumping garden refuse, and rubbish.			
	Ecological consequences of high frequency fires.	*		
	Human-caused climate change.	*	*	*
	Instream structures and other mechanisms that alter natural flow.			*
	Removal of deadwood and deadtrees.	*		
	The removal of large woody debris from NSW rivers and streams.		*	
	Use of insecticides, herbicides, fertilizers.			
	Water quality degradation arising from increased urbanization.			
Introduction of alien species	Competition from feral honeybees.	*		
	Impacts associated with feral animals: rabbit, bees, deer, pigs, goats, exotic fish, cat, red fox, and plague minnow* (*Listed separately as KTPs).*	*	*	
	Introduction of non-indigenous fish and marine vegetation to the coastal waters of NSW.			*
	Invasion of exotic garden plants, exotic grasses, vine and scramblers; invasion of Lantana, and Bitou Bush. (*Listed separately as KTPs)*	*		
Diseases	Disease/ soil pathogens Eg. *Phytopthora* spp.			
	Infection of frogs by amphibian chytrid causing the disease chytridiomycosis.	*	*	
	Infection by Psittacine circoviral (beak and feather) disease affecting endangered Psittacine species and populations.	*	*	

DECC (2007a: Appendix A) provides further guidance on which threatened fauna in the Greater Southern Sydney Region are at risk from these threats.

5.2 Threat Abatement Plans

Threat abatement plans are prepared under the TSC Act and EPBC Act to research and propose management actions to address KTPs. Many of the recommended actions are not site specific; however some plans list priority sites, such as for Bitou Bush control. Threat abatement plans relevant to the Illawarra are listed in Table 9.

Table 9: Threat abatement plans prepared under the TSC Act and the EPBC Act

Threat Abatement Plan	*TSC Act*	*EPBC Act*	*# of site specific actions listed for the Illawarra*
Competition and land degradation by rabbits.		*	Nil
Predation by the European red fox.	*	*	1 priority site targeting Long-nosed Potaroo at Barren Grounds Nature
Infection of amphibians with chytrid fungus resulting in chytridiomycosis.		*	Nil
Competition and land degradation by unmanaged		*	Nil

goats.			
Predation by feral cats.		*	Nil
Bitou bush and boneseed.	*		3 priority sites: Bass Point, Killalea and Seven Mile Beach
Predation by the plague minnow (*Gambusia holbrookii*).	*		Nil
Plan to protect environmental assets from Lantana (Draft).	*		No specific sites identified. A number of actions apply generally.

Given the lack of spatial information available on the location of specific threats, a spatial analysis of threats was not undertaken. It is for this reason a values based approach has been taken for prioritising works and priority actions in the strategy. That is, works to reduce the impact of threats should be undertaken in areas of highest known biodiversity value.

5.3 Climate Change

Climate change is the most pervasive, least understood and least predictable of all the threatening processes (Auld and Keith 2009). Evidence suggests changes in the Earth's physical environment consistent with global warming are already occurring. It is very likely (>90% certain) that greenhouse gas increases caused most of the warming already seen in the mid twentieth century (DECC 2007b). Increases in greenhouse gases are primarily due to fossil fuel combustion, agriculture and land use change (DECC 2007b). On a per capita basis, Australians are responsible for releasing greater volumes of greenhouse gases than any other country (DECC 2007b).

There still remain some unknowns over the timing and extent of projected changes in climate this century due to uncertainties about the amount of greenhouse gases that will be released into the atmosphere later this century, compounded by uncertainties about the climate system itself (DEFRA 2007).

For biodiversity, there is expected to be a range of direct and indirect impacts of a changing climate. DECC (2008a) have summarised predicted climatic changes by 2050 for the Illawarra to be:

- Hotter days over all seasons (1.5-3°C increase).
- Substantial increases in summer rainfall and a slight to moderate increase in spring/autumn rain.
- Increased evaporation leading to slightly drier conditions in winter and spring.
- Increased sea level rise - up from 1990 levels by 40cm by 2050, and 90cm by 2100.
- Increased storminess, intensity and frequency of storms.

For biodiversity, the main threat from climate change is whether species and communities can adapt to survive the magnitude and rate of change. Individual species have two possible survival mechanisms – adaptation or migration (DECC 2007b). Adaptive evolution is considered unlikely due to the predicted rapid rate of change which is 10-60 times faster than has occurred in the past (DECC 2007b), therefore migration and behavioural change is more likely to be the major survival mechanism.

General expected changes to biodiversity include (DECC 2007b):

- Species range shifts to cooler latitudes (south) or higher elevations;
- Changes to flowering and fruiting times;
- Vegetation thickening in eucalypt woodlands from carbon dioxide enrichment;

- Behavioural changes in fauna populations;
- Extinctions of local populations along range boundaries;
- Increasing invasion of highly mobile, opportunistic, weedy plant species;
- Progressive 'decoupling' (breakage) of species interactions (e.g. timing of food availability);
- Increasing threat to fresh water ecosystems through changes in water temperature and chemistry and potential saline inundation;
- Increased carbon dioxide will favour plants utilizing the C_3 photosynthetic pathway of photosynthesis (rather than C_4) – this will alter competitive relationships between plants and may result in substantial changes in species composition, and increased competition from weedy species (Adam 2009); and
- Decoupling of pollinator – plant relationships, leading to reduced pollination (Adam 2009).

Ecosystems in the Illawarra which are likely to be vulnerable to climate change are outlined in Table 10.

Table 10: Communities and species vulnerable to climate change in the Illawarra

Type	*Threat*
Riparian vegetation.	Increased disturbance from predicted increase in storm and flood events.
Coastal zone vegetation.	Increased pressure from sea level rise, coastal erosion and storm events. Likely to impact dune vegetation, saltmarsh, wetlands, littoral rainforest, and estuarine vegetation.
Low lying coastal areas.	At risk from inundation, potential saline influences.
Freshwater wetlands.	Saline influences from sea level rise or intrusion from the water table. Increasing threat from decreasing water flows and changes in water temperature and chemistry.
Rainforest.	Increased evapotranspiration leading to decreased moisture levels / humidity.
Species at the northern limits of their range.	Species likely to shift range to cooler latitudes or higher elevations.
Species and communities already stressed due to fragmentation.	This applies to all vegetation of the Illawarra coastal plain.
Species with geographically restricted distributions and specialist habitat requirements.	Many of the threatened and rare species in the Illawarra. Potential to migrate is more likely to be constrained by habitat fragmentation or other barriers (Adam 2009).
Areas vulnerable to high fire intensity and frequency.	Vast areas of the sandstone plateau, and escarpment.

Plant species with wide ranging seed dispersal strategies such as via frugivorous birds and bats, water and wind are expected to be more capable of accommodating climate change and crossing migration barriers than plants that disperse seed close to the parent plants such as myrmecochorous (ant dispersed) species (Adam 2009).

Vegetation clearing and fragmentation

Decades of clearing and development on the Illawarra coastal plain has resulted in many isolated and small pockets of remnant vegetation. Fragmentation has many negative impacts on native vegetation including: genetic deterioration (loss of diversity and increased inbreeding); changed landscape processes and disturbance regimes; increased edge effects; increase abundance of invasive species; and altered species interactions affecting pollination, seed dispersal, predation, competition (Hobbs and Yates 2003). A recent study (Broadhurst 2007) has shown small populations are highly susceptible to declining seed production, loss of genetic diversity increased inbreeding leading to poor seedling vigour

and increased hybridisation. Increasing patch size and reconnecting such isolated remnants is one way to increase the viability and reduce threats to these remnants.

5.4 Weeds

Weed invasion in the Illawarra has been occurring since 1815, with the earliest non-indigenous settlements and has continued since (BES, 2006). There are more than 200 weed species known in the Illawarra, which are listed in Appendix 2. Most are environmental weeds that pose threats to biodiversity, however some are also listed as noxious, as national Weeds of National Significance (WONS), or as KTPs under the Threatened Species Act. Weeds threaten biodiversity due to their ability to outcompete native plants. This leads to a reduction in the diversity of flora and fauna habitat.

Weeds in the Illawarra include a range of grasses, forbs, shrubs, trees and vines and aquatic weeds. Due to the absence of weed mapping, the Illawarra Escarpment Weed Strategy (BES 2006) recommends weed control to be targeted at biodiversity sites of highest value. It is recommended that this approach is taken across the Illawarra region.

5.5 Pest Animals

Since European settlement of Australia, more than 220 terrestrial vertebrates have been introduced to Australia (Coutts-Smith *et al.* 2007). Of these, many have established populations that pose significant threats to biodiversity and some have been implicated in the extinction of many native species and in the decline of others (Coutts-Smith *et al.* 2007). Pest animals pose direct threats to biodiversity through various means including degradation of habitat, competition; along with inadvertent impacts from associated pest control, grazing and browsing (Coutts-Smith *et al.* 2007).

Table 11 outlines pest animals and priorities for control in the Illawarra. The impacts and priorities for control are based on recent work by DECC (2007a) for the metropolitan region. Some species priorities were modified based on their known impacts and abundance in the Illawarra.

Table 11: Pest animals and priorities for control

Pest animal	*Impacts on biodiversity*	*Priority for control*
Deer (Rusa, Red and Fallow deer).	Overgrazing, trampling, ring-barking, dispersal of weeds, acceleration of erosion, concentration of nutrients and degradation of water quality (NSW Scientific Committee 2004 in DECC 2007a). Contributing to traffic accidents.	High - potential to expand range to the south.
Feral cat.	Prey on native animals.	Moderate.
Feral goat.	Soil damage and erosion, trampling, dispersal of weeds, prevention of native species regeneration through grazing, competition with native fauna for food and resources.	High.
Feral pig.	Prey on native animals; compete with native fauna for food resources, habitat alteration by wallowing, rooting and foraging, spread of weeds, reduction in water quality, spread of root rot fungus (*Phytopthora cinnamomi*).	Moderate.
Fox.	Preying on native species, competition with native fauna for food and resources.	High - refer to Red Fox Threat Abatement Plan.
Indian Myna.	Potential competition for nesting sites and hollows.	Low.
Rabbit.	Land degradation through grazing, ring barking of trees, construction of burrows, soil erosion. Competition with native fauna for food and resources.	Moderate.

There are a number of other pest animal species present in the region; however these have not been listed as they are considered to have less significant impacts on biodiversity (DECC 2007a).

Rusa, Red and Fallow deer are the most significant current threat. Wide ranging impacts across the Illawarra Escarpment include destruction of understorey vegetation. In recent years, they have migrated from the Royal National Park to Ulladulla, and have the potential to significantly expand their range further south (DECC 2007a).

6 BIODIVERSITY VALUES

The landforms of the Illawarra region gives rise to a high level of biodiversity. The Illawarra Councils cover an area approximately 108,000 hectares in size. Approximately half of this is vegetated. Most of the retained vegetation is found on the Illawarra Escarpment slopes and sandstone plateau west of the escarpment, which is largely water catchment land. The Illawarra coastal plain however, has mostly been cleared, leaving mostly isolated remnants of vegetation vulnerable to a number of ongoing threats.

Biodiversity values applied in the Strategy are more fully described below.

6.1 ENDANGERED ECOLOGICAL COMMUNITIES

There are 19 Endangered Ecological Communities (EECs) listed as threatened under the NSW TSC Act or the Commonwealth EPBC Act in the Illawarra. Some are distributed across all three LGAs, others are restricted to particular LGAs as indicated in Table 12.

Due to the high level of vegetation clearing on the coastal plain for agriculture industry and residential development, most vegetation types that occur on the Illawarra coastal plain are now listed as EECs. Other EECs also occur on the Illawarra Escarpment, Woronora Plateau and Moss Vale Tablelands. Table 12 provides a list of the EECs and the prioritisation of those communities based on an assessment of the level of threat to the community, and population status. This assessment method was adopted from DECC (2008b), however, with a focus on the Illawarra region. Appendix 3 provides further information on the distribution of EECs.

Table 12 : Endangered Ecological Communities (EECs) of the Illawarra

Endangered Ecological Community (EEC)	*TSC Act*	*EPBC Act*	*Wollongong LGA*	*Shellharbour LGA*	*Kiama LGA*	*Priorities*
Bangalay Sand Forest	yes		*	*	*	High
Coastal Saltmarsh	yes		*	*	*	High
Freshwater Wetlands on Coastal Floodplains	yes		*	*	*	High
Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion	yes		*	*	*	Highest
Illawarra Subtropical Rainforest in Sydney Basin Bioregion	yes		*	*	*	Highest
Littoral Rainforest (TSC Act); Littoral Rainforest and Coastal Vine Thickets of Eastern Australia (EPBC Act)	yes	yes	*	*	*	High

Melaleuca armillaris Tall Shrubland	yes			*	*	Highest
O'Hares Creek Shale Forest	yes		*			Highest
River-flat Eucalypt Forest on Coastal Floodplains	yes	yes	*	*		High
Robertson Basalt Tall Open-forest	yes			*	*	High
Robertson Rainforest	yes			*	*	High
Shale/ Sandstone Transition Forest	yes	yes	*			High
Southern Highlands Shale Woodlands				*		High
Southern Sydney Sheltered Forest	yes		*			Highest
Swamp Oak Floodplain Forest	yes		*	*	*	High
Swamp Sclerophyll Forest on Coastal Floodplains	yes		*	*	*	High
Sydney Freshwater Wetlands in the Sydney Basin Bioregion	yes		*	*		Highest
Temperate Highland Peat		yes	*			High
Themeda Grassland on seacliffs and coastal headlands	yes		*		*	High

6.2 ENDANGERED POPULATIONS

The NSW TSC Act allows for the listing of endangered populations. There are currently 35 listed populations in NSW, with three occurring in the Illawarra. Table 13 details the Illawarra populations.

Table 13: Listed Endangered Populations of the Illawarra

Population	*Description*	*LGA*
Lespedeza juncea.	Known from just one roadside population south of Dapto. Disjunct from other populations in Western Sydney, far south coast and southern tablelands.	Wollongong
Chorizema-parvilorum.	This population has been recorded from between Austinmer and Albion Park. It typically occupies woodland or forest dominated by Forest Red Gum (*Eucalyptus tereticornis*) and/or Woollybutt (*E. longifolia*). At Austinmer, the species is recorded from a coastal headland.	Shellharbour and Wollongong
Callitris endlicheri, Woronora Plateau Population.	This population represent the eastern limit of the species, and is disjunct from other known populations. The Woronora population is restricted to a single sandstone outcrop approximately two hectare in area.	Wollongong

The *Lespedeza* and *Chorizema* populations are most at risk, particularly as they are within fragmented habitats that will face increasing threats with proposed future urban expansion of West Dapto/Yallah Calderwood area. The *Callitris endlicheri* population is actively managed by the National Parks and Wildlife Service as part of Dharawal Nature Reserve.

6.3 Threatened Species

Threatened species records for the Illawarra were compiled using ATLAS data (dated Feb 2009), engagement with experts, and herbarium records from the NSW and Janet Cosh Herbariums.

There are 66 threatened fauna species, and 31 threatened flora species which have been recorded within the study area. Appendices 4, 5 and 6 provide detailed lists of those flora, fauna and aquatic species. Of the threatened fauna, the majority are birds and mammals that are threatened. A high proportion of the locally occurring frogs are also threatened.

Threatened species have been prioritised based on the level of threat and their importance to the Illawarra region. These priorities are also shown in Appendix 4 and 5. The prioritisation was initially taken from the Threatened Species Prioritisation and Implementation Strategy for the Priorities Actions Statement for the Metropolitan Region (DECC 2008b). However, as this region is a much larger study area, it was considered a local review of these priorities was required to better reflect priorities and threats in the Illawarra. The prioritisation rules devised by DECC (2008b) that were used to guide the review are shown in Table 14.

Table 14: Prioritisation rules for revised rankings

PRIORITY	*Level of endemism*	*Level of threat*	*Population status*
Highest	High to medium level of endemism and abundance to Illawarra	High	Extremely rare to rare
High	Medium to Low level of endemism and abundance to Illawarra	High to medium	Extremely rare to rare
Medium	Medium to Low level of endemism and abundance to Illawarra	Medium to Low	rare to locally common
Low	Medium to Low level of endemism and abundance to Illawarra	Medium to Low	Uncommon to common

It is noted that several species have become extinct in the region. Protected migratory birds are also listed in Appendix 7, and covered in section 3.2.1.

The Illawarra Councils will support DECCW to prioritise key actions from the Priority Actions Statement, and Recovery Plans so that opportunities to invest in threatened species recovery will be targeted appropriately.

6.4 Critical Habitat

Part 3 of the TSC Act 1995 allows for the listing of critical habitat. There is currently no listed critical habitat in the Illawarra.

6.5 Rare Flora

Regionally rare flora for the Illawarra have been identified in previous work (NCC 1999, Mills and Associates 2000, and Fairley 2004) and incorporated into this Strategy in Appendix 8. 94 species in total have been flagged as rare in the region. Some of these are listed as Rare or Threatened Australian Plants (ROTAPS) under the schedule prepared by Briggs and Leigh (1996).

6.6 Rare Fauna

Rare fauna have been compiled from several datasets collated within the region (Chafer *et al.* 1999, Mills and Associates 2000, NPWS 2002b, Mills and Associates 2006b, DECC 2007a). There has been comparatively less systematic fauna survey across the Illawarra than for flora, as a result there is less understanding of rare fauna species. Given the active membership of the Illawarra Bird Observers Club, there is more known about birds than other fauna groups in the region. Appendix 9 contains the list of rare fauna compiled for the Illawarra.

6.7 Fauna Habitats

Fauna data across the region is very variable. Fauna data is more available for the north of the region, with fewer records and less systematic studies available in Shellharbour and Kiama LGAs. Given this paucity of consistent fauna data across the Illawarra, broad vegetation classes were used as an indicator of threatened fauna habitats. Habitat types were used that had been defined in recent studies (DECC 2007a, DECC 2007d). The habitat approach is often more practical compared with a species-by-species approach, especially when there are many threatened species in an area (DECC 2007a), and an absence of systematic survey data.

Each threatened fauna species recorded for the region has been assigned to its predominant habitat type based on knowledge of their distributions described in existing literature (DECC 2007a, DECC 2007d, and NPWS 2003b). The full list of species by habitat can be seen at Appendix 10.

6.8 Vegetation Communities

There are three major landform types in the Illawarra: the coastal plain; Illawarra Escarpment; and plateau, comprising the Woronora and Budderoo Plateaux. Each landform gives rise to different geologies and climate, leading to a very high diversity of vegetation types.

The coastal plain is highly urbanised in the north of the region, and progressively more rural towards the south. Most of the vegetation of the coastal plain has been cleared, and what little remains is mostly listed as EEC. There remain scattered remnants of grassy woodlands, wetlands, saltmarsh, rocky coastal headlands and dune vegetation. Most of the coastal plain is flat and mildly undulating with volcanic hills giving rise to dry and subtropical rainforests.

The Escarpment slopes are mostly vegetated with moist eucalypt forests and rainforests, which provide a scenic backdrop to the coastal plain.

The Woronora and Budderoo sandstone plateaux beyond the Escarpment include another suite of vegetation types including woodlands, heaths, upland swamps, shale forests and sheltered gully forests. Table 15 shows the distribution of extant (current) vegetation across the council areas of the Illawarra.

Table 15: Proportion of vegetated lands across the Illawarra Region

	Kiama	*Shellharbour*	*Wollongong*	*Illawarra Region*
LGA total area (ha)	25,791	14,759	68,437	108,987
Total vegetation (ha)	12,841	5,309	47,666	65,816
% of LGA	50	36	72	100
% of Illawarra region	12	5	44	60

Extant vegetation figures in Table 15 are based on mapping by Tozer *et al.* (2006) from aerial photos taken between 1994 and 2001. Therefore, these figures are likely to over represent current extant vegetation.

As shown in Table 15, most of the vegetation is distributed within the Wollongong LGA. A large portion of this is within the control of the Sydney Catchment Authority. Appendix 11 lists the vegetation units as defined by Tozer *et al.* (2006) that occur in the Illawarra, alongside a summary of the key species and habitat for each community.

6.9 Vegetation Priorities

The Southern Rivers CMA Catchment Action Plan (CAP) (2006) broadly defines priority vegetation types as those with '30% of their original distribution being managed for conservation'. The barrier to determining this is that there is no reliable mapping of the pre-European extent of vegetation communities in the Illawarra. To define a more specific list of vegetation priorities for the Illawarra we devised a classification of vegetation priorities using SCIVI vegetation mapping (Tozer *et al.* 2006).

To do this, an assessment was made of the endemism and reservation status of each vegetation community in the Illawarra compared with the entire SCIVI study area. The SCIVI study area extends from Sydney in the north to the Victorian border in the south and west to Goulburn (Tozer *et al.* 2006). This enabled a comparison to be made between the distributions of plant communities within the Illawarra against the whole SCIVI study area. Using this information, a ranking of three priority classes has been developed (1 being highest). This is designed to help inform the meeting of CAP targets and priority conservation areas across the Illawarra.

Table 16: Vegetation priority classes

Priority	*Endemism % of distribution within the Illawarra*	*Proportion of community reserved in NPWS reserves in the Illawarra*
1	>60%	<15% reserved
2	<60%	<30% reserved or listed as EEC
3	<60%	>30% reserved

Table 16 shows those communities with a higher endemism (>60% distribution) to the Illawarra that have not met their conservation targets ranked as Priority 1. These communities have very limited distribution beyond the Illawarra region. As such, their management and conservation hinges on regional efforts. Those EECs which are highly endemic to the Illawarra were included in this class.

Most of the Priority 1 vegetation occurs on the Illawarra coastal plain and foothill rainforests south of Wollongong. Priority 1 vegetation communities include Illawarra Grassy Woodland, Illawarra Subtropical Rainforest, Bracelet Honey Myrtle Scrub and Coastal Upland Swamps. The first three of these communities are all very poorly protected in reserves, and are mostly restricted to the Illawarra region. Coastal Upland Swamps are relatively protected within water catchment lands, however they are under threat from longwall mining and the associated impacts of subsidence resulting in cracking of valley floors and creeklines leading to altered surface hydrologies (NSW Scientific Committee 2005).

Priority 2 areas are those communities that are still poorly reserved (<30%), but have a distribution which extends beyond the Illawarra. This priority class captures most other vegetation communities within the Illawarra. Vegetation communities that fell into Priority 3 on the basis of their reservation

and endemism status, but are listed as EECs, were also included in Priority 2 due to their threatened status under the TSC Act or EPBC Act.

Priority 3 communities were those that meet the 30% reservation status, and are not particularly endemic to the Illawarra. In the Illawarra region, they are confined mostly to the Budderoo Plateau within National Park estate. This class included sandstone woodlands, gully forests and heaths.

Appendix 12 shows the complete list of vegetation units with their determined priority class.

Vegetation priorities should be used to guide priorities for investment and conservation efforts on land outside of the regional corridors. These priorities can also be used to target opportunities for land acquisition or incentives.

6.10 Regional Biodiversity Corridors

The Strategy consolidates and maps a network of regional biodiversity corridors across the Illawarra. The biodiversity value of corridor networks is well known. Landscapes that retain more connections between patches of otherwise isolated areas of vegetation are more likely to maintain more numerous and more diverse populations of various plant and animal species (Lindenmayer and Fischer, 2006). Conversely, a lack of landscape connectivity can have a range of negative impacts on species populations (Lindenmayer and Fischer, 2006). It is thought that if existing remnants are left to persist without sufficient immigration to maintain genetic diversity, continued losses of biodiversity are certain (Parker *et al.* 2008).

Most of the areas defined in the Strategy as forming part of a regional corridor network have already been flagged as core conservation areas in previous studies. This is because they are large, biologically diverse, contain a diversity of habitats and vegetation communities, contain habitats for threatened species, and contain vegetation communities that are significant to New South Wales and the Illawarra region (Mills and Associates 2000).

There is a clear mandate for planning for biodiversity corridors as shown by the various state, regional and local policies and plans promoting them including Australia's Biodiversity Conservation Strategy-draft (Commonwealth of Australia 2009), The Southern Rivers Catchment Action Plan (Southern Rivers CMA 2006), Illawarra NRM Plan (Southern Rivers CMA 2010), and the Illawarra Regional Strategy (DoP2006).

This Strategy has responded to these high order targets and regional plans by consulting with local experts, and review of previous studies to delineate and map boundaries in order to define a regional corridor network. This was done to facilitate improved incorporation of the corridors into planning instruments, and to guide biodiversity planning and conservation priorities.

The proposed objectives of the Illawarra biodiversity corridors are to:

- Delineate areas of high quality habitat;
- Conserve and protect areas of high quality habitat;
- Enhance existing connectivity within corridors by regenerating or revegetating missing links where possible;
- Consolidate and manage these continuous links to provide large scale connectivity through the landscape;
- Implement effective planning controls to prevent further fragmentation;
- Maintain viability of native vegetation and provide dispersal corridors for fauna;
- Minimising further clearing within these areas; and

- To minimise the impact of development on land within and adjoining the regional corridors.

Method used to Map Illawarra Biodiversity Corridors

Regional corridors for the Wollongong LGA have already been largely defined through existing studies (Mills and Associates 2000, NPWS 2002b, NPWS 2003a, Eco Logical 2004, WCC 2005, Mills and Associates 2006b, WCC 2007, DECC 2007d, and DoP 2006). They include a north-south escarpment moist forest corridor, and an east-west corridor linkage through Yallah and Marshall Mount. The Marshall Mount corridor boundary needs to be negotiated as part of the upcoming West Dapto LEP Stage 5.

Through engagement with local flora and fauna experts and review of existing studies, regional corridors to the south of Wollongong LGA were defined. The north-south escarpment moist forest corridor was extended along the escarpment to the southern boundary of Kiama LGA, and major east-west links were also identified.

The information which was considered in the drafting of corridor boundaries includes:

- Aerial photography;
- Buffering of extant vegetation by 50m using SCIVI mapping - where other mapping did not exist;
- Mapping of high conservation value areas (Mills and Associates 2001 and 2006, NPWS 2003a);
- Advice from engagement with local flora and fauna experts; and
- Other studies which have outlined significant linkages (Mills and Associates 2001, SRCMA 2008, DoP 2006, WCC 2007).

The regional corridors maps are shown in Appendix 1 of Volume One. A summary of the main corridor links is provided below.

Escarpment Moist Forest Corridor

The escarpment moist forest corridor was originally defined in the Wollongong LGA from Helensburgh in the north, to the Calderwood Valley in Shellharbour (NPWS 2003). However, the southern boundary of this corridor was defined at Calderwood due to study area limitations. Physically, the moist forest corridor continues the length of the Illawarra Escarpment from the Royal National Park in the north, and continues to the south along the Escarpment through Shellharbour and Kiama LGAs, south to the Shoalhaven, where it ends at Cambewarra.

For the purposes of the Strategy, the boundaries were delineated only to Foxground to the southern boundary of the Kiama LGA. The Escarpment supports large area of native vegetation and a diversity of habitat types, and therefore contains a large proportion of the biodiversity of the Illawarra (Mills and Associates 2006b). The moist eucalypt forests provide quality habitat for bird, arboreal mammal, reptile and bat assemblages (NPWS 2002b). The Escarpment corridor provides the largest, continuous core conservation area in the region. Protection and improved connectivity of this corridor may allow for the recolonisation of fauna species that may be locally extinct in Wollongong, but are known to occur further south such as the Stuttering Frog and the Spotted-tail Quoll (NPWS 2002b). Threats to the Illawarra Escarpment occur mostly from development pressure in the foothills, and from pest animal and weed invasion.

Yallah Corridor

A few studies have attempted to define a corridor through the Yallah-Marshall Mount precinct (NPWS 2002b, Eco Logical 2004, WCC 2007). A Growth Centres Commission report (2008) on the West Dapto Release Area recommended review of this corridor. This corridor presents the main opportunity in the

Illawarra for conservation of the largest remnants of Illawarra Grassy Woodlands. This community is endemic to the Illawarra, and due to its distribution on the coastal plain in prime agricultural land, has been severely depleted. The conservation and management of this significant community will need to be managed through revised corridor designs that maximise connectivity and viability of this community into the future. Grassy woodlands in the Illawarra also provide quality habitat for bird, reptile and bat assemblages (NPWS 2002b). It is recommended that state agencies including DECCW, and the SRCMA are included in the redesign of this corridor as part of the West Dapto LEP Stage 5.

Catchment Corridor

The Catchment Corridor delineates the operational area of the Sydney Catchment Authority (SCA). These are lands that have been declared under the *Sydney Water Management Act 1987* for their value in the protecting the quality drinking water provided to greater Sydney, and for their ecological integrity (SCA and DEC, 2007). This land is managed by the SCA in accordance with the Special Areas Strategic Plan of Management (SASPoM). This plan is guided by two primary goals, firstly to protect water quality, and secondly to conserve ecosystem integrity, natural and cultural values (SCA and DEC, 2007).

Johnstons Spur Corridor

Johnstons Spur is an eastern corridor extension from the Escarpment Moist Forest Corridor. It has been identified as a core conservation area by Mills and Associates (2000) for its extensive area of dry foothills forests, including Red Gum and dry rainforest communities; habitat for several forest dwelling threatened fauna species; and habitat for many regionally significant flora and fauna species (Mills and Associates 2000).

Tongarra - Stockyard Mountain Corridor

Tongarra - Stockyard Mountain area in Shellharbour and Kiama LGAs has been identified as a core conservation area in Mills and Associates (2000) for its extensive areas of moist escarpment forests, extensive dry foothills forests including Red Gum and dry rainforest, habitat for forest dwelling threatened fauna species and several threatened and regionally significant flora and fauna species.

Saddleback Corridor

The slopes of Saddleback Mountain have previously been identified by Mills and Associates (2006b) as a core conservation area as it supports large stands of Illawarra Subtropical Rainforest known to provide habitat for several threatened species including *Daphnandra* sp. Illawarra, *Zieria granulata* and *Cynanchum elegans.*

Dunmore Hills Corridor

This area is defined as a core conservation area in Mills and Associates (2000) extending from Oak Flats, Dunmore and the Jamberoo Valley. It contains habitat for a range of threatened species and three EECs including Bracelet Honeymyrtle Shrubland (*Melaleuca armillaris*) which is restricted to the Killalea-Dunmore-Jamberoo area on volcanic outcrops (Gaia Research 2009). Recent fauna survey work (Gaia Research 2009) show the area supporting habitat for four threatened fauna species, and three threatened plant species.

Minnamurra River Estuary Corridor

The Minnamurra River forms the boundary between Kiama and Shellharbour LGAs. The estuary provides a rich diversity of habitats including mudflats, mangroves, saltmarsh and floodplain vegetation with important values for both terrestrial and aquatic fauna (Mills and Associates 2006b). The Minnamurra provides the largest estuarine system between Lake Illawarra and the Shoalhaven River (Mills and Associates 2006b).

Crooked River and Seven Mile Beach Corridor

The Crooked River and Seven Mile Beach form part of a coastal corridor south from Gerroa into the Shoalhaven LGA. The area supports several EECs including Littoral Rainforest, Swamp Oak Floodplain Forest, and Bangalay Sand Forest.

Corridor Considerations for Establishing Corridors

In urban and rural landscapes, corridor networks will require not only the use of public lands, but also private lands and the involvement of landholders and residents if local biodiversity is to be adequately maintained (Parker *et al.* 2008). Enlisting the support of local residents is a significant challenge for local government (Parker *et al.* 2008). The Southern Rivers CMA 'Escarpment to Sea' project will also provide incentive support to key landholders within the regional corridors for biodiversity improvement actions.

Local corridors have not been identified as part of this process, as the emphasis has been placed on regional strategies which will guide co-ordinate common biodiversity goals across the Illawarra. Local corridors have been identified in other previous work, however, require further consideration include:

- Croome - Blackbutt corridor;
- Keira green corridor;
- Kembla corridor; and
- Towradgi corridor;

6.11 Estuarine and Wetland Habitats

Wetlands and estuaries in the Illawarra provide important habitats for a range of resident and migratory bird species, and unique plant assemblages. More than 1,500 hectares of wetland have been reclaimed in the Illawarra since European settlement for industrial, urban, sporting and agricultural purposes (Chafer 1997). In 1997, the area of wetland remaining was 1,044 hectares (Chafer 1997), and has possibly further been reduced since this time. The large majority of wetlands in the Illawarra occur in the Lake Illawarra and Minnamurra catchments.

Four wetlands in the Illawarra region are recognised as nationally important in the Directory of Important Wetlands in Australia (Environment Australia 2001). Table 17 outlines those listed wetlands and the LGA they lie within.

State Environment Planning Policy No. 14 (SEPP14) also lists certain coastal wetlands in the Illawarra region. The policy is designed to ensure coastal wetlands are protected. Under SEPP14, a proposal to carry out clearing of land, drainage works, land filling or the construction of levees within a classified wetland is designated development and requires an Environmental Impact Statement and consultation with the NSW Department of Planning. Table 17 outlines wetlands listed under SEPP14 and the LGA they occur within.

Table 17: Illawarra wetlands listed on the National Directory of Important Wetlands and SEPP14

Wetland	*LGA*	*National Directory of Important wetlands*	*SEPP14*
Lake Illawarra	Wollongong and Shellharbour	Yes	
Killalea Lagoon	Shellharbour	Yes	Yes
Coomaditchie Lagoon	Wollongong	Yes	
Minnamurra River Estuary (Including Dunmore Swamp)	Kiama and Shellharbour	Yes	Yes
Werri Lagoon	Kiama		Yes

Spring Creek	Kiama	Yes
Albion Park Aerodrome	Shellharbour	Yes
Haywards Bay	Wollongong	Yes
Koona Bay	Shellharbour	Yes
Wollingurry Point (Yallah)	Wollongong	Yes
Picnic and Werrang Islands	Shellharbour	Yes

The Ramsar Convention or 'Convention on Wetlands of International Importance' is an international register of significant wetlands. This convention recognises over 120 million hectares of internationally significant wetlands. Australia has more than 60 Ramsar sites registered (DECC 2008c), however, none to date are listed from the Illawarra region.

Wetland Care Australia and the Southern Rivers CMA have prioritised and mapped wetlands of the southern rivers region (Wetland Care Australia 2010). This work should be used as a guiding document for wetland priorities in the Illawarra region.

A number of coastal estuaries provide further wetland habitat in the Illawarra. Most of these are classified as ICOLLs (Intermittent Closed and Open Lakes and Lagoons) for which conditions within vary depending on whether they are open or closed to the sea (Industry and Investment NSW 2009).

Macrophytes (aquatic plants) of major estuaries and lakes of the Illawarra have recently been mapped (Industry and Investment NSW, 2009). This mapping covers Towradgi Creek, Allans Creek, Lake Illawarra, Elliott Lake, Shellharbour Creek, Killalea Lagoon, Minnamurra River, Werri Lagoon and Crooked River. This mapping delineates the distribution of seagrasses such as *Zostera, Halophila, Ruppia*, and mangrove and saltmarsh communities.

Table 18: Estuaries of the Illawarra

Estuary	*Management Plan*	*Council Responsibility*
Hargraves	Yes	Wollongong
Stanwell Creek	Yes	Wollongong
Stony Creek	Yes	Wollongong
Flannagans Creek	Yes	Wollongong
Hewitts Creek	Yes	Wollongong
Tramway Creek	Yes	Wollongong
Slacky Creek	Yes	Wollongong
Whartons Creek	Yes	Wollongong
Collins Creek	Yes	Wollongong
Bellambi Gully	Yes	Wollongong
Towradgi Creek	Yes	Wollongong
Fairy Creek	Yes	Wollongong
Tom Thumb Lagoon	Yes	Wollongong
Lake Illawarra	Yes	Lake Illawarra Authority in partnership with Wollongong and Shellharbour
Allans Creek	No	Wollongong
Lake Elliott	Yes	Shellharbour
Minnamurra	Yes	Kiama
Crooked River	Yes	Kiama on behalf of the Department of Lands.
Werri Lagoon	Yes	Kiama
Spring Creek	Yes	Kiama

Estuaries in the Illawarra are managed under estuary management programs. Each Council is guided by an estuary management program which defines priority actions, including actions relevant to biodiversity, in the estuaries under its responsibility.

Table 19: Estuary Management Plans

LGA	*Estuary Management Plans*
Wollongong LGA	Estuary Management Plan for Estuary Management Study and Plan for Fairy, Towradgi, Hewitts and Tramway Creeks 2005.
	Estuary Management Plan for Several Wollongong Creeks and Lagoons 2007. This addresses the following estuaries: Tom Thumb Lagoon (including Springhill and J.J. Kelly catchments; Bellambi Lagoon; Bellambi Gully (including Farrahars Creek catchment); Collins Creek; Whartons Creek; Slacky Creek; Flanagans Creek (including Thomas Gibson Creek); Stoney Creek; Stanwell Creek; and Hargraves Creek.
Shellharbour LGA	Elliot Lake Estuary Management Plan 2003.
Kiama LGA	Minnamurra River Estuary Management Plan 2003.
	Crooked River Estuary Management Plan 2003.

7 PRIORITISING RESTORATION WORKS ON PUBLIC LAND

As part of the Strategy, an assessment of the biodiversity values of public lands under Council care and control (Community and Crown land) was undertaken to identify priority sites for undertaking bush restoration.

Through engagement with the biodiversity reference group, a hierarchy of variables was identified to prioritise those sites with the highest biodiversity value. Each of these variables was classified to enable a systematic ranking of sites and their relative values. The ranking was based on a combination of variables including vegetation type, connectivity (presence within a regional corridor), patch size, and type of existing management. Each variable was classified with different score weightings as shown in Table 20.

Priority vegetation types were deemed to have the highest importance in determining priority sites. Once the priority vegetation types were identified, these were combined with the other variables. The existing management regime was also included so that current efforts would be acknowledged.

Table 20: Assessment matrix for determining priorities for protection and restoration of public lands

Variable	*Scoring approach*
Priority Vegetation	Priority 1 = 4 Priority 2 = 2
Connectivity	= 2 if intersects with mapped regional corridor
Patch size	>10ha = 3 2-10ha = 1 <2ha = 0
Management regime	Qualified bush regenerators = 2 Volunteer sites = 1 No active bush restoration = 0

The values in Table 20 are further explained below. The final ranking was determined by adding these scores as shown in Table 21.

Table 21: Community Land Priority Scores

Score	*Priority*
10 -11	Highest Priority
7-9	High Priority
3-6	Moderate Priority
<= 2	Low Priority

These priorities were reviewed by each of the partner Councils for anomalies brought about by weaknesses in the spatial data used. Amendments were made to the score where the generated score did not reflect biodiversity values known in the field.

Priority Vegetation Types

The classification of priority vegetation types is explained in Section 6.9.

Patch Size

Patch size classes were defined into three categories, 0-2ha, 2-10ha, and >10ha. This categorisation is based on studies that demonstrate that 2ha is the threshold for plants under which biodiversity declines rapidly (Drinnan 2006). Patch size was determined by assessing the extent of continuous vegetation beyond property boundaries.

Priority Sites

As a result of the assessment process described above, a ranking of Community and Crown land sites were derived for each LGA. The maps showing these priority sites are shown in Appendix 13.

In summary the highest priority sites for investment in the region are listed in Table 22. A larger number of High and Moderate Priority sites are also defined, and can be seen in the complete set of maps in Appendix 13.

Table 22: Highest priority sites for investment

Reserve	*LGA*
Minnamurra River Estuary	Kiama
Crooked River Estuary	Kiama
Jerrara Dam	Kiama
Bass Point Reserve	Shellharbour
Blackbutt Reserve	Shellharbour
Croome Reserve	Shellharbour
Bellambi Lagoon Recreation Area	Wollongong
Integral Energy Park-Darkes Rd	Wollongong
Mt Brown Reserve	Wollongong
Perkins Beach	Wollongong
Puckeys Estate	Wollongong
Purrungully Woodland	Wollongong
Bardess Crescent Reserve, Farmborough Heights	Wollongong

8 GUIDING PRINCIPLES FOR THE MANAGEMENT OF NATURAL AREAS

The management of natural areas should be guided by a clear set of management principles. The primary principle is the biodiversity benefits of protecting and enhancing existing remnant vegetation far outweigh those of 'compensatory' planting in cleared areas (AABR 2005). It is important to be mindful that clearing and planting in existing natural areas can irreversibly damage the integrity of natural areas and undermine their natural recovery potential. In an effort to minimise this threat, it is proposed the Illawarra Councils adopt the '3R Principles' as defined by AABR (2005) in 23.

Table 23: The 3R Principles

Retain first.	Conserving existing natural areas is the first priority. Efforts should be directed to protecting these areas from threatening processes such as weeds, grazing, stormwater, mowing etc.
Regenerate second.	Where bushland is degraded by threats such as weed invasion, grazing, or other disturbances, regeneration is the primary goal. This involves mitigating threats such as weed invasion to encourage natural regeneration.
Replant last.	Planting should only be considered after a site's natural ability to regenerate has been assessed as very poor.

A common barrier to this approach is the time constraints associated with grant funding and budget cycles. Grant funding is often an annual program, where insufficient time is allowed to monitor natural recruitment. Where possible, longer contracts should be negotiated so recruitment can be monitored and a planting schedule developed accordingly, if needed.

Other guiding principles for natural area management are:

- Threatening processes such as erosion, stormwater, and weed invasion should be controlled prior to revegetation work where possible.
- Plantings in or near bushland should ensure that no plant pathogens or weed propagules are introduced via potting media, on boots, gloves, tools, materials, equipment, vehicles etc.
- Mulch should only be used if it can be guaranteed weed free.
- Species selection should aim to replicate species diversity and structural complexity of prior original vegetation type. Species selection should aim to include species from all strata of the community.
- Plantings in natural areas should be recorded, including a map, date, species planted, number of plants of each species planted, provenance of each species, and source nursery.

8.1 PROVENANCE

Provenance is a term that refers to the location from where plant seed has been collected. Collecting from 'local' provenance has been the dominant approach in recent years due to the theory that local species exhibit provenance variation in morphological and physiological features, and are better able to cope with the local conditions. 'Local' has often been interpreted as from the target site, or as close as possible. However, due to the many various pollination strategies of different plant species, distance is thought to be a poor indicator of adaptive variation (Florabank 17/8/09). Collecting from the closest possible site may result in seed being collected from small, inbred populations which may have negative consequences for the receiving vegetation (Florabank 17/8/09).

It is now accepted that it is more important to match the environmental conditions at the seed collection site with those at the revegetation site (HNCMA, 17/8/09). Soil type, aspect, elevation, and the vegetation community are the obvious features to compare between sites.

Climate change brings new questions to the local provenance approach (Adam 2009), and debate is now turning to whether we should modify the 'local' provenance standards. A recent study (Broadhurst 2007) on the genetic diversity of small, isolated plant populations has shown that major negative genetic effects were observed when population size fell below 100-200 reproductive plants. Populations under this threshold are associated with declining seed production, inbreeding and increased hybridisation. For this reason, seed collection undertaken for revegetation projects should be sourced from large populations greater than 100-200 plants.

The Illawarra Councils propose to adopt the following recommendations adapted from the Hawkesbury-Nepean CMA (undated) and Broadhurst (2007) for provenance:

- Collect seed from large, healthy, genetically diverse, natural populations (more than 100 plants) or combine several collections from smaller populations within the Illawarra sub-catchment (defined by Wollongong, Shellharbour and Kiama LGAs).
- Identify target species for seed collection and collect mature seed.
- Collect seed from at least 20 widely spaced, healthy parent plants to maximise genetic diversity.
- Collect no more than 10% of the seed or 20% of the fruit on any individual plant.
- Ensure that seed is not over-collected from any site or population. and
- Seed collection should be undertaken from natural areas rather than parks and gardens.

Nurseries generally need 6-8 months lead time to grow tubestock, or up to 18 months if provenance seed is not available and is required to be collected. Seed collection needs to comply with licensing conditions set out in Section 132C of the National Parks and Wildlife Act 1974 (HNCMA, 17/8/09).

9 GRANT OPPORTUNITIES

The following outlines the major grant opportunities that can be sought to assist with implementation of the Illawarra Biodiversity Strategy.

9.1 CARING FOR OUR COUNTRY

Caring for our Country is the Federal Government's natural resource management program. It commenced on 1 July 2008 and integrates delivery of the Commonwealth's existing natural resource management programs: the Natural Heritage Trust; the National Action Plan for Salinity and Water Quality; the National Landcare Program; the Environmental Stewardship Program; and the Working on Country Indigenous Land and Environmental Program.

Further information : http://www.nrm.gov.au/funding/index.html
Phone: 1800 552 008.

9.2 LAND AND PROPERTY MANAGEMENT AUTHORITY – CROWN LANDS PROGRAM

The Land and Property Management Authority NSW (LPMA) provides grant opportunities to assist managers of Crown land. Funding is made available to improve facilities, and protect the heritage value of the Crown land.

Further information: http://www.lands.nsw.gov.au/crown_land/crown_reserves/funding
Phone: 02 9228 6666.

9.3 Industry and Investment NSW - Fish Habitat Restoration program

Habitat Action Grants are open to individuals, community groups, and local Councils for projects to enhance fish habitat including rivers, creeks, estuaries, and wetlands in NSW. Grants are limited to $30,000 (GST excl) and proposals should include matched funds or contributing in-kind support from the applicant or other sources. Habitat Action Grant proposals are advertised by Industry and Investment NSW (formerly DPI) every year, usually around August.

Further information : http://www.dpi.nsw.gov.au/fisheries/recreational/your-fees/habitat-action-grants-funding-up-to-$30,000
Ph: (02) 6626 1107 or (02) 4916 3926.

9.4 NSW Environmental Trust

The Restoration and Rehabilitation Program aims to protect, restore and enhance degraded natural ecosystems, and for waste avoidance and recovery. Funds are usually available for community groups, and State and Local Governments.

Further information : http://www.environment.nsw.gov.au/grants/restoration.htm
Phone: (02) 8837 6093.

9.5 Education for Sustainability Grants Program

The Education for Sustainability Grants Program aims to support projects that facilitate changes in community attitudes and behaviours in support of sustainable development in Australia.

Further information : http://www.environment.gov.au/education/programs/index.html
Ph: 02 6274 1111.

9.6 Southern Rivers CMA

'Caring for our Coasts' is a NSW wide program, funded by the Australian Government's Caring for our Country Program. This program aims to strengthen the awareness and capacity of coastal communities to rehabilitate and protect priority coastal ecosystems. Community groups and Councils with an interest in protecting and restoring coastal environments are able to submit proposals for funding between $5,000 and $50,000.

Further information : http://www.southern.cma.nsw.gov.au

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11 APPENDICES

1. Data Audit
2. Weeds of the Illawarra
3. Endangered Ecological Communities
4. Threatened flora
5. Threatened fauna
6. Freshwater and marine threatened species
7. Migratory birds
8. Rare flora
9. Rare fauna
10. Fauna habitats
11. Vegetation type descriptions
12. Vegetation type priorities
13. Priorities for bush restoration maps

APPENDIX 1 DATA AUDIT

Name	Description / Limitations	LGA coverage
Tindall D., Pennay C., Tozer M.G., Turner K., Keith D.A. (2004) Native vegetation map report series. No. 4. Araluen, Batemans Bay, Braidwood, Burragorang, Goulburn, Jervis Bay, Katoomba, Kiama, Moss Vale, Penrith, Port Hacking, Sydney, Taralga, Ulladulla, Wollongong. NSW Department of Environment and Conservation and NSW Department of Infrastructure, Planning and Natural Resources, Sydney.	Also know as the P5MA mapping. The mapping is at a broad scale of 1:100 000. Extant vegetation cover is derived from aerial photo and satellite imagery captured prior to 2002. The mapping has not been ground-truthed in the Illawarra. Additionally, this mapping has not been used to date by either of the three Councils so there is currently limited understanding of its weaknesses in this area. Some regional vegetation communities are not well defined in this mapping.	Wollongong, Shellharbour and Kiama and beyond
Tozer M.G., Turner, K., Simspon, C., Keith, D.A., Beukers, P., Mackenzie, B., Tindall, D., and Pennay, C. (2006) Native Vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. NSW Department of Environment and Conservation and NSW Department of Infrastructure, Planning and Natural Resources, Sydney.	The same limitations apply as for the P5MA. The P5MA maps were mostly unchanged north of Araluen and Batemans Bay. The main amendments made in Tozer *et al.* (2006) that are relevant to the Illawarra include the delineation of seagrass communities, delineation of river mangrove, and the splitting of Coastal Scrub and Beach Strand from Coastal Sand Forest.	Wollongong, Shellharbour and Kiama and beyond
NPWS (2002) Native Vegetation of the Illawarra Escarpment and Coastal Plain. NSW National Parks and Wildlife Service.	Vegetation mapping at 1;16000 scale. The mapping delineates polygons of native vegetation ≥ 0.3ha (300m^2). Spatial accuracy of the linework is mostly within 24m accuracy, but can reach up to 70m on steep escarpment slopes where displacement errors from air photos are greatest. Errors in this mapping may also arise due to misinterpretations of canopy patterns in the API. However, a reliability code on each polygon allows for this reliability to be assessed based on how the site was assessed (i.e. in the field, or from aerial photo interpretation). In this context, the coastal vegetation requires refinement. Some small patches are not mapped and some vegetation stands which constitute EEC s are inaccurately identified.	Wollongong. A small portion extends into Shellharbour LGA at Calderwood Valley

Eco-logical (2006) Vegetation Mapping Update and Field Validation	This study allowed for field ground truthing of the NPWS (2002) Native Vegetation of the Illawarra Escarpment and Coastal Plain mapping. The field assessment was undertaken at 332 sites for the coastal plain and 200 sites for the escarpment. In total this resulted in a change of community for 3% of the sites sampled, and a change of condition for 27% of sites.	Wollongong
NPWS (2003) Native Vegetation of the Woronora, O'Hares and Metropolitan Catchments.	This vegetation mapping uses aerial photo interpretation (API) from a combination of photos at 1:16,000 and 1:25,000 scales. The vegetation classification is based on 576 full floristic survey sites. Spatial accuracy is poorer on steep escarpment slopes where displacements from air photos are greatest. The vegetation classification is not consistent with NPWS (2002) mapping. e.g. MU17 is O'Hares Creek Shale Forest, while MU17 in NPWS (2002) is Tall Open Gully Gum forest and O'Hares Creek Shale Forest is MU21.	Wollongong
Mills, K. and Associates (2006) The Natural Vegetation in the Municipality of Kiama, NSW.	Excludes vegetation within the National Park Estates within the LGA. This mapping is based on field surveys undertaken in 2003, and 1:8,000 aerial photography (1997). Several communities with small distributions are not mapped, including some smaller patches of EECs including Themeda Grasslands, and Freshwater Wetlands. The classification was based on a binomial system and captures 1) the name(s) of dominant species in the tallest stratum, and 2) the structure of the community.	Kiama
Department of Environment, Climate Change and Water (2009) The native vegetation of the Sydney Metropolitan Catchment Management Area DRAFT.	This mapping has not yet been reviewed within the Wollongong LGA, however it does improve on the current mapping (NPWS 2002) for its classification and mapping of Southern Sydney Sheltered Forest as a discreet map unit.	Only the far northern part of Wollongong LGA. North from approximately Stanwell Tops
Kiama Municipal Council (2007) Roadside Vegetation Survey, Plan of Management.	A survey assessed 206km of rural roads and mapped and determined conservation value for roadside vegetation. The mapping does not align or validate to any other available vegetation mapping. Remnant vegetation was assessed by a basic 'windscreen survey'.	Kiama
Nature Conservation Council (1999) Illawarra Bushland database.	Compiles a number of random meander surveys from the Illawarra. Unfortunately, due to the non standardised approach to surveying, these data cannot be used toward the larger quantitative mapping data sets. They otherwise provide a very valuable reference for specific sites. The survey boundaries were estimated from 1:25,000 topographic maps.	Illawarra - Stanwell Park to Shoalhaven River

Mills, K. and Associates (2000) Nature Conservation Study Rural Lands Study Area City of Shellharbour.	Identifies and describes the vegetation and conservation values of the rural lands study area. Also discusses fauna habitat in the Shellharbour LGA. Vegetation mapping is the result of field surveys conducted in 1999, and reference to 1:8,000 colour aerial photos (1998).	Shellharbour
Mills, K. and Associates (2001) The Natural Vegetation in the City of Shellharbour.	Expands on Mills (2000) to cover the whole LGA, excluding National Park Estate. Mapping is based on field surveys in 1999. Reference was also made to 1:8,000 aerial photographs taken in 1998. Vegetation was classified based on dominant canopy trees and the structure of the community.	Shellharbour
Gaia Research (2009) Fauna surveys in remnant forests in the Dunmore region of the Illawarra.	Details the results of a number of systematic fauna surveys undertaken for this area. Makes recommendations for key conservation priorities of the area.	Shellharbour, Kiama
Eco Logical Australia (2007) Shellharbour / Kiama Regional Hard Rock Resource Review - Flora and Fauna assessment	Validated, reviewed and refined P5MA vegetation community mapping by Tindall *et al*. (2004). Field survey resulted in revised vegetation mapping at 1:10,000 scale.	Shellharbour, Kiama
Mills, K. and Associates (2004) Flora and Fauna assessment urban fringe	This assessment was undertaken to assist in the development of the Urban Fringe LEP on the edge of existing urban areas at Dunmore and Albion Park. It undertook a review of mapping of flora and fauna (Mills 2001), validated mapping accuracy, and describes regionally and locally significant vegetation and communities. Priorities for conservation are also identified. Amends boundaries to Grassy Woodlands.	Shellharbour
NPWS (2003) Bioregional Assessment Study Part III. Conservation assessment identifying areas of National, State, and bioregional significance for biodiversity within Wollongong LGA.	This study identifies priority conservation areas across the Wollongong LGA, and a small part of the Shellharbour LGA (Calderwood Valley). It assigns conservation significance across the study area based on a range of factors including the presence of habitat for threatened species, condition, patch size, waterbird habitat, regional corridors and quality of habitat for threatened fauna. This report also proposes two regional corridors; 1) The Moist Forest Fauna Linkage, a continuous north-south band along the edge of the escarpment, and 2) The Yallah-Calderwood Fauna Linkage, connecting the escarpment to Lake Illawarra.	Wollongong and part of Shellharbour
NPWS (2002) Bioregional Assessment Part II. Fauna of the Illawarra Escarpment, Coastal Plain and Plateau.	Descriptions and habitat models for 29 priority vertebrate fauna species of the Wollongong area were derived from systematic field survey data. A modelling package was used to statistically examine relationships between the location of species and environmental attributes such as climate, terrain, vegetation type and geology to map predicted high and moderate quality habitat for each species. For some species, GIS layers were manipulated by fauna specialists familiar with habitat requirements of each species to produce expert habitat models. Mostly threatened species were selected for modelling; some non-threatened species that were considered significant were also included. Only species with sufficient field records	Wollongong and part of Shellharbour

	were able to be modelled.	
DECC (2007) Terrestrial Vertebrate Fauna of the Greater Southern Sydney Region. Vol. 2 Species of Conservation Concern and Priority Pest Species.	This provides habitat mapping and detailed descriptions for a range of key species of conservation concern, and attributes species with a priority ranking for the Southern Sydney Region. This extends to Calderwood valley in the south, west to Jenolan Canes, north to Katoomba, and east to the coast. It also provides habitat models for those species. Of 432 terrestrial vertebrate species that have been found in the region, 92 were selected for detailed assessment in this study.	Wollongong and part of Shellharbour
Mills, K. and Associates (2006) The Fauna of Kiama.	Compiles fauna data from Kiama by the author, NPWS Wildlife Atlas, Chafer (1997) and Chafer, Brandis and Wright (1999), records of the Illawarra Bird Observers Club and Mills species records. Also lists fish of rivers and estuaries. Also looks at pest species and core conservation areas. Provides profiles on habitat requirements for threatened species in Kiama LGA. This report does not map existing or potential habitat.	Kiama
DECC (2007) Terrestrial Vertebrate Fauna of the Greater Southern Sydney Region: Volume 4 - Fauna of the Metropolitan, O'Hares Creek and Woronora Special Areas.	This volume supplements Volume 1- Background Report, and 2 - Fauna of Conservation Concern. It summarises the vertebrate fauna values of the Metropolitan, O'Hares Creek and Woronora Special Areas. This is mostly relevant to the Wollongong LGA.	Wollongong and part of Shellharbour
Chafer, C.J. (1997) Biodiversity of wetlands in the Illawarra Catchments: an inventory. Illawarra Catchment Management Committee, Wollongong.	This documents a range of biota recorded from the Illawarra region's wetlands including, macroinvertebrates, amphibians, reptiles, mammals, fish, birds, flora and algae. It consolidates a range of data sets previously dispersed in various literature. It highlights gaps in the known fish fauna of the Illawarra. Includes data on macroinvertebrates, amphibians, reptiles, mammals, fish, wetland birds and native wetland plants.	Illawarra
DECC (2008) Rapid Fauna Habitat Assessment of the Sydney Metropolitan Catchment Management Authority area. Report to the Sydney Management Catchment Authority. Information and Assessment Section, Metropolitan Branch, DECC, Hurstville.	Limited application to the Illawarra study area. Relevant only to the far north of Wollongong LGA. The study was done to assist the Sydney Metro CMA to address priority fauna species in the Catchment Action Plan. It describes the terrestrial, native fauna of the study area, prioritises key habitat areas, and prioritises species of conservation concern.	Northern extent of Wollongong LGA only
DECC (2008) Shorebird habitat mapping	Feeding and roosting areas for seven species - Black-tailed Godwit, Sanderling, Great Knot, Terek Sandpiper, Broad-billed Sandpiper, Greater Sand Plover and Lesser Sand Plover. Positional accuracy varies from 10-100m. The mapping is broad and possibly under-estimates the habitat for these species.	Illawarra

APPENDIX 2 WEEDS OF THE ILLAWARRA

Botanical Name	Common Name	Noxious weeds						WONS **	High Priority Weeds ***	Environmental Weed
		Class 1	Class 2	Class 3	Class 4	Class 4*	Class 5			
Acacia baileyana	Cootamundra Wattle									*
Acacia karroo	Karoo Thorn	*								*
Acacia nilotica	Prickly Acacia	*								*
Acacia saligna	Golden Wreath Wattle									*
Acer negundo	Box Elder									*
Acetosa sagittata	Turkey Rhubarb								*	*
Achnatherum brachychaetum	Espartillo						*			*
Agapanthus praecox subsp. *orientalis*	Agapanthus									*
Ageratina adenophora	Crofton Weed								*	*
Ageratina riparia	Mistflower								*	*
Ailanthus altissima	Tree of Heaven								*	*
Alocasia macrorrhizos	Elephant Ears									*
Alstroemeria psittacina	New Zealand Christmas Bell									*
Alternanthera philoxeroides	Alligator Weed		*							*
Amaranthus spp.	Amaranth									*
Ambrosia artemisiifolia	Annual Ragweed						*			*
Ambrosia confertiflora	Burr Ragweed						*			*
Anagallis arvensis	Scarlet/Blue Pimpernel									*
Andropogon virginicus	Whisky Grass									*
Annona glabra	Pond Apple	*								*
Anredera cordifolia	Madeira Vine								*	*
Araujia sericifera	Moth Vine								*	*
Argemone mexicana	Mexican poppy						*			*
Arundo donax	Giant Reed									*
Asparagus aethiopicus	Ground Asparagus									*
Asparagus asparagoides	Bridal Creeper						*	*		*
Asparagus scandens, A. plumosus	Climbing Asparagus									*
Aster subulatus	Wild Aster									*
Asystasia gangetica subsp. *micrantha*	Chinese Violet	*								*
Avena barbata	Bearded Oats									*
Avena strigosa	Sand Oat						*			*
Axonopus fissifolius	Narrow-leaved Carpet Grass									*
Baccharis halimifolia	Groundsel Bush			*						*
Bambusa spp. and Phyllostachys spp.	Bamboo									*
Bassia scoparia- except *Bassia scoparia* subsp. *trichophylla*	Kochia	*								*
Bidens pilosa	Cobblers Pegs									*
Brachychiton discolor	Lacebark Tree									*
Brassica barrelieri subsp. *oxyrrhina*	Smooth-stemmed Turnip						*			*
Briza spp. *(major, minor, subarista)*	Shivery Grass									*
Bromus catharticus	Prairie Grass									*
Bromus racemosus	Smooth Brome									*

Botanical Name	Common Name	Noxious weeds						WONS **	High Priority Weeds ***	Environmental Weed
		Class 1	Class 2	Class 3	Class 4	Class 4*	Class 5			
Bryophyllum spp. and hybrids	Mother of Millions								*	*
Cabomba caroliniana	Cabomba						*			*
Caesalpinia decapetala	Mysore Thorn			*						*
Canna indica	Indian Shot									*
Capsella bursa-pastoris	Shepherd's Purse									*
Cardiospermum grandiflorum	Balloon Vine									*
Carthamus glaucus	Glaucous starthistle						*			*
Celtis occidentalis	Hackberry									*
Celtis sinensis	Chinese Nettle Tree									*
Cenchrus biflorus	Gallon's Curse						*			*
Cenchrus brownii	Fine-bristled Burr Grass						*			*
Cenchrus echinatus	Mossman River Grass						*			*
Centaurea maculosa	Spotted Knapweed	*								*
Centaurea nigra	Black Knapweed	*								*
Cerastium glomeratum	Mouse Ear Chickweed									*
Cestrum parqui	Green Cestrum									*
Chamaesyce spp.	Caustic Weeds									*
Chenopodium album	Fat Hen									*
Chenopodium ambrosioides	Mexican Tea									*
Chloris gayana	Rhodes Grass								*	*
Chloris virgata	Feathertop Rhodes Grass									*
Chlorophytum comosum	Spider Plant									*
Chromolaena odorata	Siam weed	*								*
Chrysanthemoides monilifera subsp *monilifera*	Boneseed				*			*		*
Chrysanthemoides monilifera subsp *rotundata*	Bitou bush				*			*	*	*
Cinnamomum camphora	Camphor Laurel									*
Cirsium vulgare	Spear Thistle									*
Citrus x taitensis	Rough Lemon Citrus									*
Conium maculatum	Hemlock									*
Convolvulus arvensis	Field Bindweed									*
Conyza albida	Tall Fleabane									*
Conyza bonariensis	Flaxleaf Fleabane									*
Coprosma repens	Mirror Bush									*
Coreopsis lanceolata	Coreopsis									*
Cortaderia species	Pampas grass				*					*
Cotoneaster spp.	Cotonoeaster									*
Crassocephalum crepidioides	Thickhead									*
Crassula multicava	Stonecrop									*
Cretaegus monogyna	Hawthorn									*
Cryptostegia grandiflora	Rubbervine	*								*
Cupaniopsis anacardioides	Tuckeroo									*
Cuscuta campestris	Golden Dodder				*					*
Cuscuta species	Dodder						*			*
Cynara cardunculus	Artichoke Thistle						*			*
Cyperus brevifolius	Mullumbimby couch									*
Cyperus eragrostis	Umbrella Sedge									*
Cyperus esculentus	Yellow Nutgrass						*			*
Cyperus rotundus	Nut Grass									*
Cyperus tenellus	Tiny flat sedge									*

Botanical Name	Common Name	Noxious weeds						WONS **	High Priority Weeds ***	Environmental Weed
		Class 1	Class 2	Class 3	Class 4	Class 4*	Class 5			
Cytisus scoparius	Scotch/English broom				*					*
Dactylis glomerata	Cocksfoot Grass									*
Datura stramonium	Common Thornapple									*
Delairea odorata	Cape Ivy								*	*
Digitaria sanguinalis	Summer Grass									*
Dipogon lignosus	Dolichus Pea									*
Echinochloa crus-galli	Barnyard Grass									*
Ehrharta erecta	Panic Veldtgrass									*
Eichhornia azurea	Anchored water hyacinth	*								*
Eichhornia crassipes	Water hyacinth			*						*
Eleusine spp.	Crowsfoot Grasses									*
Emex australis	Spiny Emex									*
Equisetum species	Horsetail	*								*
Eragrostis curvula	African Lovegrass				*					*
Erigeron karvinskianus	Bony-tip Fleabane									*
Eriobotrya japonica	Loquat									*
Erythrina crista-galli	Cockspur Coral Tree									*
Erythrina x sykesii	Coral Tree								*	*
Euphorbia marginata	Snow-on-the-Mountains									*
Euphorbia peplus	Petty Spurge									*
Euryops spp.	Yellow Daisy									*
Festuca gautieri	Bear-skin Fescue						*			*
Foeniculum vulgare	Fennel									*
Fraxinus spp.	European Ashes									*
Freesia alba x leichtlinii	Freesia									*
Fumaria muralis subsp. *muralis*	Fumary									*
Galinsonga parviflora	Potato weed									*
Gaura lindheimeri	Clockweed						*			*
Gaura parviflora	Clockweed						*			*
Gazania species	Gazania									*
Genista monspessulana	Cape Broom									*
Gomphocarpus fruticosus	Narrow-leaved Cotton Bush									*
Grevillea robusta	Silky Oak Grevillea									*
Gymnocoronis spilanthoides	Senegal Tea Plant	*								*
Harrisia species	Harrisia Cactus					*				*
Hedera helix	English Ivy									*
Hedychium gardnerianum	Ginger Lily									*
Helianthus ciliaris	Texas blueweed						*			*
Herbertia lahue	Blue Tiger Flower									*
Hieracium species	Hawkweed	*								*
Holcus lanatus	Yorkshire Fog Grass									*
Hydrocotyle bonariensis	Pennywort									*
Hygrophila polysperma	East Indian Hygrophila	*								*
Hymenachne amplexicaulis	Hymenachne	*								*
Hyparrhenia hirta	Coolatai Grass									*
Hypericum perforatum	St Johns Wort			*						*
Hypochaeris radicata	Catsear									*
Impatiens walleriana	Busy Lizzie									*
Ipomea purpurea	Morning Glory									*
Ipomoea cairica	Coastal Morning glory									*

Botanical Name	Common Name	Noxious weeds						WONS **	High Priority Weeds ***	Environmental Weed
		Class 1	Class 2	Class 3	Class 4	Class 4*	Class 5			
Ipomoea indica	Morning Glory								*	*
Jacaranda mimosifolia	Jacaranda									*
Juncus acutus	Sharp Rush									*
Koelreuteria paniculata	Golden Shower									*
Lactuca serriola	Prickly Lettuce									*
Lagarosiphon major	Lagarosiphon	*								*
Lagunaria patersonia subsp. *patersonia*	Norfolk Island Hibiscus									*
Lantana camara	Lantana				*		*	*	*	*
Leonotis leonurus	Lion's Tail									*
Ligustrum lucidum	Large leaved Privet								*	*
Ligustrum sinense	Small leaved Privet								*	*
Lilium formosanum	Formosan Lily									*
Limnocharis flava	Yellow Burrhead	*								*
Lonicera japonica	Japanese Honeysuckle									*
Ludwigia longifolia	Long-leaf Willow Primrose						*			*
Lycium ferocissimum	African Boxthorn				*					*
Medicago species	Burr Medics									*
Melilotus indicus	Hexham Scent									*
Miconia spp.	Miconia	*								*
Mimosa pigra	Mimosa	*								*
Modiola caroliniana	Red Flowered Mallow									*
Montbretia crocosmia x crocosmiliflora	Monbretia									*
Morus alba	White Mulberry									*
Myriophyllum aquaticum	Parrot's Feather									*
Myriophyllum spicatum	Eurasian water milfoil	*								*
Nassella neesiana	Chilean Needle Grass					*				*
Nassella tenuissima	Mexican Feather Grass	*								*
Nassella trichotoma	Serrated Tussock					*		*		*
Nephrolepsis spp.	Fishbone Fern									*
Nothoscordum borbonocum	Onion Weed									*
Ochna serrulata	Ochna									*
Olea europaea subsp. *cuspidata*	African Olive									*
Olea europea subsp. *europea*	Olive									*
Opuntia species - except *O. ficus-indica*	Prickly Pear					*				*
Orobanche species - Includes all *Orobanche* species except the native *O. cernua* var. *australiana* and *O. minor*	Broomrapes	*								*
Oryza rufipogon	Red rice						*			*
Oxalis species and varieties - Includes all *Oxalis* species and varieties except the native species *O. chnoodes, O. exilis, O. perennans, O. radicosa, O. rubens,* and *O. thompsoniae*	Oxalis						*			*
Paraserianthes lophantha subsp. *lophantha*	Cape Wattle									*
Parietaria judaica	Wall Pellitory									*

Botanical Name	Common Name	Noxious weeds						WONS **	High Priority Weeds ***	Environmental Weed
		Class 1	Class 2	Class 3	Class 4	Class 4*	Class 5			
Parthenium hysterophorus	Parthenium weed	*								*
Paspalum dilatatum	Paspalum									*
Paspalum urvillei	Vasey Grass									*
Passiflora caerula	Blue Passionfruit									*
Passiflora edulis, P. subpeltata, P. suberosa	Passionfruit									*
Pelargonium alchemilloides	Garden Geranium									*
Pennisetum clandestinum	Kikuyu									*
Pennisetum macrourum	African Feathergrass						*			*
Pennisetum setaceum and cultivars	Fountain Grass						*			*
Pennisetum villosum	Foxtail									*
Persicaria capitata	Knotweed									*
Phalaris aquatica	Phalaris									*
Phoenix canariensis	Canary Island date palm									*
Physalis peruviana	Cape Gooseberry									*
Phytolacca octandra	Inkweed									*
Picnomon acarna	Soldier thistle						*			*
Pinus pinaster	Cluster Pine									*
Pinus radiata	Radiata Pine									*
Pistia stratiotes	Water lettuce	*								*
Plantago lanceolata	Lamb's Tongues									*
Plantago major	Greater Plantain									*
Poa annua	Winter Grass									*
Polycarpon tetraphyllum	Four Leaf Allseed									*
Polygala myrtifolia	Myrtle Leaf Milkwort									*
Polygala virgata	Broom Milkwort									*
Polygonum aviculare	Wireweed									*
Polypogon monspeliensis	Annual Beard Grass									*
Prunella vulgaris	Self-heal									*
Prunus laurocerasus	Cherry Laurel									*
Psoralea pinnata	African Scurfpea									*
Pyrancantha spp.	Firethorn									*
Ranunculus repens	Creeping Buttercup									*
Rhaphiolepsis indica	Indian Hawthorn									*
Richardia stellaris	Field Madder									*
Ricinus communis	Castor Oil Plant									*
Robinia pseudoacacia	False Acacia/Black Locust									*
Roldana petasitis	Roldana									*
Romulea species - Includes all *Romulea* species and varieties except *R. rosea* var. *australis*	Onion Grass						*			*
Rorippa microphylla	One-rowed Watercress									*
Rosa rubiginosa	Briar Rose									*
Rubus fruticosus spp. aggregate - except cultivars Black satin, Chehalem, Chester Thornless, Dirksen Thornless, Loch Ness, Murrindindi, Silvan, Smoothstem, Thornfree	Blackberry					*				*

Botanical Name	Common Name	Noxious weeds						WONS **	High Priority Weeds ***	Environmental Weed
		Class 1	Class 2	Class 3	Class 4	Class 4*	Class 5			
Rumex crispus	Curled Dock									*
Sagittaria graminea subsp. *platyphylla*	Sagittaria									*
Sagittaria montevidensis	Arrowhead						*			*
Sagittaria platyphylla	Sagittaria						*			*
Salix species - Includes all *Salix* species except *S. babylonica, S. x reichardtii, S. x calodendron*	Willows						*	*		*
Salvinia molesta	Salvinia		*					*		*
Schefflera actinophylla	Umbrella Tree									*
Scolymus hispanicus	Golden Thistle						*			*
Senecio angulatus	Creeping Groundsel									*
Senecio madagascariensis	Fireweed									*
Senna pendula var *glabrata*	Easter Cassia								*	*
Senna septemtrionalis	Arsenic Bush									*
Setaria gracilis	Slender Pigeon Grass									*
Sida rhombifolia	Paddys Lucerne									*
Sisymbrium thellungii	African turnipweed						*			*
Solanum chenopodioides	White tip Nightshade									*
Solanum mauritianum	Wild Tobacco Tree									*
Solanum nigrum	Blackberry Nightshade									*
Solanum pseudocapsicum	Madeira Winter Cherry									*
Solanum seaforthianum	Brazilian Nightshade									*
Sollya heterophylla	Bluebell Creeper									*
Sonchus arvensis	Corn Sowthistle						*			*
Sonchus oleraceus	Common Sowthistle									*
Sporobolis fertilis	Giant Parramatta Grass			*						*
Sporobolus africanus	Parramatta Grass									*
Stachytarpheta cayennensis	Cayenne Snakeweed						*			*
Stellalria media	Chickweed									*
Stenotaphrum secundatum	Buffalo Grass									*
Stratiotes aloides	Water Soldier	*								*
Striga species - Includes all *Striga* species except native species and *Striga parviflora*	Witchweed	*								*
Tagetes minuta	Stinking Roger									*
Tamarix aphylla	Athel tree						*			*
Taraxacum officinale	Dandelion									*
Thunbergia alata	Black Eyed Susan									*
Toxicodendron succedaneum	Rhus Tree				*					*
Trachyandra divaricata	Dune Onion Weed									*
Tradescantia fluminensis	Trad								*	*
Trapa spp.	Water Caltrop	*								*
Triadica sebifera	Chinese Tallow Wood									*
Trifolium arvense	Hare's Foot Clover									*
Trifolium repens	Clover									*
Tropaeolum majus	Nasturtium									*
Ulex europaeus	Gorse			*						*
Verbascum blattaria	Moth Mulllein									*
Verbascum virgatum	Twiggy Mullein									*
Verbena bonariensis	Purpletop									*

Botanical Name	Common Name	Noxious weeds						WONS **	High Priority Weeds ***	Environmental Weed
		Class 1	Class 2	Class 3	Class 4	Class 4*	Class 5			
Verbena officinalis	Common Verbena									*
Verbena rigida	Purple Verbena									*
Veronica anagallis-aquatica	Blue Water Speedwell									*
Veronica arvensis	Wall Speedwell									*
Veronica persica	Creeping Speedwell									*
Vicia sativa	Common Vetch									*
Vinca major	Periwinkle									*
Watsonia borbonia, W. meriana	Watsonia									*
Xanthium occidentale	Noogoora Burr									*
Xanthium spinosum	Bathurst Burr									*
Zantedeschia aethiopicum	Arum Lily									*
Total		27	2	6	9	5	35	7	17	277

Data sources

***SRCMA (23/11/2009) High Priority Widespread Weeds. Accessed from http://www.environment.nsw.gov.au/CMAweeds/southernrivers.htm

** WONS Weeds of National Significance. Accessed from http://www.weeds.gov.au/weeds/lists/wons.html

BES (2006) Strategic Weed Management Plan, Illawarra Escarpment.

Noxious weeds - Legal Requirements

Class 1	The plant must be eradicated from the land and the land must be kept free of the plant.
Class 2	The plant must be eradicated from the land and the land must be kept free of the plant.
Class 3	The plant must be fully and continuously suppressed and destroyed.
Class 4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.
Class 4*	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed.
Class 5	The requirements in the Noxious Weeds Act for a notifiable weed must be complied with.

APPENDIX 3 ENDANGERED ECOLOGICAL COMMUNITIES OF KIAMA, SHELLHARBOUR AND WOLLONGONG LGA'S

Endangered Ecological Community	TSC Act	EPBC Act	Wollongong	Shellharbour	Kiama	Distribution	Alignment with Tozer *et al.* (2006) Mapping*	DECC priorities (2008b)
Bangalay Sand Forest	Yes		*	*	*	Coastal sand plains on deep, freely draining sands of marine origin. Example locations include Perkins Beach, Korrongulla Wetland, Minnamurra Spit, Seven Mile Beach National Park - Gerroa.	Coastal Sand Forest	High
Coastal Saltmarsh	Yes		*	*	*	Found at the upper limits of the inter-tidal zone of coastal estuaries or saline lakes/lagoons. Examples at Lake Illawarra, Werri Lagoon, Tom Thumb Lagoon, Haywards Bay, Towradgi Creek and Minnamurra River.	Estuarine Saltmarsh	High
Freshwater Wetlands on Coastal floodplains	Yes		*	*	*	Typically on silts, muds or humic loams in depressions, flats, drainage lines, and lakes associated with coastal floodplains. Examples include Mullet and Hooka Creeks, Killalea Lagoon, Yallah Wetlands, and Jerrara Creek Wetland.	Coastal Freshwater Lagoon (part) and Floodplain Wetlands.	High
Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion	Yes		*	*	*	Known only from the Kiama, Shellharbour and Wollongong LGAs. Occurs on floodplains, ridges and slopes of the lower escarpment. Strongholds are West Dapto, Kembla Grange, Yallah, Albion Park, Mount Brown, Blackbutt Reserve, and Croome Reserve.	Illawarra Lowland Woodland and South Coast Grassy Woodland	Highest
Illawarra Subtropical Rainforest in Sydney basin Bioregion	Yes		*	*	*	Associated with coastal permian volanics and other subsrtates mainly between Albion Park and Gerringong, Berkeley Hills, and Illawarra escarpment foothills.	Part of Subtropical Dry Rainforest and part of Subtropical Complex Rainforest.	Highest
Littoral Rainforest (TSC Act); Littoral Rainforest and coastal vine thickets of eastern Australia (EPBC Act)	Yes	Yes	*	*	*	A closed forest community found on headlands and sandunes in close proximity to the coast. Examples include Blue Angle Creek - Gerroa, Bass Point, Perkins Beach, Royal NP, scattered headlands of northern suburbs of Wollongong.	Temperate Littoral Rainforest, and Littoral Thicket (part).	High
Melaleuca armillaris Tall Shrubland	Yes			*	*	Occurs in the local government areas of Shellharbour and Kiama, where remnants have been recorded at Dunmore, Jamberoo Valley, and in small patches in and around Killalea State Park	Basalt Hilltop Scrub and the Dunmore distribution of Morton-Mallee Heath.**	Highest

Endangered Ecological Community	TSC Act	EPBC Act	Wollongong	Shellharbour	Kiama	Distribution	Alignment with Tozer *et al.* (2006) Mapping*	DECC priorities (2008b)
O'Hares Creek Shale Forest	Yes		*			Found north from Cataract Dam through the Woronora Plateau, Darkes Forest, and Helensburgh area. On flat ridgetops and adjoining slopes associated with shale outcrops.	Sydney Shale-Ironstone Cap Forest	Highest
River-flat Eucalypt Forest on Coastal Floodplains	Yes	Yes	*	*		Drainage lines and river terraces of coastal floodplains where flooding is periodic. Examples - Macquarie Rivulet and Minnamurra River.	In the Illawarra this relates to 'Floodplain Swamp Forest'.	High
Robertson Basalt Tall Open-Forest	Yes		*	*	*	High nutrient soils in high rainfall areas of the Southern Highlands, in the Illawarra mostly found in Knights Hill, Kiama LGA.	Southern Highlands Basalt Forest	Highest
Robertson Rainforest	Yes			*	*	Robertson Rainforest is found on high fertility soils derived generally from Tertiary basalts, at high altitudes (500-750m) and under high rainfalls (Mills & Jakeman 1995). Known from the Knights Hill area mostly in the Kiama district.	Yarrawarra Temperate Rainforest	Highest
Shale/ Sandstone Transition Forest	Yes	Yes	*			NPWS (2003) Woronora mapping suggests restricted amounts of this community occur on the far western margins of the Wollongong LGA in the Cataract catchment within Sydney Catchment Authority land.	Cumberland Shale Sandstone Transition Forest.	Highest
Southern Sydney Sheltered Forest	Yes		*			Associated with sheltered heads and upper slopes of gullies where soils are influenced by lateral movement of moisture, nutrients and sediments from more fertile substrates. Known in the northern part of Wollongong LGA around the Helensburgh, Stanwell Tops, Otford and Darkes Forest area.	Not listed under the TSC Act at time of publication.	Highest - *not listed in DECC 2008. Restricted distribution.*
Southern Highlands Shale Woodlands	Yes		*	*		Southern Highlands Shale Woodland is msotly confined to a small area in the Southern Highlands, mostly around Bundanoon. It has been observed in the far west of the Shellharbour LGA in Macquarie Pass National Park. It is restricted to clay soils derived from Wianamatta Shale. It may also occur in the Kiama LGA as part of the Moss Vale Tableland.	Southern Highlands Shale Woodland. Also mapped as Highlands Shale Tall Open Forest in NPWS (2002a)	High

Endangered Ecological Community	TSC Act	EPBC Act	Wollongong	Shellharbour	Kiama	Distribution	Alignment with Tozer *et al.* (2006) Mapping*	DECC priorities (2008b)
Swamp Oak Floodplain Forest	Yes		*	*	*	Lake margins and estuarine fringes associated with coastal floodplains where groundwater is saline or sub-saline. Example sites include; Puckey's Estate, Minnamurra, Lake Illawarra, Dunmore wetlands.	Floodplain Swamp Forest, Estuarine Fringe Forest, Estuarine Creekflat Scrub.	High
Swamp Sclerophyll Forest on Coastal Floodplains	Yes		*	*	*	Associated with humic clay and sandy loam soils on waterlogged or periodically flooded areas. Example sites include Crooked River area - Gerroa, Perkins Beach - Windang.	Coastal Sand Swamp Forest	High
Sydney Freshwater Wetlands in the Sydney Basin Bioregion	Yes		*	*		Primarily freshwater swamps in in swales and depressions behind dunes or low nutrient sandplains. Example sites includes Coomaditchy lagoon, Shellcove, Korrongulla Wetland - Primbee, Spring Creek - Kiama, and Bellambi Lagoon.	Forms part of Coastal Freshwater Lagoon and Floodplain Wetlands	Highest
Temperate Highland Peat Swamps on Sandstone		*Yes*	*			Temporary or permanent swamps associated with a substrate of peat over sandstone, and vegetation characterised by the presence of sedges, graminoids (grass-like plants) and forbs (herbaceous non-grass or grass-like plants). In the Illawarra these are mostly found in the northern part of Wollongong LGA around Maddens Plains, Woronora Plateau, and Stanwell Tops	Coastal Upland Swamps	High
Themeda Grassland on Seacliffs and Coastal Headlands	Yes		*		*	Closed tussock grassland known from seacliffs and coastal headlands. Example sites include Wollamai Point - Berkely, Killalea Park, Bald Hill - Stanwell Park.	Headland Grassland	High

** Other vegetation mapping datasets are also available that map EECs in this area, refer to Appendix 1 Data audit. A map should always be used in combination with field surveys.*

***The Morton Malle Heath mapping across the Dunmore lands is an error in the mapping. This unit is a sandstone heath - its distrubtion in Dunmore should be amended to Basalt Hilltop Scrub. (G. Daly pers comm.)*

APPENDIX 4 THREATENED FLORA

			NO. OF RECORDS BY LGA						SOURCE OF RECORDS		
SCIENTIFIC NAME	**TSC ACT**	**EPBC ACT**	**KIAMA**	**SHELL**	**WOLL**	**Total**	**Illawarra Priority**	**Distribution in the Illawarra**	**ATLAS data**	**NSW Herbarium**	**Janet Cosh herbarium**
Acacia baueri s ubsp. *aspera*	Vulnerable				3	**3**	3 Medium	Low heath, often on sandstone (NCC 1999). Recorded from SCA lands in Cordeaux and Cataract catchments.	-	-	-
Acacia bynoeana	Endangered				41	**41**	3 Medium	Mostly recorded in SCA lands from Darkes Forest north in Woronora catchment on latertitic soils.	-		
Arthropteris palisotii	Endangered				1	**1**	3 Medium	Found in rainforest, mainly on trunks. Recorded from Mount Keira in Illawarra Escarpment SCA.	-		
Astrotricha crassifolia	Vulnerable	Vulnerable			162	**162**	3 Medium	Found around Woronora dam within SCA lands.	-	-	
Boronia deanei	Vulnerable	Vulnerable	9			**9**	3 Medium	Wet heath. Recorded at Budderroo NP (NCC 1999).	-	-	-
*Callistemon linearifolius**	Vulnerable				2	**2**	3 Medium	Occurs in dry sclerophyll forest. Recorded from Coalcliff and Garrawarra, northern Wollongong LGA.	-		
Callitris endlicheri- Woronora plateau population	Endangered population				6	**6**	2 High	Found at Woronora Plateau.	-		
Chorizema parviflorum	Endangered population			10	40	**50**	2 High	Recorded between Ausinmer and Albion Park. Mostly occurring in the Yallah area.	-		
Cynanchum elegans	Endangered	Endangered	9	30	44	**83**	2 High	Often occurs in association with dry rainforest vegetation. Known from Berkeley Hills on latite to Toolijooa in association with Budgong sandstone.	-	-	-
Daphnandra sp.' Illawarra'	Endangered	Endangered	60	14	10	**84**	1 Highest	Endemic to the Illawarra. The main distribution extends from Avondale in Wollongong LGA to Toolijooa in Kiama LGA.There is a nothern outlying population at Scarborough	-	-	-
Epacris purpurascens var. *purpurascens**	Vulnerable				22	**22**	3 Medium	All records found within SCA lands, mostly around Woronora Dam, several records within Cataract Catchment.	-	-	
Genoplesium baueri	Vulnerable				1	**1**	4 Low	Heathcote National Park.	-		
Grevillea rivularis	Endangered	Endangered	7			**7**	2 High	Grows on moist creekside on sandstone; rare, confined to Carrington Falls (Plantnet).	-	-	-
Haloragis exalata subsp. e*xalata. (Includes var. exalata and var. laevis)*	Vulnerable	Vulnerable			3	**3**	3 Medium	Damp places near watercourses (NCC 1999). Recorded from Stanwell Park and Coalcliff.	-	-	
Irenepharsus trypherus	Endangered	Endangered	12	15	1	**28**	1 Highest	Restricted to the Illawarra and Shoalhaven. Known from Budderoo NP, Macquarie Pass, Stockyard Mtn, Minnamurra rainforest, Yellow Rock and Marshall Mount.	-	-	-
Lespedeza juncea	Endangered population				2	**1**	1 Highest	Only known from Yallah area. Further survey work needed.	-		
Leucopogon exolasius	Vulnerable	Vulnerable			25	**25**	3 Medium	Mostly on Sydney Catchment Authority land, Woronora dam south to Cordeaux.	-	-	-
Melaleuca deanei	Vulnerable	Vulnerable			4	**4**	3 Medium	SCA land near Woronora dam.	-	-	-
Persoonia acerosa	Vulnerable				1	**1**	3 Medium	SCA land near Cordeaux dam.	-		
Persoonia bargoensis	Endangered	Vulnerable			1	**1**	3 Medium	Restricted to small area between Western edge of the Woronora Plateau and the northern edge of the Southern Highlands. Woodland or dry sclerophyll forest on			-
Persoonia hirsuta	Endangered	Endangered			1	**1**	3 Medium	Recorded in Cataract catchment. Occurs in dry sclerophyll open forest, woodland and heath on sandstone (Plantnet).			-
Pimelea spicata	Endangered	Endangered	3	37		**40**	1 Highest	Known from the Illawarra and the Cumberland Plain. In the Illawarra known from coastal headlands and hill tops from Mount Warrigal in the north to Minnamurra, and	-	-	
Pomaderris adnata	Endangered				27	**27**	1 Highest	Endemic to Sublime Point area - highly restricted population.	-	-	-
Pomaderris brunnea	Vulnerable	Vulnerable			1	**1**	4 Low	SCA land, Cordeaux catchment. In open forest, confined to the Colo R. and upper Nepean R. (Plantnet).	-	-	

			NO. OF RECORDS BY LGA						SOURCE OF RECORDS		
SCIENTIFIC NAME	**TSC ACT**	**EPBC ACT**	**KIAMA**	**SHELL**	**WOLL**	**Total**	**Illawarra Priority**	**Distribution in the Illawarra**	**ATLAS data**	**NSW Herbarium**	**Janet Cosh herbarium**
Pomaderris walshii	Critically endangered		6			**6**	2 High	Carrington Falls, Douglas creek. Highly restricted distribution. It is currently known only from the upper catchment of the Kangaroo River, above the escarpment near		-	-
Prostanthera marifolia	Critically endangered				10	**10**	4 Low	Recorded in the north of Wollongong LGA in Garrawarra SCA, Helensburgh and Woronora dam area.	-	-	
Pterostylis gibbosa	Endangered	Endangered		2	14	**16**	1 Highest	Known from Penrose, Yallah, Croome area. Mostly on privately owned land.	-	-	
Pterostylis pulchella	Vulnerable	Vulnerable	3			**3**	3 Medium	Grows on escarpments close to waterfalls and on moist, sheltered ridges; chiefly from Blue Mtns to Fitzroy Falls (Plantnet). Recorded in Budderoo NP and Yellow Rock area.	-	-	
Pultenaea aristata	Vulnerable	Vulnerable		1	4466	**4467**	2 High	Grows in moist, dry sclerophyll woodland to heath on sandstone; Helensburg to Mt Keira (Plantnet).	-	-	-
Senna acclinis	Endangered				1	**1**	1 Highest	Grows in subtropical rainforest, and moist eucalypt forest. Now very rare owing to clearing; last collected at Balgownie in 1982 (Plantnet).	-	-	
Solanum celatum	Endangered		7	286	2	**295**	1 Highest	Escarpment lands from Mount Kembla south to Macquarie Pass, Tongarra and Yellow Rock areas.	-	-	
Syzygium paniculatum	Endangered	Vulnerable			1	**1**	2 High	Grows in subtropical and littoral rainforest on sandy soils or stabilized dunes near the sea (Plantnet). Recorded at Coalcliff.	-	-	
Wilsonia backhousei	Vulnerable			1		**1**	3 Medium	Grows in coastal and subcoastal saltmarsh, brackish swamps and in inland saline sites (Plantnet). Recorded from Shellharbour - Bass Point on coastal rock shelf. G. Leonard			
Zieria granulata	Endangered	Endangered	128	91	2	**221**	1 Highest	Restricted to the Illawarra region where it is recorded moslty from coastal lowlands between Oak Flats and Toolijooa, in the local government areas of Shellharbour and	-	-	-
		Total	244	487	4,894	5,624					

**These species are flagged as needing further survey work to confirm their species identification.*

APPENDIX 5 THREATENED FAUNA

					No. of records by LGA						
Class	**Scientific Name**	**Common Name**	**TSC**	**EPBC**	**KIAMA**	**SHELL**	**WOLL**	**Total**	**Illawarra Priorities**	**Notes**	**Footnotes**
FROGS	*Heleioporus australiacus*	Giant Burrowing Frog	Vulnerable	Vulnerable	1		44	**45**	Medium	Most likely habitat is sandstone woodland, heath and upland swamp habitats, including the Woronora Plateau (NPWS 2002b).	
	Litoria aurea	Green and Golden Bell Frog	Endangered	Vulnerable	10	22	346	**378**	Highest	Most populations occur in highly modified environs such as in the Port Kembla area. Of highest importance are any populations located in natural situations.	1
	Litoria littlejohni	Littlejohn's Tree Frog	Vulnerable	Vulnerable			44	**44**	High	This frog is poorly known and population trends in the species have been poorly documented.	1
	Mixophyes balbus	Stuttering Frog	Endangered	Vulnerable		10		**10**	Highest	Formerly widespread, known only known from Macquarie Pass. May be other hitherto unrecorded locations which if found are of extreme conservation importance. One of most threatened species in the Illawarra, if not already locally extinct.	1, 3
	Pseudophryne australis	Red-crowned Toadlet	Vulnerable				83	**83**	Medium	Widespread, particularly in SCA land and DECCW reserves. However, for continuation of distribution it is important that inbetween areas are protected and not cleared resulting in populations becoming isolated or disjunct.	1
BIRDS	*Botaurus poiciloptilus*	Australasian Bittern	Endangered		1	4	4	**9**	High	Dependant on wetland habitats.	1
	Burhinus grallarius	Bush Stone-curlew	Endangered		1			1	Locally extinct	Locally extinct.	
	Calidris alba	Sanderling	Vulnerable			15	16	31	Low	Uncommon visitor. Primarily restricted to sandflats of coastal estuaries and ocean beaches e.g. Bellambi Pt. But flocks never seem to hang around for long; likely to be on passage through the area.	1
	Calidris tenuirostris	Great Knot	Vulnerable			10	10	20	Low	Uncommon visitor. Primarily restricted to sand/mudflats of coastal estuaries.	1
	Callocephalon fimbriatum	Gang-gang Cockatoo	Vulnerable		1		79	**80**	Low	Winter visitor to Illawarra. Nest sites are 'High'.	1
	Calyptorhynchus lathami	Glossy Black-Cockatoo	Vulnerable			1	8	**9**	Low	Nest sites 'High', foraging areas 'low'.	1
	Charadrius leschenaultii	Greater Sand-plover	Vulnerable			7	6	13	Low	Uncommon visitor. Primarily restricted to sand/mudflats of coastal estuaries.	1
	Charadrius mongolus	Lesser Sand-plover	Vulnerable			2	2	4	Low	Uncommon visitor. Primarily restricted to sand/mudflats of coastal estuaries.	1
	Circus assimilis	Spotted Harrier	Vulnerable			3		3	Low	Occasional visitor.	2
	Dasyornis brachypterus	Eastern Bristlebird	Endangered	Endangered	1		1	**2**	Highest	Barren Grounds area.	1
	Ephippiorhynchus asiaticus	Black-necked Stork	Endangered			1	2	**3**	Low	Former resident / vagrant.	1,2,
	Esacus neglectus	Beach Stone-curlew	Critically endangered				1	**1**	Low	Vagrant to the area.	1,2,
	Grantiella picta	Painted Honeyeater	Vulnerable				1	**1**	Medium	Vagrant	1,2,
	Haematopus fuliginosus	Sooty Oystercatcher	Vulnerable			5	23	**28**	High	Foraging sites on exposed reef platforms and adjacent beaches are subject to high levels of disturbance by fishermen, dogs and people in general.	1
	Haematopus longirostris	Pied Oystercatcher	Endangered			1	3	**4**	Medium	Only present in small numbers. All nesting attempts are likely to fail due to human disturbance. Also feeding areas such as beaches and sandflats at estuary entrances are subject to high levels of disturbance.	1
	Hieraaetus morphnoides	Little Eagle	Vulnerable			4	7	**13**	Medium	Regularly seen at Darkes Forest.	2
	Irediparra gallinacea	Comb-crested Jacana	Vulnerable			2		**2**	Locally extinct	Locally extinct.	
	Ixobrychus flavicollis	Black Bittern	Vulnerable				13	**13**	High	Dependant on wetland habitats.	1

					No. of records by LGA						
Class	**Scientific Name**	**Common Name**	**TSC**	**EPBC**	**KIAMA**	**SHELL**	**WOLL**	**Total**	**Illawarra Priorities**	**Notes**	**Footnotes**
	Lathamus discolor	Swift Parrot	Endangered	Endangered		6	28	**34**	Highest	As for Regent Honeyeater, although a more regular visitor	1
	Limicola falcinellus	Broad-billed Sandpiper	Vulnerable				3	**3**	Low	Rare visitor. Primarily restricted to sand/mudflats of coastal estuaries.	1
	Limosa limosa	Black-tailed Godwit	Vulnerable				1	**1**	Medium	Rare visitor.	1,2,
	Lophoictinia isura	Square-tailed Kite	Vulnerable			1	3	**4**	Medium	Rare visitor. However, where nesting these should be protected	1
	Neophema chrysogaster	Orange-bellied Parrot	Critically endangered	Critically endangered		1		**1**	Low	Vagrant	1,2,
	Neophema pulchella	Turquoise Parrot	Vulnerable				10	**10**	Medium	Uncommon visitor to woodlands and heathy areas. No known breeding locations .	1,2,
	Ninox connivens	Barking Owl	Vulnerable			1	4	**5**	High	Rare in the region.	1
	Ninox strenua	Powerful Owl	Vulnerable			10	39	**49**	Medium	Nest sites 'High'; Foraging Areas 'Medium'	1
	Oxyura australis	Blue-billed Duck	Vulnerable			3	1	**4**	Low	Rare visitor.	1,2,
	Pachycephala olivacea	Olive Whistler	Vulnerable			2	3	**5**	Low	Rare winter visitor, mostly to water catchment land	1,2,
	Pandion haliaetus	Osprey	Vulnerable				1	**1**	Low	Rare visitor	1
	Petroica rodinogaster	Pink Robin	Vulnerable				4	**4**	Low	Rare winter visitor	1
	Petroica boodang	Scarlet Robin	Vulnerable				9	**9**	Medium	Open forests and woodlands.	
	Petroica phoenicea	Flame Robin	Vulnerable			1	1	**2**	Medium	Formerly seasonal visitors in significant numbers to the uplands around Robertson. Nowdays rarerly occur.	
	Pezoporus wallicus wallicus	Eastern Ground Parrot	Vulnerable		107			107	HIghest	Recently rediscovered on Woronora Plateau.	1,2,
	Ptilinopus magnificus	Wompoo Fruit-Dove	Vulnerable				2	**2**	High	Vagrant. Formerly a resident. Primarily occurs in rainforest habitats or other forest types with fruiting trees in subcanopy	1
	Ptilinopus regina	Rose-crowned Fruit-dove	Vulnerable			5	2	**7**	Medium	Very rare visitor. Primarily occurs in rainforest habitats or other forest types with fruiting trees in subcanopy	1
	Ptilinopus superbus	Superb Fruit-Dove	Vulnerable				3	**3**	Medium	Very rare visitor. Primarily occurs in rainforest habitats or other forest types with fruiting trees in subcanopy	1,2,
	Rostratula benghalensis australis	Painted Snipe (Australian subspecies)	Endangered			2		**2**	Low	Although a rare visitor comments as for Australasian Bittern. Also likely to be overlooked due to its habitat preferences and cryptic nature.	1
	Sterna albifrons	Little Tern	Endangered			1	370	**371**	highest	Nest sites of highest conservation significance.	1
	Stictonetta naevosa	Freckled Duck	Vulnerable			1	7	**8**	Medium	Rare visitor relying on wetland habitat.	1,2,
	Thinornis rubricollis	Hooded Plover	Critically endangered				1	**1**	Low	Rare visitor	1
	Tyto novaehollandiae	Masked Owl	Vulnerable			1	7	**8**	High	Prime habitat would have been the Illawarra coastal plain and adjacent scarp forest, particularly rainforest gullies. Most of this habitat has been cleared or severely modified. Any forest remnant supporting this species is of importance.	1
	Tyto tenebricosa	Sooty Owl	Vulnerable			4	66	**70**	Medium	Nest sites 'High'; Foraging Areas 'Medium'	1
	Xanthomyza phrygia	Regent Honeyeater	Critically endangered	Endangered		1	1	**2**	Highest	Occasionally utilises mainly autumn and winter flowering eucalypt species, such as Swamp Mahogany. Any council or private lands supporting such trees are of high importance to this species.	1
	Xenus cinereus	Terek Sandpiper	Vulnerable			1		**1**	Low	Rare visitor. Primarily restricted to sand/mudflats of coastal estuaries.	1
MAMMALS	*Bettongia penicillata penicillata*	Brush-tailed Bettong (South-East Mainland)	Endangered		2	2	2	6	Locally extinct	Locally extinct	1,2,
	Cercartetus nanus	Eastern Pygmy-possum	Vulnerable				60	**60**	Medium	Most suitable habitat in sandstone heaths and woodlands (NPWS 2002b).	
	Chalinolobus dwyeri	Large-eared Pied Bat	Vulnerable	Vulnerable			4	**4**	High	Any roosts are 'highest'	1

					No. of records by LGA						
Class	**Scientific Name**	**Common Name**	**TSC**	**EPBC**	**KIAMA**	**SHELL**	**WOLL**	**Total**	**Illawarra Priorities**	**Notes**	**Footnotes**
	Dasyurus maculatus	Spotted-tailed Quoll	Vulnerable	Endangered	9	2	8	**19**	High	This species is uncommon in the region with localised populations in places in Barren Grounds, elsewhere records are mostly of sporadic single individuals suggesting dispersing individuals or very low density remnant populations. All population require protection, including from inappropriate baiting for feral dogs and foxes	
	Dasyurus viverrinus	Eastern Quoll	Endangered				4	**4**	Locally extinct	No known extant populations. However, if any were to be discovered these would be of the highest conservation significance.	[1]
	Falsistrellus tasmaniensis	Eastern False Pipistrelle	Vulnerable				6	**6**	Medium	Roosts sites if found are 'high'	[1]
	Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	Endangered	Endangered			3	**3**	Highest	No recent confirmed records, possibly locally extinct	[1]
	Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	Vulnerable			2	65	**67**	Medium	Roosts sites if found are 'highest'	[1]
	Mormopterus norfolkensis	Eastern Freetail-bat	Vulnerable				15	**15**	High	Better understanding of habitat requirements is need to understand distribution in the Illawarra (NPWS 2002b).	
	Myotis adversus	Large-footed Myotis	Vulnerable			1	36	**37**	High	This bat is scattered along waterways and wetlands in the region. Any roosts are 'High'	[1]
	Petaurus australis	Yellow-bellied Glider	Vulnerable		1			1	Low	Not known in the Illawarra but if found 'high' significance.	[1,2,]
	Petaurus norfolcensis	Squirrel Glider	Vulnerable				1	**1**	High	Not known in the Illawarra but if found 'high' significance.	
	Petrogale penicillata	Brush-tailed Rock-wallaby	Endangered	Vulnerable			1	**1**	Locally extinct	No known extant populations. However, if any were to be discovered these would be of the highest conservation significance.	[1]
	Phascolarctos cinereus	Koala	Vulnerable		2		40	**42**	Medium	Most likely to be seen above the escarpment, dispersing from the Nepean and Wedderbrun populations (NPWS 2002b).	
	Potorous tridactylus	Long-nosed Potoroo	Vulnerable	Vulnerable	77			77	Highest	Mostly in reserved lands such as Barren Grounds.	[1]
	Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable	Vulnerable		32	34	**66**	High	All camps in the Illawarra are significant.	[1]
	Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Vulnerable				1	**1**	Low	Likely to be a rare primarily autumn visitor. Where roosts are located in hollows of old trees, these require the highest level of protection .	[1]
	Scoteanax rueppellii	Greater Broad-nosed Bat	Vulnerable				6	**6**	High	Likely to be rarer and more localised than records suggest.	[1]
REPTILES	*Hoplocephalus bungaroides*	Broad-headed Snake	Endangered	Vulnerable			6	**6**	Highest	Predicted habitat primarily within Sydney Water Catchment land and Dharawal SCA.	
	Varanus rosenbergi	Rosenberg's Goanna	Vulnerable				14	**14**	Medium	Scattered through the heathlands of the region. However, the security of the populations are questionable with no formal studies or monitoring being conducted.	[1]
INVERTEBRATES	*Petalura gigantea*	Giant Dragonfly	Vulnerable				1	**1**	Low	Recorded from wetland habitats north from Moss Vale	
Source: Wildlife ATLAS Feb 2009				TOTAL	213	167	1,566	1,948			

[1] Schulz, M. (pers comm.)
[2] Madden, K. (pers comm.)
[3] Garry Daly (pers comm.)

TSC Act schedules

- Schedule 1, of endangered species, endangered populations and ecological communities and species that are presumed to be extinct, and
- Schedule 1A, of critically endangered species and ecological communities, and
- Schedule 2, of vulnerable species and vulnerable ecological communities, and

APPENDIX 6 FRESHWATER AND MARINE THREATENED SPECIES

Common Name	Scientific Name	Fisheries Management Act, NSW	Environment Protection and Biodiversity Conservation Act
FRESHWATER			
Sydney Hawk Dragonfly	*Austrocordulia leonardi*	Endangered	-
Adam's Emerald Dragonfly	*Archaeophya adamsi*	Endangered	-
Macquarie Perch	*Macquaria australasica*	Vulnerable	Endangered
Australian Grayling	*Prototroctes maraena*	-	Vulnerable
MARINE			
Grey Nurse Shark	*Carcharius taurus*	Critically Endangered	Critically Endangered
Southern Bluefin Tuna	*Thunnus maccoyii*	Endangered	Endangered
Great White Shark	*Carcharadon carcharias*	Vulnerable	Vulnerable
Black Cod	*Epinephelus daemelii*	Vulnerable	-
Marine Brown Alga	*Nereia lophocladia*	Critically Endangered	

APPENDIX 7 PROTECTED MIGRATORY BIRDS

Scientific Name	Common Name
Diomedea antipodensis	Antipodean Albatross
Monarcha melanopsis	Black-faced Monarch
Thalassarche bulleri	Buller's Albatross
Thalassarche impavida	Campbell Albatross
Ardea ibis	Cattle Egret
Sterna bergii	Crested Tern
Apus pacificus	Fork-tailed Swift
Diomedea gibsoni	Gibson's Albatross
Ardea alba	Great Egret, White Egret
Larus dominicanus	Kelp Gull
Gallinago hardwickii	Latham's Snipe, Japanese Snipe
Eudyptula minor	Little Penguin
Sterna albifrons	Little Tern
Macronectes halli	Northern Giant-Petrel
Neophema chrysogaster	Orange-bellied Parrot
Rostratula benghalensis s. lat.	Painted Snipe
Merops ornatus	Rainbow Bee-eater
Xanthomyza phrygia	Regent Honeyeater
Rhipidura rufifrons	Rufous Fantail
Thalassarche salvini	Salvin's Albatross
Myiagra cyanoleuca	Satin Flycatcher
Puffinus tenuirostris	Short-tailed Shearwater
Thalassarche cauta (sensu stricto)	Shy Albatross, Tasmanian Shy Albatross
Larus novaehollandiae	Silver Gull
Macronectes giganteus	Southern Giant-Petrel
Lathamus discolor	Swift Parrot
Puffinus pacificus	Wedge-tailed Shearwater
Haliaeetus leucogaster	White-bellied Sea-Eagle
Thalassarche steadi	White-capped Albatross
Pelagodroma marina	White-faced Storm-Petrel
Hirundapus caudacutus	White-throated Needletail

APPENDIX 8 RARE AND SIGNIFICANT FLORA OF THE ILLAWARRA

Scientific Name	Common Name	Notes	ROTAP Code
Abildgaardia ovata		Southern limit at Austinmer. Grows mainly on headlands on clayey soils (ref in NCC 1999. Appendix 11).	
Acalypha nemorum		Regionally rare and southern limit in the Illawarra (Mills 1988). Chiefly grows in subtropical and dry rainforest in coastal areas, a prostrate form occurs on exposed headlands; north from the Shoalhaven River (Plantnet)	
Actephila lindleyi	Actephila	Regionally rare in the Illawarra, southern limit (Mills 1988). Found in subtropical and dry rainforest, coastal areas north from Kiama (Plantnet).	
Acronychia wilcoxiana	Silver Aspen	Southern limit and disjunction; littoral rainforest at Windang (Anders Bofeldt pers.comm).	
Adiantum diaphanum	Filmy Maidenhair	Regionally rare in the Illawarra (Mills 1988). In rainforest, often along streams or near waterfalls (Plantnet).	
Adiantum silvaticum		Regionally rare in the Illawarra (Mills 1988). In rainforest or open forest, often along streams and moist cliff faces; north from the Illawarra region (Plantnet)	
Alchornea ilicifolia	Native Holly	Regionally rare in the Illawarra, southern limit (Mills 1988). Occurs in drier rainforest or on the boundary of open forest, from the coast to the escarpment ranges and upper Hunter Valley; north from the Illawarra region (Plantnet).	
Alyxia ruscifolia	Prickly Alyxia	Regionally rare in the Illawarra (Mills 1988). Grows in most types of rainforest from sea level to 1200 m alt., sometimes in sclerophyll forest; north from Wollongong (Plantnet).	
Aneilema biflorum		Regionally rare in the Illawarra (Mills 1988). Grows in damp or shaded places, often near streams; north from Araluen, and inland to Camden district (Plantnet).	
Archontophoenix cunninghamiana	Bangalow Palm	Regionally rare in the Illawarra (Mills 1988). Grows in or near rainforest in coastal districts, mostly in moist sites beside creeks and on alluvial flats; north from Batemans Bay (Plantnet).	
Asplenium attenuatum	Simple Spleenwort	Regionally rare in the Illawarra (Mills 1988). Usually on rocks in shady places or gullies, sometimes epiphytic..	
Asplenium bulbiferum		Regionally rare in the Illawarra (Mills 1988). Clumped fern in rainforest, terrestrial or growing on rocks, trees or treefern trunks (Plantnet).	
Australina pusilla		Regionally rare in the Illawarra (Mills 1988). Widespread in moist shady situations in forests (Plantnet).	
Austromyrtus acmenoides [Syn. Gossia acmenioides]	Scrub Ironwood	Regionally rare in the Illawarra (Mills 1988). Grows in subtropical rainforest, but more commonly in dry rainforest; chiefly north from the Hunter Valley but as far south as the Illawarra region (Plantnet).	
Blandfordia cunninghamii		Rare. ROTAP 3RCi. Damp sandy or peaty sites aong tops of sandstone cliffs or rocky creeks. Restricted to 2 distinct areas, Blue Mountains and an area between Mount Kembla and Wedderburn. (Fairley 2004).	3RCi
Blechnum camfieldii		Regionally rare in the Illawarra (Mills 1988). Widespread in low-lying areas near the coast, often found near saline waterways; north from Clyde Mtn (Plantnet).	
Blechnum chambersii		Regionally rare in the Illawarra (Mills 1988). In rainforest or in caves near waterfalls; south from Minamurra Falls, rare in NSW (Plantnet).	
Blechnum gregsonii		Blue Mountains to Minnamurra falls. Rock and damp places near waterfalls, sometimes epiphytic (Mills 1988)	2RCa
Brachychiton populneus	Kurrajong	Uncommon in coastal locations (Mills 2000). Dry Eucalypt forest on escarpment foothills.	
Bulbophyllum minutissimum		Regionally rare in the Illawarra (Mills 1988). Recorded between Milton and Shellharbour (Mills 2000). Subtropical rainforest (Mills 2000).	

Scientific Name	Common Name	Notes	ROTAP Code
Bulbophyllum shepherdii	Wheat-leaved Orchid	Few records in the Illawarra, known from Mount Kembla and Royal National Park (Mills 2000). Grows on rocks or trees in rainforest, often in deep shade; north from Conjola, from sea level to c. 1000 m alt (Plantnet).	
Canavalia rosea	Coastal Jack Bean	Rare in NSW, and very rare south of Sydney. Southern limit at Kendall's Beach headland, Kiama (Mark Robinson pers.comm.). Also on Windang Island (Mills 2000).	
Celastrus subspicata		Regionally rare in the Illawarra (Mills 1988). Grows in warmer rainforest; chiefly in coastal districts, north from the Shoalhaven River (Plantnet).	
Celtis paniculata	Native Celtis	Regionally rare in the Illawarra (Mills 1988). In dry, subtropical and especially littoral rainforest; coastal areas north from Kiama district (Plantnet).	
Choricarpia leptopetala	Brush Turpentine	Regionally rare in the Illawarra (Mills 1988). Known from Stanwell Park. Grows on rainforest margins, on poorer soils, often near watercourses or on ridges in wet sclerophyll forest; north from Stanwell Park (Plantnet).	
Cinnamomum oliveri	Oliver's Sassafras	Regionally rare in the Illawarra (Mills 1988). High rainfall zone along the escarment between Berry and Jamberoo (Mills 2000).	
Correa lawrenciana var. *macrocalyx*		Regionally significant, disjunct population at southern limit (NCC 1999, Appendix 11).	
Cupaniopsis anacardioides	Tuckeroo	Regionally rare in the Illawarra (Mills 1988). In littoral rainforest and scrub near the sea and along estuaries, north from Coalcliff (Anders Bofedlt pers.comm.)	
Cyathea cooperi	Straw Treefern	Regionally rare in the Illawarra (Mills 1988). Moist rainforest on the escaprment (Mills 2000).	
Darwinia briggsiae		Mostly occurring in the Budawang ranges, but observed on cliff face overlaooking Macquarie Pass (Fairley 2004). Heathy woodland on rocky outcrops (Fairley 2004).	2RC-
Darwinia diminuta		Occurs in Maddens Plains (Fairley 2004). Heath and woodland. Known from Maddens Plains (Fairley 2004).	2RCi
Darwinia grandiflora		Occurs in Maddens Plains, and along the Bulli-Appin Road, and Cataract-Avon catchments (Fairley 2004). Wet heath, edge of rocky outcrops and sandstone rock platforms (Fairley 2004).	2RCi
Deeringia amaranthoides	Shrubby Deeringia	Regionally rare in the Illawarra (Mills 1988). Climber to 4 m high, or sometimes a small shrub, often flowering when quite small (Plantnet).	
Dendrobium tetragonum	Tree Spider Orchid	Regionally rare in the Illawarra (Mills 1988).Grows on rainforest trees and along streams; coastal districts, north from the Illawarra region (Plantnet)	
Denhamia celastroides	Denhamia	Regionally significant, southern limit; recorded at Macquarie Pass and Royal National Park (NCC 1999). Grows in most types of rainforest and margins with wet sclerophyll forest, disjunct from Wingham (Plantnet).	
Dictymia brownii		Regionally rare in the Illawarra (Mills 1988). Often forming large clumps on rocks or tree trunks, in or near rainforest; widespread, chiefly in the ranges, north from the Blue Mountains , also recorded from Batlow (Plantnet).	
Dillwynia sp. 'Barren Grounds'		Recently recognised, restricted distribution to Barren Grounds NR (Fairley 2004). Wet heath and margins of swamps in sandy - peaty soils.	
Dillwynia sp. *'trichopoda'*		Scattered in small populations. Avon-Cordeaux dam cathcment areas. Sandy soils in dry Eucalypt woodlands (Fairley 2004).	
Dioscorea transversa	Native Yam	Regionally rare in the Illawarra (Mills 1988).Widespread, chiefly in warmer rainforest and moist sclerophyll forest, north from Stanwell Tops (Plantnet).	

Scientific Name	Common Name	Notes	ROTAP Code
Elaeocarpus holopetalus	Black Olive Berry	Regionally rare in the Illawarra (Mills 1988). In and on the margins of cooler rainforest to 1500 m alt., mainly on the ranges in gullies; south from the Ebor area (Plantnet).	
Epacris calvertiana var. *versicolor*		Rare and restricted. Between Barren Grounds and Bundanoon. An old record for Saddleback Mountain (1908). Damp rocky creekbanks and among sheltered rocks in sandstone crevices, near running water (Fairley 2004).	
Epacris coriacea		Occurs in a narrow zone on the escarpment between Royal National Park and Barren Grounds - Budderoo National Park . Rock crevices on sandstone cliffs (Fairley 2004).	3RC-
Epacris microphylla var. *rhombifolia*		Uncommon, restricted distribution. Has been recorded at the top of Jamberro Pass (Fairley 2004). Rocky creek banks, sphagnum bogs, and moist cliff edges (Fairley 2004).	
Erythrorchis cassythoides	Climbing Orchid	Regionally rare in the Illawarra (Mills 1988).Grows on eucalypts, stumps and logs, chiefly in sclerophyll forest on the coast, also on the tablelands; north from Royal N.P. and inland to the Torrington district (Plantnet).	
Eucalyptus apiculata		Mallee Eucalypt observed at Darkes Forest. Rocky outcrops and shallow sandy soils of heaths (Fairley 2004).	3RC-
Eucalyptus luehmanniana	Yellow-top Ash	Restricted to a north-south rage of 100km from Brisbane Water National Park to Bulli Pass within a 20km strip of the coast. Rocky ridgetops and exposed sandy slopes in heath communities.	2RCa
Eucryphia moorei	Pinkwood	Regionally rare in the Illawarra (Mills 1988). Common in warm-temperate rainforest and often the dominant in cool-temperate rainforest, from near Bulli Pass south to Vic., often in gullies (Plantnet).	
Flagellaria indica	Whip Vine	Regionally rare in the Illawarra (Mills 1988).Grows in or near warmer coastal rainforest, frequently along streams or in gullies and often forming dense thickets; north from Royal National Park (Plantnet).	
Geijera salicifolia var. *latifolia*	Scrub Wilga	Regionally rare in the Illawarra, southern limit (Mills 1988). Occurs between Wollongong and Foxground. Southern limit in Kiama area (Mills 2000). Grows in rainforest and vine thickets, coastal districts north from the Illawarra (Plantnet).	
Genoplesium baueri	Bauer's Midge Orchid	Hunter Valley to Nowra district. Sclerophyll forest and moss gardens over sandstone (NCC 1999 Appendix 23).	3RC-
Gmelina leichhardtii	White Beech	Regionally rare in the Illawarra (Mills 1988). Very rare in southern NSW, Southern limit at Berry (Mills 2000). Grows in subtropical, riverine and littoral; north from Berry (Plantnet).	
Gonocarpus salsoloides		Mount Keira - southern limit (NCC 1999 Appendix 23). Swampy areas on sand in cyperoid heath (NCC 1999 Appendix 23).	3RCa
Grevillea diffusa subsp. *constablei*		Restricted and emdemic to southern Sydney. Occurs chiefly in Royal National Park south to Helenburgh and O'Hares creek (Fairley 2004). Grows in dry sclerophyll forest or woodland, occasionally in swampy heath, in sandy soils, usually on Hawkesbury sandstone (Plantnet).	
Grevillea longifolia		O'Hares Creek (NCC 1999 Appendix 23). Hawkesbury Sandstone gully forest on sheltered slopes (NCC 1999 Appendix 23).	2RC-
Grevillea raybrownii		Grows in open eucalypt forest in southen highlands. 1901 specimen from West Dapto. Grows in dry sclerophyll forest in sandy, gravelly loam derived from sandstone, restricted to an area bounded by Dapto, Robertson and Berrima, possibly also Bungonia (Plantnet).	2KC-
Helicia glabriflora	Smooth Helicia	Regionally rare in the Illawarra (Mills 1988).Riverine and littoral rainforest and to a lesser extent warm-temperate rainforest; widely distributed on the coast and nearby ranges north from the Illawarra region (Plantnet).	

Scientific Name	Common Name	Notes	ROTAP Code
Hibbertia nitida		In the Illawarra this plant has been found at O'Hares Creek, and the Avon-Nepean Dams area. (Fairley 2004). Widespread on sandstone in the Sydney district (Plantnet).	2RC-
Hibiscus splendens	Pink Hibiscus	Regionally rare in the Illawarra (Mills 1988).Usually on rocky slopes in mixed forest (Plantnet).	
Hymenophyllum bivalve		Regionally rare in the Illawarra (Mills 1988).Large patches on boulders or tree trunks, usually in rainforest above 300 m alt. (Plantnet).	
Hymenophyllum marginatum	Bordered Filmy Fern	Regionally rare in the Illawarra (Mills 1988).Grows on rocks in rainforest, usually near creeks or waterfalls (Plantnet).	
Hymenophyllum pumilum		Pass above Kiama (NCC 1999 Appendix 23). Epiphytic in cooler rainforest, on wet rocks and cliffs (NCC 1999 Appendix 23).	3RC-
Hymenophyllum rarum	Narrow Filmy Fern	Regionally rare in the Illawarra (Mills 1988). In patches on rocks or often epiphytic on trees or treeferns, in rainforest or moist gullies (Plantnet).	
Korthalsella rubra		Regionally rare in the Illawarra (Mills 1988). Widespread but rare in NSW, rare in the Illawarra. Recorded at Mount Keira (Mills 2000). Parasitic on a broad range of hosts in rainforest to semi-arid woodland (Plantnet).	
Leptopteris fraseri		Regionally rare in the Illawarra (Mills 1988). In very wet places, often near waterfalls in cooler rainforest; chiefly on the ranges south from the Walcha district (Plantnet).	
Lindsaea trichomanoides		Regionally rare in the Illawarra (Mills 1988).In rocky areas of moist forest, chiefly in coastal situations south of Sydney; not common (Plantnet).	3RC-+
Lomandra fluviatilis		From Mount Keira and Bargo in the south to Putty and ohwes Valley in the north. Grown in rocky beds in freshwater streams where it is ocassionalyly inundated by floods (Fairley).Grows in creek beds on sandy soils; in the Royal National Parl to Colo River (Plantnet).	3RCa
Lunathyrium japonicum		Regionally rare in the Illawarra (Mills 1988).Grows in a range of habitats but frequently forms large colonies in or close to stream banks and damp rock faces and crevices (Plantnet)	
Macroglena caudata	Jungle Bristle Fern	Regionally rare in the Illawarra (Mills 1988). In rainforest, commonly on treefern trunks, widespread on the coast and adjacent ranges (Plantnet).	
Mallotus philippensis	Red Kamala	Regionally rare in the Illawarra (Mills 1988).Grows on margins and within warmer rainforest; chiefly north from the Hunter River, also found at Mt Keira (Plantnet).	
Mitrasacme pilosa var. *pilosa*		Uncommon, with a restricted distribution. In the Illawarra, collected from Barren Grounds Nature Reserve.	-
Monotoca ledifolia		Rock platforms on O'Hares Creek (Dharawal NR), and Griffiths trails (Barren Grounds NR). Exposed flat sandstone rocky areas on ridges and plateaux (Fairley 2004).	3RC-
Myoporum bateae		Regionally rare. Eucalypt forest in coastal mountain ranges between Macquarie Pass and Cobargo; old record from Blue Mountains (Mills 2000).	3RC-
Neolitsea dealbata	White Bolly Gum	Regionally rare in the Illawarra (Mills 1988).Common understorey species found in warmer types of rainforest and in ecotone with eucalypt forest, north from the Illawarra region (Plantnet).	
Olearia burgessii		Possible disjunct population at Croome Road, Albion Park, now thought to be extinct from fire (NCC 1999:Appendix 23). Dry sclerophyll woodland.	3K
Omalanthus stillingifolius		Uncommon, recorded between Killalea and Albion Park (Mills 2000). With the largest known population in theSydney region at Albion Park (Robinson, 2001). Moist rocky outcrops near rainforest (Mills 2000) and Eucalypt forest Robinson 2001).	
Panicum pygmaeum	Pygmy Panic	Rare in southern NSW and the Illawara. Rainforest and dense eucalypt forest (Mills 2000) and open Eucalypt forest on fertile soil (Mark Robinson pers.comm.).	

Scientific Name	Common Name	Notes	ROTAP Code
Pellaea paradoxa		Regionally rare in the Illawarra (Mills 1988).In rock crevices, often in rainforest but extending to drier sites (Plantnet).	
Persoonia mollis subsp. *ledifolia*		Uncommon and localised. Early collections were made in 1901 in West Dapto (Fairly 2004). Also recorded at Barren Grounds - Budderro National Park. Heath to dry sclerophyll forest on Hawkesbury sandstone, from the Shoalhaven R. north to Kangaloon, east to Jamberoo and West to Wingello (Plantnet).	-
Persoonia oxycoccoides		Jamberoo Pass (NCC 1999 Appendix 23). Montane heath to dry sclerophyll forest on sandstone.	2RCa
Pisonia umbellifera	Birdlime Tree	Regionally rare in the Illawarra (Mills 1988). Lowland subtropical rainforest and littoral rainforest (Mills 2000).	
Polystichum formosum	Broad Shield Fern	Regionally rare in the Illawarra (Mills 1988). Widespread, but more plentiful in northern areas, in rocky gorges near waterfalls in rainforest (Plantnet).	
Pteris comans	Hairy Bracken	Regionally rare in the Illawarra (Mills 1988). In wet places in rainforest or tall open forest; uncommon (Plantnet).	
Pultenaea paludosa		Uncommon and restricted. Known from Maddens Plains, Bulli to Appin (Fairley 2004). In freshwater swamps dominated by sedges and/or shrubs, usually in peaty soil over sandstone or coastal sand, below 800 m altitude; south from Grafton district (Plantnet)	
Pultenaea villifera		Patchy distirbution, observed on western boundary of Shellharbour LGA (Mills 2000). Sandstone soils from Blue Mountains to Eden (Mills 2000).	
Rumohra adiantiformis		Regionally rare in the Illawarra (Mills 1988).Grows on rocks or trees along rainforest margins (Plantnet).	
Sarcochilus hillii		Regionally rare in the Illawarra (Mills 1988). Usually grows in gallery rainforest on a variety of hosts but most often on Backhousia myrtifolia or rarely on rocks, from sea level to 900 m alt.; north from the Bega district (Plantnet).	
Sarcochilus olivaceus		Regionally rare in the Illawarra (Mills 1988).Grows on trees and more rarely on rocks in rainforest, from sea level to c. 600 m alt.; north from Tathra (Plantnet).	
Symplocos stawellii	White Hazelwood	Regionally rare in the Illawarra, southern limit (Mills 1988).Grows in subtropical and warm-temperate rainforest; north from Royal N.P. (Plantnet). North from Gerringong Creek (NCC 1999, Appendix 11).	
Syzygium oleosum	Blue Lilly Pilly	Regionally rare in the Illawarra (Mills 1988).Grows in littoral, subtropical and warm-temperate rainforest, north from Mt Kembla (Plantnet).	
Telopea mongaensis	Monga Waratah	Regionally rare in the Illawarra (Mills 1988). In fringing temperate rainforest or wet sclerophyll forest, along margins of streams or occasionally mountain slopes, from between 540 to 760 m altitude, on escarpment from Monga (near Braidwood) to Fitzroy Falls (Plantnet).	
Tetratheca neglecta		Barren Grounds NR (NCC 1999 Appendix 23). Sandstone woodland on flat and undulating sandstonen riges and plateau tops (NCC 1999 Appendix 23).	3RC-
Thysanotus virgatus		Restricted between Mount Keira to Sutherland. Dry sclerophyll forest and Heath on sandy soils sometimes with ironstone gravels (NCC 1999 Appendix 8 Appendix 8).	3RC-
Tmesipteris billardieri		Regionally rare in the Illawarra (Mills 1988).Usually epiphytic on treeferns; in rainforest, chiefly in the ranges, south from the Blue Mountains (Plantnet).	
Tmesipteris ovata		Regionally rare in the Illawarra (Mills 1988). Usually epiphytic on treeferns, widespread but not common, in rainforest (Plantnet).	
Tmesipteris parva		Regionally rare in the Illawarra (Mills 1988).Usually epiphytic on treeferns, widespread but not common, in rainforest and moist eucalypt forest (Plantnet).	

Scientific Name	Common Name	Notes	ROTAP Code
Typhonium eliosurum		Rare in the Illawarra Lowland rainforest and moist eucalypt forest on alluvial soils near streams. Most of its habitat has been cleared (Mills 2000). Most records are from the Illawarra region, including Bass Point and Mt Keira (Fairley 2004). Other locations include Macquaries Pass, Whispering Gallery and Bass Point Reserve (Mills 2000) and Albion Park (Mark Robinson pers.comm.).	3RC

Sources

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ROTAP CODES Source: Briggs, J.D. & Leigh J.H. (1988) Rare or threatened Australian plants.
Plant Codes:

Distribution category
1 Known from type collection only
2 Geographic range < 100km
3 Geographic range > 100km

Conservation status
E Endangered (at risk of disappearing in 1 or 2 decades)
V Vulnerable (at risk of disappearing in 20 - 50 years)
R Rare (rare in Australia but currently not endangered or vulnerable)
K Poorly known

Reservation adequacy code
C Population reserved
a Adequately reserved (>1000 plants)
i Inadequately reserved (<1000 plants)
- Adequacy of reservaiton unknown.

APPENDIX 9 RARE FAUNA

CLASS	SCIENTIFIC NAME	COMMON NAME	NOTES	SOURCE
FROGS	*Litoria caerulea*	Green Tree Frog	Previously common, now rapidly declining	Mills 2006b; DECC 2007a; Mills 2000
	Pseudophryne bibronii	Bibron's Toadlet	Declining, rare on the Illawarra coastal plain	DECC 2007a
BIRDS	*Actitis hypoleucos*	Common Sandpiper	Rare summer visitor	Chafer, Brandis & Wright 1999
	Ailuroedus crassirostris	Green Catbird	Rare rainforest bird in Illawarra	Mills 2006b; NPWS 2002b; Mills 2000
	Alectura lathami	Australian Brush-turkey	Isolated, recovering population, mainly resticted to rainforest on escarpment	NPWS 2002b, Mills 2000; Chafer, Brandis & Wright 1999
	Anhinga melanogaster	Darter	Uncommon nomadic visitor	Chafer, Brandis & Wright 1999
	Anous stolidus	Common Noddy	Rare summer visitor	Chafer, Brandis & Wright 1999
	Aphelocephala leucopsis	Southern Whiteface	Rare in Illawarra	Chafer, Brandis & Wright 1999
	Ardea intermedia	Intermediate Egret	Rare nomadic visitor	Chafer, Brandis & Wright 1999
	Artamus leucorynchus	White-breasted Wood-swallow	Rare nomadic visitor	Chafer, Brandis & Wright 1999
	Artamus personatus	Masked Wood-swallow	Rare nomadic visitor	Chafer, Brandis & Wright 1999
	Aviceda subcristata	Pacific Baza	Rare visitor, possibly at southern limit of distribution	Chafer, Brandis & Wright 1999
	Butorides striatus	Striated Heron	Uncommon nomadic visitor	Chafer, Brandis & Wright 1999; Mills 2000
	Calidris melanotos	Pectoral sandpiper	Rare summer visitor	Chafer, Brandis & Wright 1999
	Calonectris leucomelas	Streaked Shearwater	Rare summer visitor	Chafer, Brandis & Wright 1999
	Catharacta maccormicki	Southern Great Skua	Rare winter visitor	Chafer, Brandis & Wright 1999
	Catharacta skua	Great Skua	Uncommon winter visitor	Chafer, Brandis & Wright 1999
	Centropus phasianinus	Pheasant Coucal	Rare heathland species in Illawarra	Chafer, Brandis & Wright 1999; Mills 2006b; NPWS 2002b
	Chalcophaps indica	Emerald Dove	Rare rainforest bird in Illawarra	Mills 2006b; Mills 2000; Chafer, Brandis & Wright 1999
	Charadrius veredus	Oriental Plover	Rare summer visitor	Chafer, Brandis & Wright 1999
	Cheramoeca leucosternus	White-backed Swallow	Rare nomadic visitor	Chafer, Brandis & Wright 1999
	Chlidonias hybridus	Whiskered Tern	Rare, spring passage migrant	Chafer, Brandis & Wright 1999
	Chlidoniasleucopterus	White-winged Black Tern	Uncommon summer visitor	Chafer, Brandis & Wright 1999
	Chrysococcyx osculans	Black-eared Cuckoo	Very rare east of Great Dividing Range	Chafer, Brandis & Wright 1999
	Chthonicola sagittata	Speckled Warbler	Uncommon in Illawarra	Chafer, Brandis & Wright 1999
	Cincloramphus curalis	Brown Songlark	Uncommon summer visitor	Chafer, Brandis & Wright 1999
	Cinclosoma punctatum	Spotted Quail-thrush	Declining population	DECC 2007a
	Circus approximans	Swamp Harrier	Rare	Mills 2000
	Circus assimillis	Spotted Harrier	Rare nomadic visitor	Chafer, Brandis & Wright 1999
	Cladorhynchus leucophalus	Banded Stilt	Rare nomadic visitor	Chafer, Brandis & Wright 1999
	Climacteris erythrops	Red-browed Treecreeper	Restricted local distribution - mainly occurring in tablelands	Chafer, Brandis & Wright 1999; NPWS 2002b
	Columba leucomela	White-headed Pigeon	Uncommon and in decline	Mills 2000
	Coracina papuensis	White-bellied Cuckoo-shrike	Rare in Illawarra	Chafer, Brandis & Wright 1999
	Corvus mellori	Little Raven	Uncommon nomadic visitor	Chafer, Brandis & Wright 1999

CLASS	SCIENTIFIC NAME	COMMON NAME	NOTES	SOURCE
	Coturnix chinensis	King Quail	Rare nomadic visitor	Chafer, Brandis & Wright 1999; Mills 2000
	Coturnix ypsilophora	Brown Quail	Uncommon nomadic visitor	Chafer, Brandis & Wright 1999
	Cracticus nigrogularis	Pied Butcherbird	Rare in Illawarra	Chafer, Brandis & Wright 1999
	Cuculus saturatus	Oriental Cuckoo	Rare summer visitor	Chafer, Brandis & Wright 1999
	Daphoenositta chrysoptera	Varied Sittella	Declining	DECC 2007a
	Dendrocygna eytoni	Plumed Whistling-Duck	Rare nomadic visitor	Chafer, Brandis & Wright 1999
	Diomedea bulleri	Buller's Albatross	Rare winter visitor	Chafer, Brandis & Wright 1999
	Diomedea chrysostoma	Grey-headed Albatross	Rare winter visitor	Chafer, Brandis & Wright 1999
	Diomedea epomophora	Royal Albatross	Rare in Illawarra	Chafer, Brandis & Wright 1999
	Dromaius novaehollandiae	Emu	Rare, mainly restricted to west of region	Chafer, Brandis & Wright 1999
	Egretta garzetta	Little Egret	Uncommon nomadic visitor	Chafer, Brandis & Wright 1999
	Egretta sacra	Eastern Reef Egret	Regional population <20	Chafer, Brandis & Wright 1999
	Epthianura albifrons	White-fronted Chat	Disjunct populations in Illawarra	Chafer, Brandis & Wright 1999; Mills 2006b
	Erythrogonys cinctus	Red-kneed Dotterel	Uncommon nomadic visitor	Chafer, Brandis & Wright 1999
	Falco peregrinus	Peregrine Falcon	Population declining throughout the world. Nest on the escarpment	Mills 2006b; Mills 2000
	Falco subniger	Black Falcon	Rare nomadic visitor	Chafer, Brandis & Wright 1999
	Fregetta grallaria	White-bellied Storm-Petrel	Rare visitor	Chafer, Brandis & Wright 1999
	Fregetta tropica	Black-bellied Storm-petrel	Rare summer visitor	Chafer, Brandis & Wright 1999
	Fulmarus glacialoides	Southern Fulmar	Rare winter visitor	Chafer, Brandis & Wright 1999
	Gallinago hardwickii	Latham's Snipe	Uncommon summer visitor	Chafer, Brandis & Wright 1999
	Garrodia neris	Grey-backed Storm Petrel	Rare winter visitor	Chafer, Brandis & Wright 1999
	Geopelia cuneata	Diamond Dove	Rare nomadic visitor	Chafer, Brandis & Wright 1999
	Geopelia humeralis	Bar-shouldered Dove	Disjunct populations in Illawarra	Mills 2006b; Mills 2000;Chafer, Brandis & Wright 1999
	Gliciphila melanops	Tawny-crowned Honeyeater	Rare heathland species	Mills 2006b; DECC 2007a
	Halobaena caerulea	Blue Petrel	Rare visitor to Illawarra	Chafer, Brandis & Wright 1999
	Heteroscelus brevipes	Grey-tailed Tattler	Uncommon summer visitor	Chafer, Brandis & Wright 1999
	Heteroscelus incanus	Wandering Tattler	Rare summer visitor	Chafer, Brandis & Wright 1999
	Hieraaetus morphnoides	Little Eagle	Rare	Mills 2000
	Hylacola pyrrhopygia	Chestnut-rumped Heathwren	Rare heathland bird species in Illawarra	Chafer, Brandis & Wright 1999
	Larus pacificus	Pacific Gull	Uncommon nomadic visitor	Chafer, Brandis & Wright 1999
	Lonchura castaneothorax	Chestnut-breasted Mannikin	Disjunct populations in Illawarra	Mills 2006b; Mills 2000; Chafer, Brandis & Wright 1999
	Lopholaimus antarcticus	Topknot Pigeon	Rare	Mills 2000
	Lugensa brevirostris	Kerguelen Petrel	Rare winter visitor	Chafer, Brandis & Wright 1999
	Malacorhynchus membranaceus	Pink-eared Duck	Uncommon nomadic visitor	Chafer, Brandis & Wright 1999

CLASS	SCIENTIFIC NAME	COMMON NAME	NOTES	SOURCE
	Megalurus timoriensis	Tawny Grassbird	Disjunct population in Kiama and Lake Illawarra.	Chafer, Brandis & Wright 1999; Mills 2006b; Mills 2000
	Melithreptus gularis	Black-chinned Honeyeater	Rare in Illawarra	Chafer, Brandis & Wright 1999
	Melopsittacus undulatus	Budgerigar	Rare nomadic visitor	Chafer, Brandis & Wright 1999
	Milvus migrans	Black Kite	Rare nomadic visitor	Chafer, Brandis & Wright 1999
	Monarcha trivirgatus	Spectacled Monarch	rare summer visitor	Chafer, Brandis & Wright 1999
	Myiagra cyanoleuca	Satin Flycatcher	rare summer visitor	Chafer, Brandis & Wright 1999
	Numenius minutus	Little Curlew	Rare summer visitor	Chafer, Brandis & Wright 1999
	Nymphicus hollandicus	Cockatiel	Rare nomadic visitor	Chafer, Brandis & Wright 1999
	Origma solitaria	Rockwarbler	Declining population, O'Hares Creek area, sandstone plateau species	DECC 2007a
	Orthonyx temminckii	Logrunner	Rare	Mills 2006b; Mills 2000; NPWS 2002b
	Pachyptila belcheri	Slender-billed Prion	Rare winter visitor	Chafer, Brandis & Wright 1999
	Pachyptila desolata	Antarctic Prion	Uncommon winter visitor	Chafer, Brandis & Wright 1999
	Pelecanoides urinatrix	Common Diving-Petrel	Rare visitor to Illawarra	Chafer, Brandis & Wright 1999
	Petroica goodenovii	Red-capped Robin	Rare nomadic visitor	Chafer, Brandis & Wright 1999
	Petroica phoenicea	Flame Robin	Declining population -mainly occurring in tablelands	DECC 2007a; Chafer, Brandis & Wright 1999; DECC 2007a
	Phaethon lepturus	White-tailed Tropicbird	Rare summer visitor	Chafer, Brandis & Wright 1999
	Phaps elegans	Brush Bronzewing	Uncommon in Illawarra	Chafer, Brandis & Wright 1999
	Philemon citreogularis	Little Friarbird	Uncommon nomadic visitor	Chafer, Brandis & Wright 1999
	Phoebetria fusca	Sooty Albatross	Rare winter visitor	Chafer, Brandis & Wright 1999
	Phoebetria palpebrata	Light-mantled Sooty Albatross	Rare winter visitor	Chafer, Brandis & Wright 1999
	Phylidonyris nigra	White-cheeked Honeyeater	Uncommon in Illawarra	Chafer, Brandis & Wright 1999
	Pitta versicolor	Noisy Pitta	Rare rainforest bird in Illawarra	Chafer, Brandis & Wright 1999; Mills 2006b; Mills 2000
	Plegadis falcinellus	Glossy Ibis	Rare nomadic visitor	Chafer, Brandis & Wright 1999
	Pluvialis squatarola	Grey Plover	Uncommon summer visitor	Chafer, Brandis & Wright 1999
	Porzana fluminea	Australian Spotted Crake	Uncommon nomadic visitor	Chafer, Brandis & Wright 1999
	Porzana pusilla	Baillon's Crake	Uncommon nomadic visitor	Chafer, Brandis & Wright 1999
	Porzana tabuensis	Spotless Crake	Uncommon nomadic visitor	Chafer, Brandis & Wright 1999
	Procellaria aequinoctialis	White-chinned Petrel	Rare winter visitor	Chafer, Brandis & Wright 1999
	Procellaria parkinsoni	Black Petrel	Rare summer visitor	Chafer, Brandis & Wright 1999
	Pseudobulweria rostrata	Tahiti Petrel	Rare summer visitor	Chafer, Brandis & Wright 1999
	Pterodroma arminjoniana	Herald Petrel	Rare summer visitor	Chafer, Brandis & Wright 1999
	Pterodroma cervicalis	White-necked Petrel	Rare summer visitor	Chafer, Brandis & Wright 1999
	Pterodroma cookii	Cook's Petrel	Rare summer visitor	Chafer, Brandis & Wright 1999
	Pterodroma inexpectata	Mottled Petrel	Rare summer visitor	Chafer, Brandis & Wright 1999
	Pterodroma mollis	Soft-plumaged Petrel	Rare visitor to Illawarra	Chafer, Brandis & Wright 1999
	Puffinus assimilis	Little Shearwater	Rare visitor to Illawarra	Chafer, Brandis & Wright 1999

CLASS	SCIENTIFIC NAME	COMMON NAME	NOTES	SOURCE
	Puffinus bulleri	Buller's Shearwater	Uncommon summer visitor	Chafer, Brandis & Wright 1999
	Puffinus huttoni	Hutton's Shearwater	Uncommon nomadic visitor	Chafer, Brandis & Wright 1999
	Puffinus lherminieri	Audubon's Shearwater	Rare nomadic visitor	Chafer, Brandis & Wright 1999
	Rallus pectoralis	Lewin's Rail	Uncommon in Illawarra	Chafer, Brandis & Wright 1999
	Recurvirostra novaehollandiae	Red-necked Avocet	Rare nomadic visitor	Chafer, Brandis & Wright 1999
	Sericornis citreogularis	Yellow-throated Scrubwren	Rare rainforest bird in Kiama	Mills 2006b; Mills 2000
	Smicornis brevisrostris	Weebill	Uncommon in Illawarra	Chafer, Brandis & Wright 1999
	Sphecotheres vieilloti	Australasian Figbird	Rare rainforest bird in Illawarra	Mills 2006b; Mills 2000; Chafer, Brandis & Wright 1999
	Stagonopleura bella	Beautiful Firetail	Rare heathland species, mostly in Kiama, but possibly elsewhere in region	Mills 2006b; Chafer, Brandis & Wright 1999
	Stercorarius longicaudus	Long-tailed Jaeger	Uncommon summer visitor	Chafer, Brandis & Wright 1999
	Sterna nilotica	Gull-billed Tern	Rare nomadic visitor	Chafer, Brandis & Wright 1999
	Sterna paradisaea	Arctic Tern	Rare winter visitor	Chafer, Brandis & Wright 1999
	Stipiturus malachurus	Southern Emu-wren	Rare heathland species	DECC 2007a; Mills 2006b; Mills 2000
	Strepera versicolor	Grey Currawong	Restricted local distribution - mainly occurring in tablelands	Chafer, Brandis & Wright 1999; NPWS 2002b
	Sula leucogaster	Brown Booby	Rare visitor	Chafer, Brandis & Wright 1999
	Tadorna tadornoides	Australian Shelduck	Uncommon nomadic visitor	Chafer, Brandis & Wright 1999
	Taeniopygia guttata	Zebra Finch	Disjunct population in Kiama - mainly occurring in tablelands	Chafer, Brandis & Wright 1999; Mills 2006b
	Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet	Rare nomadic visitor	Chafer, Brandis & Wright 1999
	Tringa glareola	Wood Sandpiper	Rare summer visitor	Chafer, Brandis & Wright 1999
	Tringa stagnatillis	Marsh Sandpiper	Rare summer visitor	Chafer, Brandis & Wright 1999
	Turnix varia	Little Button-quail	Uncommon in Illawarra	Chafer, Brandis & Wright 1999
	Vanellus tricolor	Banded Lapwing	Rare nomadic visitor	Chafer, Brandis & Wright 1999
	Zoothera lunulata	Bassian Thrush	Uncommon and vulnerable because of its ground-dwelling habit	Mills 2006b; Mills 2000; Chafer, Brandis & Wright 1999
MAMMALS	*Canis lupus dingo*	Dingo	Population decline, genetic pollution; significance to local indigenous communities	DECC 2007a
	Macropus giganteus	Eastern Grey Kangaroo	Declining population due to habitat change	DECC 2007a
	Ornithorhynchus anatinus	Platypus	Isolated declining population	DECC 2007a; NPWS 2002b
	Perameles nasuta	Long-nosed Bandicoot	Declining	DECC 2007a
	Petauroides volans	Greater Glider	Restricted, declining population	NPWS 2002b; DECC 2007a; Whelan 2004
	Pseudomys novaehollandiae	New Holland Mouse	Rare	DECC 2007a
	Thylogale thetis	Red-necked Pademelon	Rare and declining	Mills 2006b; DECC 2007a
	Trichosurus cunninghami	Mountain Brushtail Possum	Restricted distribution	NPWS 2002b

CLASS	SCIENTIFIC NAME	COMMON NAME	NOTES	SOURCE
MOLLUSCS	*Meridolum gulosum*	Land Snail	Bulli is northern limit of distribution	Puslednik 2002
	Meridolum sp.	Land snail	Undescribed species from Berkeley to Lake Illawarra	Puslednik 2002
REPTILES	*Cacophis squamulosus*	Golden-crowned Snake	Southern limit of distribution	NPWS 2002b
	Nannoscincus maccoyi	Highlands Forest-skink	Northern limit of distribution	NPWS 2002b
	Notechis scutatus	Tiger Snake	Declining (overall and locally) population.	DECC 2007a; NPWS 2002b;

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APPENDIX 11 VEGETATION TYPES OF THE ILLAWARRA

Vegetation Type	Total Illawarra extent (ha)*	Description (after Tozer *et al.* 2006)	Floristic Summary (after Tozer *et al.* 2006)
Basalt Hilltop Scrub	231	This unit is restricted to 100-200m ASL on exposed ridgetops on shallow rocky soil derived from volcanic geologies (Bumbo Latite and Milton Monzonite). All occurrences are in the coastal hinterland near Jamberoo and west of Milton, where mean annual rainfall varies between 1200 and 1500mm.	**Shrubs:** *Melaleuca armillaris, Leucopogon juniperinus, Acacia parvipinnula, Melaleuca armillaris, Indigofera australis, Zieria granulata.* **Groundcover:** *Bracteantha bracteata, Cheilanthes sieberi, Notodanthonia longifolia, Eragrostis leptostachya, Fimbristylis dichotoma, Plectranthus graveolens, Sporobolus creber.*
Blue Mountains - Shoalhaven Hanging Swamps	1,205	This unit is restricted to humic sandstone soils in headwater valleys and seepage areas on Hawkesbury, Narrabeen and Shoalhaven Group sandstones, generally at elevations of 500-1100m ASL in areas receiving 1000-1850mm mean annual rainfall. In the Illawarra it occurs in the Budderroo Plateau.	**Shrubs:** *Leptospermum juniperinum, Baeckea linifolia, Sprengelia incarnata, Epacris obtusifolia, Hakea teretifolia, Banksia ericifolia.* **Groundcover:** *Empodisma minus, Leptocarpus tenax, Gymnoschoenus sphaerocephalus, Lepidosperma limicola, Drosera hingta, Xyris operculata*
Blue Mountains Heath	1	Characterised by an open to dense shrub canopy with emergent mallees and a groundcover of sedges and forbs. Blue Mountains Heath occupies areas of shallow, damp sandy loam on exposed Narrabeen sandstone plateaux at 600-1150m ASL, where mean annual rainfall varies from 1000 to 1350mm.	**Trees:** *Eucalyptus stricta.* **Shrubs:** *Isopogon anemonifolius, Allocasuarina nana, Leptospermum trinervium, Lomandra glauca, Platysace linearifolia, Petrophile pulchella, Banksia ericifolia, Hakea laevipes, Brachyloma daphnoides, Conospermum taxifolium, Epacris microphylla, Leptospermum arachnoides.* **Groundcover:** *Dampiera stricta, Goodenia bellidifolia, Lepidosperma viscidum, Patersonia sericea*
Budderoo Temperate Rainforest	198	Simple closed forest with a dense tree canopy, a prominent shrub stratum and a fern/sedge dominated groundcover. This rainforest is restricted to moist gullies below sandstone cliffs between Mt Kembla and the Budderoo Plateau. It has been recorded from sites at elevations between 460 - 650m ASL and with annual rainfall greater than 1500mm. Budderoo Temperate Rainforest is closely related to Sandstone Scarp Warm Temperate Rainforest (RF p114), both occuring below sandstone cliffs at higher altitudes, however Budderoo Temperate Rainforest is restricted to the highest elevations of the very high rainfall areas on the Illawarra Scarp. Its originally small distribution is unlikely to have been depleted by land clearing.	**Trees:** *Ceratopetalum apetalum, Quintinia sieberi, Eucryphia moorei.* **Shrubs:** *Coprosma quadrifida, Dracophyllum secundum, Epacris longiflora, Tasmannia insipida, Todea barbara, Tristaniopsis collina* . **Climbers:** *Tmesipteris truncata* . **Groundcover:** *Gleichenia microphylla, Grammitis billardierei, Gahnia sieberiana, Pyrrosia rupestris.*
Budderoo-Morton Plateau Forest	2,052	Budderoo-Morton Plateau Forest is a low eucalypt forest with a dense sclerophyll shrub stratum and an open groundcover dominated by sedges. Budderoo-Morton Plateau Forest is found on sheltered, periodically damp parts of elevated sandstone plateaux between 550 and 1000m ASL, primarily on the Budderoo, Little Forest, Tianjara and the southern Morton plateaux. Budderoo-Morton Plateau Forest grades into heath with decreasing soil depths (eg Morton Mallee-Heath, HL p122), or upland swamps in areas of impeded drainage (Blue Mountains-Shoalhaven Hanging Swamps, FRW p130). It is replaced by Shoalhaven Sandstone Forest (DSF p148) in areas receiving lower rainfall.Budderoo-Morton Plateau Forest belongs to the Sydney Montane Dry Sclerophyll Forests vegetation class (Keith 2004). The majority of its distribution is within Budderoo and Morton National Parks.	**Trees:** *Corymbia gummifera, Eucalyptus sieberi, E. piperita.* **Shrubs:** *Bossiaea kiamensis, Aotus ericoides, Banksia paludosa, Leptospermum trinervium, Amperea xiphoclada, Acacia obtusifolia, Banksia serrata, Epacris longifolia.* **Groundcover:** *Lomandra longifolia, Gahnia sieberiana, Gleichenia dicarpa, Empodisma minus.*
Coastal Freshwater Lagoon	145	Areas of this unit commonly have a mosaic of tall reeds, dense patches of taller shrubs, herbfields and open water. These coastal lagoons are scattered throughout the coastline of the study area, in areas of shallow sandy alluvium inundated by freshwater or slightly brackish water below 10m ASL. Lagoons are typically permanently inundated and associated with depressions in coastal sand plains and river flats. At their margins, they may grade into Coastal Sand Swamp Forest (FOW p45) or Floodplain Swamp Forest (FOW p105). With increasing salinity and access to tidal/estuarine waters, Coastal Freshwater Lagoon is replaced by Estuarine Creekflat Scrub (FOW p107). Lagoons on coastal sand sheets in the Sydney Basin bioregion are listed as Sydney Freshwater Wetland EEC under the Threatened Species Conservation Act, 1995. Some examples of these, such as the Lachlan and Botany Swamps, have been destroyed or highly modified. Lagoons on coastal floodplains are listed as Freshwater Wetlands on Coastal Floodplains EEC under the Threatened Species Conservation Act, 1995.	**Shrubs:** *Melaleuca ericifolia.* **Groundcover**: *Baumea articulata, Persicaria praetermissa, Phragmites australis, Triglochin procerum, Typha orientalis, Cladium procerum*

Vegetation Type	Total Illawarra extent (ha)*	Description (after Tozer *et al.* 2006)	Floristic Summary (after Tozer *et al.* 2006)
Coastal Rock Plate Heath	88	Coastal Rock Plate Heath has an open to clumped shrub canopy with a patchy groundcover of sedges and forbs. This unit is distributed on areas of sandstone from Broken Bay to Cataract dam, with outlying stands on Beecroft Peninsula at Jervis Bay. Coastal Rock Plate Heath is restricted to skeletal sandy soils on massive sandstone pavements in coastal and near-coastal areas 50 - 400m ASL where mean annual rainfall varies from 1200 to 1450mm. These sandstone pavements are not differentiated by any of the available abiotic modelling variables and the modelled distribution of this unit is therefore reliant on aerial photograph interpretation (API) of structurally distinct rock plate heath vegetation. Given the mapping scale and the variety of sources used to compile the API layer, in some areas Coastal Rock Plate Heath may not be distinguished from surrounding vegetation. Coastal Rock Plate Heath occurs most commonly as small patches within a widespread matrix of Coastal Sandstone Ridgetop Woodland (DSF p131). High fire frequency may threaten the diversity of these stands because many of the plant species are killed by fire and the regenerating seedlings may suffer high mortality rates if the shallow soils they inhabit are desiccated during drought.	**Shrubs:** *Allocasuarina distyla, Darwinia fascicularis, Epacris microphylla, Leucopogon microphyllus, Acacia suaveolens, Banksia ericifolia, Kunzea ambigua, Leptospermum squarrosum, Dillwynia floribunda, Zieria laevigata.* **Groundcover:** *Lepyrodia scariosa, Lepidosperma viscidum, Actinotus minor.*
Coastal Sand Forest	338	Coastal Sand Forest is a coastal eucalypt forest with a mixed understorey of sclerophyll shrubs, ferns, grasses and forbs. This forest is patchily distributed along the study area coastline from Umina to Nadgee, and is restricted to relatively sheltered deep sands below 100m ASL including aeolian and alluvial sands on beach hind dunes, coastal flats and sandstone headlands. With increasing exposure to salt-laden winds this unit grades into Coastal Foredune Scrub (HL e61) or into Littoral Thicket (HL p63) on exposed headlands and cliffs. With increasing soil moisture the transition is to Coastal Sand Swamp Forest (FOW p45.Coastal Sand Forest belongs to the South Coast Sands Dry Sclerophyll Forest vegetation class (Keith 2004). Up to half of its original distribution has been cleared, and Coastal Sand Forest includes the Umina Coastal Sandplain Woodland EEC, the Kurnell Dune Forest EEC, and the Bangalay Sand Forest EEC as listed on Schedule 1 of the NSW Threatened Species Conservation Act (1995).	**Trees:** *Banksia serrata, Eucalyptus botryoides, B. integrifolia, E. pilularis.* **Shrubs:** *Breynia oblongifolia, Monotoca elliptica, Allocasuarina littoralis, Acacia longifolia.* **Climbers:** *Glycine clandestina, Hibbertia scandens* . Groundcover: *Pteridium esculentum, Lomandra longifolia, Imperata cylindrica, Dianella caerulea, Gonocarpus teucrioides*
Coastal Sand Swamp Forest	20	This unit is a low eucalypt forest with an open shrub layer and a dense groundcover of sedges and forbs, and occurs as scattered patches along the coastline at elevations below 15m ASL in drainage lines and depressions on sandy alluvium and coastal sand flats. Examples occur at Cockle Bay, Jibbon Lagoon, Korrongulla Swamp, Commonderry Swamp and Lake Tabourie. On better drained sandy soils Coastal Sand Swamp Forest is replaced by Coastal Sand Forest (DSF p64). In poorly drained sites with a high water table Coastal Sand Swamp Forest grades into Coastal Freshwater Lagoon (FRW p313) or Floodplain Swamp Forest (FOW p105).Coastal Sand Swamp Forest belongs to the Coastal Swamp Forests vegetation class (Keith 2004). Coastal Sand Swamp Forest has a restricted range within the study area from Sydney to Kiola and has been fragmented by coastal development. It is included within the Swamp Sclerophyll Forest on Coastal Floodplains EEC, as listed on Schedule 1 of the NSW Threatened Species Conservation Act, 1995.	**Trees:** *Eucalyptus robusta* . **Shrubs**: *Leptospermum polygalifolium, Acacia longifolia, Melaleuca linariifolia, M. ericifolia, Leptospermum continentale.* **Groundcover:** *Gahnia clarkei, Selaginella uliginosa, Imperata cylindrica, Baumea juncea, B. articulata.*
Coastal Sandplain Heath	24	Coastal Sandplain Heath is a dense to open shrubland with an open groundcover of forbs and sedges. This unit is found at Port Hacking (Kurnell and Jibbon) and at Jervis Bay (Beecroft and Booderee) where mean annual rainfall is between 1200 and 1470mm. It is restricted to podsolised sand dunes, usually perched on coastal sandstone plateaux up to 150m ASL. Coastal Sandplain Heath shares some species with Agnes Banks Woodland (DSF p239) which is found on podsolised sand deposits adjacent to the Hawkesbury river near Windsor at much lower rainfall and some distance from the coast.Coastal Sandplain Heath belongs to the Wallum Sand Heaths vegetation class (Keith 2004). Parts of the original distribution at Kurnell and in the Illawarra have been cleared for urban and industrial development. The remaining stands are under considerable recreational pressures and vulnerable to localised dune erosion.	**Shrubs**: *Banksia serrata, Bossiaea ensata, Acacia suaveolens, Ricinocarpos pinifolius, Isopogon anemonifolius, Lambertia formosa, Bossiaea heterophylla, Leptospermum laevigatum, Allocasuarina distyla, Persoonia levis, Pimelea linifolia.* **Groundcover:** *Xanthosia pilosa, Gonocarpus teucrioides, Hypolaena fastigiata, Lomandra glauca, Dampiera stricta, Lepidosperma concavum*
Coastal Sandstone Gully Forest	9,741	Coastal Sandstone Gully Forest is an open eucalypt forest with a diverse sclerophyll shrub stratum and an open groundcover dominated by sedges. This forest is distributed along the eastern portion of the Hornsby and Woronora plateaux (below 500m ASL) where it occurs on the lower slopes of sandstone gullies within an annual average rainfall band of 1000 - 1550mm. Coastal Sandstone Gully Forest grades into Sandstone Riparian Scrub (Map Unit FOW p58) immediately adjacent to creeklines, and grades into Coastal Sandstone Ridgetop Woodland (DSF p131) on upperslopes and in less sheltered positions. Hinterland Sandstone Gully Forest (DSF p142) replaces this unit in similar landforms and substrates as rainfall declines with distance from the coast.Coastal Sandstone Gully Forest belongs to the Sydney Coastal Dry Sclerophyll Forests vegetation class (Keith 2004). Several examples are represented in conservation reserves and about one-third of the distribution has been cleared for urban development. Weeds, high frequency fires and fragmentation associated with the urban fringe pose localised threats.	**Trees:** *Banksia serrata, Eucalyptus piperita, Angophora costata, Corymbia gummifera.* **Shrubs:** *Persoonia levis, Leptospermum polygalifolium, Lomatia silaifolia, Persoonia pinifolia, Banksia ericifolia, Acacia terminalis, Leptospermum trinervium, Platysace linearifolia, Banksia spinulosa, Ceratopetalum gummiferum, Acacia suaveolens.* **Climbers:** *Smilax glyciphylla* . **Groundcover:** *Lomandra longifolia, Pteridium esculentum, Gonocarpus teucrioides, Entolasia stricta, Caustis flexuosa, Dianella caerulea, Doryanthes excelsa, Lepidosperma laterale* .

Vegetation Type	Total Illawarra extent (ha)*	Description (after Tozer *et al.* 2006)	Floristic Summary (after Tozer *et al.* 2006)
Coastal Sandstone Plateau Heath	1,210	This unit is characterised by an open to dense shrub canopy with emergent mallees and groundcover of sedges and forbs. This unit occurs as widespread but scattered occurrences across the Hornsby and Woronora plateaux, with southern outliers on Beecroft Peninsula. Within this distribution Coastal Sandstone Plateau Heath is restricted to shallow damp sandy loams on coastal and near-coastal sandstone plateaux (Hawkesbury Sandstone and Conjola Sandstone) below 600m ASL, within a wide range of rainfall (mean 900-1600mm per annum). On Hawkesbury Sandstone this Map Unit commonly occurs as patches scattered within a matrix of Coastal Sandstone Ridgetop Woodland (DSF p131). On skeletal soils and rock outcrops Coastal Sandstone Plateau Heath is replaced by Coastal Rock Plate Heath (HL p126), and where drainage is impeded it is replaced by Coastal Upland Swamp (FRW p129). Coastal Sandstone Plateau Heath was generally not separable from surrounding vegetation using any of the available abiotic modelling variables, and consequently this unit was largely delineated by aerial photograph interpretation.	**Trees:** *Corymbia gummifera* . **Shrubs:** *Isopogon anemonifolius, Banksia ericifolia, Lambertia formosa, Epacris microphylla, Leptospermum trinervium, Hakea teretifolia, Pimelea linifolia, Hakea laevipes, Banksia oblongifolia, Pultenaea elliptica, Petrophile pulchella, Xanthorrhoea resinifera.* **Groundcover**: *Dampiera stricta, Lepyrodia scariosa, Actinotus minor, Cyathochaeta diandra, Lindsaea linearis, Lomandra obliqua.*
Coastal Sandstone Ridgetop Woodland	16,720	This unit is a low eucalypt forest with a diverse sclerophyll shrub layer and open groundcover of sedges. It is extensively distributed on the Triassic Hawkesbury sandstone plateaux surrounding the Sydney Basin, and is widespread on ridgetops and upper valley slopes of the Hornsby and Woronora Plateaux and the lower Blue Mountains. Coastal Sandstone Ridgetop Woodland occurs up to 600m ASL in areas receiving an average annual rainfall ranging from 850 – 1650mm. Coastal Sandstone Ridgetop Woodland grades into heath (eg Coastal Sandstone Plateau Heath HL p117) where soils become shallower, or upland swamps in areas of impeded drainage (e.g. Coastal Upland Swamp FRW p129).Coastal Sandstone Ridgetop Woodland is one of the most intensively sampled units in the study area and is variable and diverse in composition across its range. About one-quarter of its area has been cleared for urban development, but large areas are represented in conservation reserves. High frequency fires, weeds and fragmentation associated with urban encroachment are likely to pose localised threats.	**Trees:** *Corymbia gummifera, E. sieberi, E. racemosa* . **Shrubs:** *Leptospermum trinervium, Lambertia formosa, Persoonia levis, Banksia serrata, Platysace linearifolia, Acacia suaveolens, Isopogon anemonifolius, Dillwynia retorta, Petrophile pulchella, Banksia spinulosa, Bossiaea heterophylla, Banksia ericifolia, Acacia ulicifolia, Monotoca scoparia, Hakea dactyloides.* **Groundcover:** *Caustis flexuosa, Lomandra obliqua, Dampiera stricta, Entolasia stricta, Actinotus minor, Cyathochaeta diandra, Lomandra glauca*
Coastal Scrub & Beach Strand	212	Coastal Foredune Scrub is characterised by a variable shrub stratum up to 3 m tall that includes numerous species that occur at low frequencies but are apparently exclusive to this assemblage. Occasionally small trees (*Eucalyptus botryoides*) emerge above the shrub stratum. The patchy groundcover includes the prostrate succulent herb *Carpobrotus glaucescens* , the sedge *Isolepis nodosa* and the herb *Oxalis perennans* . Coastal Foredune Scrub is restricted to foredunes immediately adjacent to the coast. Coastal Sand Forest (Map Unit DSF p64) may be adjacent to Coastal Foredune Scrub in more sheltered sites on sand dunes. Beach Strand Grassland (Map Unit Grl e62) occurs between Coastal Foredune Scrub and the high tide mark. Coastal Foredune Scrub occurs throughout the coast and similar assemblages extend both north and south of the study area. More than half of Coastal Foredune Scrub has been cleared for coastal development.	Trees: *Banksia integrifolia* subsp. *integrifolia* **Shrubs:** *Acacia longifolia, Leucopogon parviflorus, Rhagodia candolleana* subsp. *candolleana* **Groundcover:** *Actites megalocarpa, Carpobrotus glaucescens, Isolepis nodosa, Lomandra longifolia, Muehlenbeckia adpressa, Oxalis perennans, Pteridium esculentum, Spinifex sericeus, Zoysia macrantha*
Coastal Upland Swamp	2,854	Coastal Upland Swamp is characterised by an open to dense shrub canopy with dense groundcover of sedges and forbs. This unit is locally restricted to swampy areas on humic sandy loams in headwater valleys and seepage zones on coastal sandstone plateaux. Coastal Upland Swamps are restricted to Hawkesbury and Shoalhaven Group sandstones, and peaty alluvium derived from these substrates. Coastal Upland Swamp generally occurs as small patches within a matrix of Coastal Sandstone Ridgetop Woodland (DSF p131) or Coastal Sandstone Plateau Heath (HL p117), however larger occurrences are common at Maddens Plains west of Bulli. It shares several species with Blue Mountains - Shoalhaven Hanging Swamps (FRW p130), which is generally found on sandstone plateaux at higher elevations. These units tend to intergrade on the southern Woronora Plateau at elevations between 500m and 600m ASL. Much of its range is within conservation reserves, although frequent fire and polluted runoff pose localised threats to some stands.	**Shrubs:** *Hakea teretifolia, Banksia ericifolia, Epacris obtusifolia, Sprengelia incarnata, Xanthorrhoea resinifera, Baeckea imbricata, Leptospermum juniperinum, Banksia oblongifolia, B. robur.* **Climbers:** *Cassytha glabella.* **Groundcover:** *Leptocarpus tenax, Empodisma minus, Lepyrodia scariosa, Selaginella uliginosa, Drosera spathulata, Dampiera stricta, Mitrasacme polymorpha, Lindsaea linearis.*

APPENDIX 10 THREATENED FAUNA HABITATS

Class	Scientific name	Common name	Illawarra Priorities	Habitat modelling resources	Coastal Valley Grassy Woodlands	Estuaries, Dunes & Saltmarsh	Coastal Wetlands & Mangroves	Riparian Forests	Escarpment Rainforests and Wet Sclerophyll Forests	Coastal Heath and Grasslands	Upland Swamps	Sandstone Heath, Forests & Woodlands
BIRDS	*Botaurus poiciloptilus*	Australasian Bittern	High	#2, #3			1	1				
	Burhinus grallarius	Bush Stone-curlew	Locally extinct	#3								
	Calidris alba	Sanderling	Low	#1		1						
	Calidris tenuirostris	Great Knot	Low	#1		1						
	Callocephalon fimbriatum	Gang-gang Cockatoo	Low	#3					1			1
	Calyptorhynchus lathami	Glossy Black-cockatoo	Low	#2, #3					1			1
	Charadrius leschenaultii	Greater Sand-plover	Low	#1		1						
	Charadrius mongolus	Lesser Sand-plover	Low	#1,		1						
	Dasyornis brachypterus	Eastern Bristlebird	Highest	#2, #3							1	1
	Ephippiorhynchus asiaticus	Black-necked Stork	Low									
	Esacus neglectus	Beach Stone-curlew	Low									
	Grantiella picta	Painted Honeyeater	Medium		1							
	Haematopus fuliginosus	Sooty Oystercatcher	High			1						
	Haematopus longirostris	Pied Oystercatcher	Medium			1						
	Irediparra gallinacea	Comb-crested Jacana	Locally extinct									
	Ixobrychus flavicollis	Black Bittern	High	#2		1	1	1				
	Lathamus discolor	Swift Parrot	Highest	#2, #3	1		1	1				1
	Limicola falcinellus	Broad-billed Sandpiper	Low	#1		1						
	Limosa limosa	Black-tailed Godwit	Medium	#1		1						
	Lophoictinia isura	Square-tailed Kite	Medium	#2, #3	1			1				
	Neophema chrysogaster	Orange-bellied Parrot	Low			1	1			1		
	Neophema pulchella	Turquoise Parrot	Medium	#2	1					1	1	
	Ninox connivens	Barking Owl	High	#2, #3	1			1				
	Ninox strenua	Powerful Owl	Medium	#2, #3					1			
	Oxyura australis	Blue-billed Duck	Low									
	Pachycephala olivacea	Olive Whistler	Low	#2, #3					1			1

Class	Scientific name	Common name	Illawarra Priorities	Habitat modelling resources	Coastal Valley Grassy Woodlands	Estuaries, Dunes & Saltmarsh	Coastal Wetlands & Mangroves	Riparian Forests	Escarpment Rainforests and Wet Sclerophyll Forests	Coastal Heath and Grasslands	Upland Swamps	Sandstone Heath, Forests & Woodlands
	Pandion haliaetus	Osprey	Low	#2,		1	1	1				
	Petroica rodinogaster	Pink Robin	Low	#2,					1			1
	Pezoporus wallicus wallicus	Eastern Ground Parrot	HIghest	#2, #3							1	1
	Ptilinopus magnificus	Wompoo Fruit-dove	High	#2, #3					1			
	Ptilinopus regina	Rose-crowned Fruit-dove	Medium	#2, #3					1			1
	Ptilinopus superbus	Superb Fruit-dove	Medium	#2, #3					1			1
	Rostratula benghalensis australis	Painted Snipe (Australian subspecies)	Low				1					
	Sterna albifrons	Little Tern	highest			1						
	Stictonetta naevosa	Freckled Duck	Medium				1					
	Thinornis rubricollis	Hooded Plover	Low			1						
	Tyto novaehollandiae	Masked Owl	High	#2, #3	1			1				
	Tyto tenebricosa	Sooty Owl	Medium	#2, #3					1			1
	Xanthomyza phrygia	Regent Honeyeater	Highest	#2, #3	1			1				
	Xenus cinereus	Terek Sandpiper	Low			1						
FROGS	*Heleioporus australiacus*	Giant Burrowing Frog	Medium	#2, #3					1		1	1
	Litoria aurea	Green and Golden Bell Frog	Highest	#2, #3			1			1		
	Litoria littlejohni	Littlejohn's Tree Frog	High	#2, #3				1			1	1
	Mixophyes balbus	Stuttering Frog	Highest	#2, #3					1			
	Pseudophryne australis	Red-crowned Toadlet	Medium	#2, #3			1				1	1
INVERTEBRATES	*Petalura gigantea*	Giant Dragonfly	Low				1				1	
MAMMALS	*Bettongia penicillata penicillata*	Brush-tailed Bettong	Locally extinct									
	Cercartetus nanus	Eastern Pygmy-possum	Medium	#2, #3	1				1			1
	Chalinolobus dwyeri	Large-eared Pied Bat	High	#2, #3	1			1				1
	Dasyurus maculatus	Spotted-tailed Quoll	High	#2, #3	1			1	1			
	Dasyurus viverrinus	Eastern Quoll	Locally extinct									
	Falsistrellus tasmaniensis	Eastern False Pipistrelle	Medium	#2, #3	1				1			1
	Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	Highest	#2, #3					1			1

Class	Scientific name	Common name	Illawarra Priorities	Habitat modelling resources	Coastal Valley Grassy Woodlands	Estuaries, Dunes & Saltmarsh	Coastal Wetlands & Mangroves	Riparian Forests	Escarpment Rainforests and Wet Sclerophyll Forests	Coastal Heath and Grasslands	Upland Swamps	Sandstone Heath, Forests & Woodlands
	Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	Medium	#2, #3	1			1	1			1
	Mormopterus norfolkensis	Eastern Freetail-bat	High	#2, #3	1				1			1
	Myotis adversus	Large-footed Myotis	High	#2, #3	1			1	1			1
	Petaurus australis	Yellow-bellied Glider	Low	#3					1			1
	Petaurus norfolcensis	Squirrel Glider	High	#3								1
	Petrogale penicillata	Brush-tailed Rock Wallaby	Locally extinct	#3								
	Phascolarctos cinereus	Koala	Medium	#2, #3	1				1			1
	Potorous tridactylus	Long-nosed Potoroo	Highest	#2, #3					1		1	
	Pteropus poliocephalus	Grey-headed Flying-fox	High	#2	1			1	1			
	Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Low		1			1	1	1	1	1
	Scoteanax rueppellii	Greater Broad-nosed Bat	High	#2					1			1
REPTILES	*Hoplocephalus bungaroides*	Broad-headed Snake	Highest	#2, #3								1
	Varanus rosenbergi	Rosenberg's Goanna	Medium	#2, #3							1	1
				TOTALS:	17	14	10	15	24	4	10	27

Habitat modelling resources

1# Avifauna research & Services (2006) Threatened Migratory Shorebird Habitat Mapping Project

2# NPWS (2002b) Bioregional Assessment Study Part II. Fauna of the Illawarra Escarpment, Coastal Plain and Plateau.

3# DECC (2007a) Terrestrial Vertebrate Fauna of the Greater Southern Sydney Region. Volume 2: Fauna of Conservation Concern and Priority Pest Species.

Habitat mapping references used to attribute species to habitat classes:

DECC (2007a) Terrestrial Vertebrate Fauna of the Greater Southern Sydney Region. Volume 2: Fauna of Conservation Concern and Priority Pest Species

DECC (2007e) Terrestrial Vertebrate Fauna of the Greater Southern Sydney Region. Volume 4: The Fauna of Metropolitan, O'Hares Creek and Woronora Special Areas. A joint project between the Sydney Catchment Authority and the Department of Environment and Climate Change (NSW).

Vegetation Type	Total Illawarra extent (ha)*	Description (after Tozer *et al.* 2006)	Floristic Summary (after Tozer *et al.* 2006)
Coastal Warm Temperate Rainforest	2,974	Coastal Warm Temperate Rainforest is a closed forest with a dense tree canopy, a subcanopy of small trees, lianes, an open layer of mesic shrubs and a fern-dominated groundcover. This rainforest is widely distributed across the study area in small patches, with local concentrations along the Illawarra scarp north from Cambewarra, along the escarpment in the Clyde district and along the Murramarang Range on the coast north of Durras. It is found in moist sheltered gullies and on sheltered escarpment slopes on loam to clay loam soils from 0 - 400m ASL with a mean annual rainfall greater than 900mm. Coastal Warm Temperate Rainforest is related to Sandstone Scarp Warm Temperate Rainforest (RF p114) which can be differentiated from this unit by its restriction to higher elevations (above 400m ASL), and the absence of lowland taxa (eg *Livistona*). Coastal Warm Temperate Rainforest belongs to the Northern Warm Temperate Rainforests vegetation class (Keith 2004). Much of its orignal distribution remains extant and it is represented within several large conservation reserves. Repeated fires may pose a threat to some	**Trees:** *Syzygium* (syn. *Acmena) smithii, Livistona australis, Ceratopetalum apetalum, Cryptocarya glaucescens, Synoum glandulosum* . **Small Trees:** *Tasmannia insipida, Eupomatia laurina, Ficus coronata, Psychotria loniceroides.* **Shrubs:** *Cyathea australis.* **Climbers**: *Morinda jasminoides, Smilax australis, Microsorum scandens, Marsdenia rostrata, Palmeria scandens, Pandorea*
Escarpment Foothills Wet Forest	4,455	Escarpment Foothills Wet Forest is a eucalypt forest with a mesophyll shrub/small tree stratum and an understorey of vines & ferns. This unit is distributed from Lake Cataract south to the Morton Plateau, occupying moist sheltered escarpment slopes between 100m and 650m ASL. South from Macquarie Pass this unit follows scarp slopes around the edges of the Southern highlands and Morton Plateau through Kangaroo Valley west to Bundanoon and south to Yarramunmun and Danjera. Over most of this range, mean annual rainfall typically varies between 1000 and 1200mm, though it reaches up to 1800mm in the Illawarra-Kangaroo Valley region. Escarpment Foothills Wet Forest shares several species with Illawarra Gully Wet Forest (WSF p99), but where their distributions overlap Escarpment Foothills Wet Forest occupies higher elevations and more southerly aspects. Escarpment Foothills Wet Forest belongs to South Coast Wet Sclerophyll Forests (Keith 2004). Extensive areas occur in conservation reserves and protected catchment areas.	**Trees:** *Eucalyptus muelleriana, E. smithii.* **Shrubs**: *Synoum glandulosum, Notelaea venosa, Elaeocarpus reticulatus* . **Climbers**: *Smilax australis, Tylophora barbata, Eustrephus latifolius, Geitonoplesium cymosum, Hibbertia dentata, Pandorea pandoran* . **Groundcover:** *Pteridium esculentum, Microlaena stipoides, Dianella caerulea, Oplismenus imbecillis*
Estuarine Creekflat Scrub	48	Estuarine Creekflat Scrub is a dense scrub with a continuous groundcover of sedges and forbs, and is recorded from scattered localities along the entire study area coastline from Cockle Bay (Brisbane Water) in the north to Nadgee Lake in the south. Within this distribution Estuarine Creekflat Scrub is restricted to shores of estuarine lagoons and brackish lakes, wetlands and creek flats below 10m ASL. Other occurrences include Botany Bay, Lake Illawarra, Minnamurra estuary, Brundee Swamp and Comerong Island, Tabourie, Termiel, Meroo, Durras and Wallagoot lakes, and at Tathra and Merimbula, and at Pedro Swamp near Moruya. Estuarine Creekflat Scrub shares a number of species with Estuarine Fringe Forest (FOW p106) but is found at sites that are likely to have marginally lower soil salinity. Estuarine Creekflat Scrub belongs to the Coastal Floodplain Wetlands vegetation class (Keith 2004). Its naturally restricted distribution has been reduced by coastal development. It is included within the Swamp Oak Forest on Coastal Floodplains EEC listed under the Threatened Species Conservation Act 1995.	**Trees:** *Melaleuca ericifolia, Casuarina glauca.* **Climbers**: *Parsonsia straminea.* **Groundcover**: *Baumea juncea, Lobelia alata, Baumea articulata, Leptinella longipes, Samolus repens, Selliera radicans.*
Estuarine Fringe Forest	53	Estuarine Fringe Forest is a low forest characterised by a rather dense non-eucalypt tree canopy, an open shrub stratum and a continuous groundcover tolerant of saline groundwater. This unit is restricted to sandy saline sediments fringing the high tide mark on the margins of tidal lakes, lagoons, inlets and river estuaries at elevations less than 5m ASL. It occurs in estuaries and tidal lakes along the length of the study area coastline, including the Hawkesbury, Georges, Hacking, Shoalhaven, Clyde, Moruya, Bermagui, Bega and Pambula rivers, and near the tidal mouths of St Georges Basin and Lake Illawarra. It is likely to also extend north and south of the study area. Estuarine Fringe Forest occupies increasingly saline environments, indicated by its increased dominance of halophytic taxa. Estuarine Fringe Forest has been greatly reduced by coastal development. It continues to be threatened by landfill and further clearing, weed invasion and recreational pressures. This map unit is included within the Swamp Oak Forest on Coastal Floodplains EEC listed under the Threatened Species Conservation Act 1995.	**Trees:** *Casuarina glauc* . **Shrubs:** *Myoporum australis.* **Groundcover:** *Juncus kraussii ssp australiensis, Samolus repens, Sarcocornia quinqueflora, Suaeda australis, Baumea juncea, Cynodon dactylon*
Estuarine Mangrove Forest	47	Estuarine Mangrove Forest is a low forest characterised by a dense tree/scrub canopy over bare mud or a patchy herbaceous groundcover. It has a scattered coastal distribution extending the length of the study area and continuing to the north and south. Estuarine Mangrove Forest is restricted to mudflats exposed to daily tidal inundation. The largest occurrences are found in the estuaries of the Clyde and Shoalhaven Rivers and in Botany Bay, and smaller areas are dotted along the entire coastline in estuaries, sheltered bays and tidal lakes Estuarine Mangrove Forest shares some species with Estuarine Saltmarsh (SL p509), and these two units intergrade readily over short distances with small changes in elevation and soil salinity. Estuarine Mangrove Forest is readily distinguished from Estuarine Saltmarsh by its mangrove tree canopy. Estuarine Mangrove Forest belongs to the Mangrove Forests vegetation class (Keith 2004). Although relatively robust to disturbance, some mangrove areas have been lost	**Trees:** *Avicennia marina* subsp. *australasica, Aegiceras corniculata.* **Groundcover:** *Sarcocornia quinqueflora.*

Vegetation Type	Total Illawarra extent (ha)*	Description (after Tozer *et al.* 2006)	Floristic Summary (after Tozer *et al.* 2006)
Estuarine Saltmarsh	138	Estuarine Saltmarsh comprises a complex, fine-scale mosaic of succulent herbfields and sedgelands. It is restricted to estuarine mudflats and saline lagoons, and is found on the upper limit of the inter-tidal zone. Estuarine Saltmarsh has a scattered coastal distribution along the entire length of the study area and is likely to continue further north and south. Larger stands are found in Botany Bay, Lake Illawarra, Jervis Bay, Merimbula Lake and the Shoalhaven, Clyde, Deua and Bermagui River estuaries Estuarine Saltmarsh has several halophytic taxa in common with Estuarine Mangrove Forest (SL p109), and these two units intergrade readily over short distances with small changes in elevation and soil salinity. Estuarine Saltmarsh is differentiated from Estuarine Mangrove Forest (SL p109) by hypersaline conditions and the dominance of succulent herbs and sedges rather than mangroves. Estuarine Saltmarsh belongs to the Saltmarshes vegetation class (Keith 2004), is part of the Coastal Saltmarsh EEC listed on Schedule 1 of the NSW Threatened Species Conservation Act (1995). This vegetation type is also Protected Marine Vegetation under the Fisheries Management Act 1994. Its naturally restricted distribution has been depleted substantially by coastal develop	**Groundcover:** *Sarcocornia quinqueflora, Samolus repens, Juncus kraussii, Suaeda australis*
Floodplain Swamp Forest	354	Floodplain Swamp Forest is a low, rather dense forest characterised by a non-eucalypt tree canopy, an open shrub layer and a semi-continuous groundcover dominated by taxa tolerant of brackish groundwater. Though typically coastal, this forest may occur some distance inland along floodplains of larger river estuaries in brackish drainage lines and depressions below 10m ASL. Floodplain Swamp Forest is closely related to, and grades into Estuarine Fringe Forest (FOW p106) below 5m ASL with increasing groundwater salinity Floodplain Swamp Forest is included within the Coastal Floodplain Wetlands vegetation class (Keith 2004). Its distribution has been greatly reduced by coastal development and remaining stands are threatened by further clearing, fragmentation, weed invasion and grazing. It is a component of the Swamp Oak Forest on Coastal Floodplains EEC, listed under the Threatened Species Conservation Act 1995.	**Trees:** *Casuarina glauca, Melaleuca styphelioides.* **Climbers:** *Parsonsia straminea.* **Groundcover:** *Commelina cyanea, Phragmites australis, Alternanthera denticulata, Carex appressa, Centella asiatica, Cynodon dactylon, Juncus kraussii*
Headland Grassland	6	Headland Grassland is a dense tussock grassland, typically less than 0.3 m tall, with occasional shrubs up to 4 m tall. Individual stands are highly restricted (most are <5 ha), and are scattered over a broad coastal distribution from Sydney to the south of Narooma. Headland Grassland is found within a few hundred metres of the sea on exposed rocky coastlines and offshore islands with shallow, black-brown, clay-loam soils derived from basic and acid volcanic rocks and from claystones. The terrain may be steep or flat and elevation is generally less than 100 m ASL. Headland Grassland has been highly modified by grazing and pasture improvement throughout its range. Some stands show signs of invasion by native and exotic shrubs where grazing regimes have changed, while all stands contain a variable component of introduced grasses and forbs. Headland Grassland belongs to the Maritime Grasslands vegetation class (Keith 2004), and is a component of the "Themeda grassland on seacliffs and coastal headlands" EEC listed on Schedule 1 of the NSW Threatened Species Conservation Act (1995).	**Shrubs:** *Banksia integrifolia* subsp. *integrifolia, Casuarina glauca, Acacia sophorae, Westringia fruticosa.* **Groundcover:** *Themeda australis, Cynodon dactylon, Microlaena stipoides, Poa poiformis, Lomandra longifolia, Isolepis nodosa, Centella asiatica, Glycine microphylla, Hibbertia scandens, Kennedia rubicunda, Commelina cyanea, Plectranthus parviflorus, Viola betonicifolia*
Hinterland Sandstone Gully Forest	269	Hinterland Sandstone Gully Forest is an open eucalypt forest with an abundant sclerophyll shrub stratum and a groundcover dominated by sedges. This forest surrounds the Cumberland plain, occuring along the western portion of the Hornsby and Woronora plateaux and in the lower Blue Mountains. Within this distribution Hinterland Sandstone Gully Forest occurs on lower slopes of dry sandstone gullies up to 600m ASL where average annual rainfall ranges from 850 to 1300mm. Hinterland Sandstone Gully Forest grades into Sandstone Riparian Scrub (FOW p58) immediately adjacent to creeklines and is replaced by Coastal Sandstone Ridgetop Woodland (DSF p131) or Wingecarribee-Burragorang Sandstone Forest (DSF p144) on upper slopes and exposed positions. As rainfall increases toward the coast, it is replaced by Coastal Sandstone Gully Forest (DSF p140). Hinterland Sandstone Gully Forest comprises part of the Sydney Hinterland Dry Sclerophyll Forests vegetation class (Keith 2004). About one third of its original extent has been supplanted by urban development. Large areas remain, including examples in conservation reserves, though edge effects such as weed invasion and high fire frequency are evident in some locations	**Trees:** *Angophora costata, Corymbia gummifera, Banksia serrata, Eucalyptus piperita.* **Shrubs:** *Persoonia linearis, P. levis, Phyllanthus hirtellus, Leptospermum trinervium, Lomatia silaifolia, Banksia spinulosa, Platysace linearifolia, Ceratopetalum gummiferum, Acacia ulicifolia, Acacia terminalis.* **Climbers:** *Billardiera scandens.* **Groundcover:** *Entolasia stricta, Pteridium esculentum, Dianella caerulea, Smilax glyciphylla, Xanthosia pilosa, Lomandra longifolia, Lepidosperma laterale, Lomandra obliqua*
Illawarra Gully Wet Forest	2,532	Illawarra Wet Gully Forest is a tall eucalypt forest with a moist open understorey, primarily distributed from the Hacking River catchment along the Illawarra scarp south to Mt Keira, on coastal lowlands near Berry and scattered through coastal foothills and lowlands from Nowra south to Batemans Bay. Illawarra Wet Gully Forest occurs on sheltered slopes and gullies with loamy soils with an annual rainfall in the range of 1000-1700mm. On the northern Illawarra escarpment, Illawarra Wet Gully Forest occupies elevations up to 400m ASL however south of Nowra rarely exceeds 200m ASL. More than a third of its original range has been cleared, mainly in the Illawarra lowlands. Highly fragmented stands amongst the suburbs at its disjunct north-east limit include an abundance of Corymbia maculata (spotted gum) and are identified as Pittwater Spotted Gum Forest listed on Schedule 1 of the NSW Threatened Species Conservation Act (1995).	**Trees:** *Livistona australis, Syncarpia glomulifera, Eucalyptus pilularis, E. paniculata .* **Shrubs:** *Synoum glandulosum, Breynia oblongifolia, Notelaea longifolia.* **Climbers:** *Eustrephus latifolius, Tylophora barbata, Hibbertia scandens, Glycine clandestina, Hibbertia dentata, Geitonoplesium cymosum.* **Groundcover:** *Lomandra longifolia, Pteridium esculentum, Dianella caerulea, Entolasia stricta, Oplismenus imbecillis, Imperata cylindrica, Pseuderanthemum variabile*

Vegetation Type	Total Illawarra extent (ha)*	Description (after Tozer *et al.* 2006)	Floristic Summary (after Tozer *et al.* 2006)
Illawarra Lowland Swamp Woodland	465	This map unit is a grassy eucalypt woodland found in coastal valleys and floodplains, most extensively around Lake Illawarra and in the Moruya - Congo area. Its distribution is restricted to flats below 100m ASL with sandy loam soils and partially impeded drainage, receiving over 1000mm of annual rainfall. On the Illawarra plain, South Coast Lowland Swamp Woodland grades into South Coast Grassy Woodland (GW p34) with increasing soil clay content and better drainage. The occurrences of these two units on the Illawarra Plain are listed as 'Illawarra Lowlands Grassy Woodland' on Schedule 1 of the NSW Threatened Species Conservation Act (1995). At Moruya, improved drainage leads from GW p3 to South East Lowland Grassy Woodland (GW e20p229). The naturally small distribution of South Coast Lowland Swamp Woodland has been severely depleted by land clearing and is threatened by continuing fragmentation, weed invasion and high frequency fire. It belongs to the Coastal Valley Grassy Woodlands vegetation class (Keith 2004).	**Trees:** *Eucalyptus globoidea, E. longifolia, Melaleuca decora.* Shrubs: *Leucopogon juniperinus, Pittosporum undulatum, Ozothamnus diosmifolius.* **Climbers:** *Glycine clandestina, G. tabacina.* **Groundcover:** *Microlaena stipoides, Pratia purpurascens, Entolasia stricta, Themeda australis, Cheilanthes sieberi, Lagenifera stipitata, Lepidosperma laterale, Cymbopogon refractus, Dichondra spp., Echinopogon caespitosus, Dianella longifolia, Imperata cylindrica, Arthropodium species B, Eragrostis leptostachya, Veronica plebeia.*
Intermediate Temperate Rainforest	542	Intermediate Temperate Rainforest is a closed forest characterised by a dense tree canopy, lianes, a mesic shrub/small tree stratum and a sparse fern-dominated groundcover. This rainforest is scattered over a wide distribution as small occurrences on relatively fertile, moist sites between 10m ASL (in the far south) and 750m ASL (western Blue Mountains), where annual rainfall exceeds 900mm. Within this distribution this unit is restricted to moist sheltered gullies among foothills and scarps. In the south of the study area, RF p116 is increasingly restricted to the coast and lower elevations, replaced by RF e6e7 (Southeast Warm Temperate Rainforest) at intermediate elevations and RF p317 (Southeast Cool Temperate Rainforest) at higher, cooler sites. Frequent fires may be a threat in some areas.	**Trees***: Syzygium (syn. Acmena) smithii, Pittosporum undulatum, Ficus coronata, Doryphora sassafras, Dendrocnide excelsa.* **Shrubs:** *Cyathea australis, Coprosma quadrifida, Notelaea venosa, Myrsine howittiana.* **Climbers:** *Pandorea pandorana, Smilax australis, Marsdenia rostrata, Eustrephus latifolius, Tylophora barbata, Microsorum scandens, Morinda jasminoides.* **Groundcover:** *Asplenium flabellifolium, Lastreopsis acuminata*
Littoral Thicket	268	Littoral Thicket is an open to dense scrub or low closed forest with an open groundcover, restricted to beach dunes and clay-soil headlands within 200m of the sea, subject to moderate wind shear and salt spray. It has been sampled along the study area coastline from McMasters Beach near Gosford to south of Potato Point, and is likely to continue as small scattered patches to the south. It is generally found at altitudes below 50m ASL, but was also recorded from higher elevations on steep exposed slopes above the sea in the northern Illawarra. Littoral Thicket is transitional between the Coastal Headland Heaths and the Littoral Rainforests vegetation classes (Keith 2004). About two-thirds of its original extent has been cleared for coastal development, and many of the remaining stands are small and threatened by continued small-scale clearing, fragmentation, intense recreational pressures, fires and weed invasion.	**Trees:** *Banksia integrifolia, Leptospermum laevigatum, Syzygium (syn. Acmena) smithii, Eucalyptus botryoides.* **Shrubs:** *Breynia oblongifolia, Monotoca elliptica, Notelaea longifolia.* **Climbers:** *Stephania japonica.* **Groundcover:** *Lomandra longifolia, Commelina cyanea, Hibbertia scandens, Pteridium esculentum, Dichondra spp., Viola hederacea, Oplismenus imbecillis, Imperata cylindrica*
Morton Mallee-Heath (Some *of this community in the Illawarra is incorrectly mapped across the Dunmore hills. In the Illawarra it occrs on the Budderoo plateau)*	54	Morton Mallee-Heath has an open to dense shrub canopy with emergent mallees and a thick groundcover of sedges and forbs. This unit occurs on damp shallow sandy loams on sandstone, at elevations from 10m to 750m, where mean annual rainfall varies from 900-1400mm. Morton Mallee-Heath is widespread on Permian Shoalhaven Group sandstones on the Morton plateau from Tallong south to Wog Wog and east to Yerriyong and Porters Creek, extending east to the coast, where it is scattered from Booderee to Meroo Point on Shoalhaven Conjola Formation sandstones Morton Mallee-Heath is transitional between the Sydney Montane Dry Sclerophyll Forests and Sydney Montane Heaths vegetation classes (Keith 2004). Much of the original distribution is within conservation reserves, where altered fire regimes and unauthorised use of off-road vehicles pose the main threats. [This community is incorrectly mapped in Dunmore instead of Basalt Hilltop Scrub, G. Daly pers comm. 2009]. **Note the 54 hectare distribution in the Illawarra is an over estimation due to the mapping error.*	**Trees:** *Eucalyptus sclerophylla, Corymbia gummifera.* Shrubs: *Leptospermum trinervium, Hakea teretifolia, Banksia ericifolia, B. spinulosa, Epacris microphylla, Hakea laevipes, Banksia paludosa, Isopogon anemonifolius, Lambertia formosa, Persoonia mollis ssp leptophylla.* Groundcover: *Lepyrodia scariosa, Patersonia sericea, Lindsaea linearis, Gonocarpus tetragynus, Goodenia bellidifolia, Ptilothrix deusta*
Nepean Shale Cap Forest	24	Nepean Shale Cap Forest (WSF p68) is a eucalypt forest with an open shrub layer and grassy groundcover, restricted to shale lenses on the upper Woronora plateau from 300m to 600m ASL. Nepean Shale Cap Forest shares a number of species with Southern Highlands Shale Forest (WSF p268), which occurs on deep clay soils derived from shale bedrock whereas this unit occurs on residual sandy – clay soils derived from shallow shale cappings. Further north on the Woronora plateau shale caps, Nepean Shale Cap Forest is replaced by Sydney Shale – Ironstone Cap Forest (DSF p143).Nepean Shale Cap Forest is transitional between the Southern Tableland and Northern Hinterland Wet Sclerophyll Forests vegetation classes (Keith 2004). Although restricted to a small range and comprised of small patches, much of its original distribution remains mostly intact within Sydney's metropolitan water catchments	**Trees:** *Eucalyptus globoidea, E. punctata, E. piperita E. crebra.* **Shrubs:** *Leucopogon lanceolatus, Persoonia linearis* . **Climbers:** *Clematis aristata, Billardiera scandens, Glycine clandestina.* **Groundcover:** *Dianella caerulea, Pteridium esculentum, Lomandra longifolia, Pratia purpurascens, Viola hederacea, Poranthera microphylla, Gonocarpus teucrioides*

Vegetation Type	Total Illawarra extent (ha)*	Description (after Tozer *et al.* 2006)	Floristic Summary (after Tozer *et al.* 2006)
River Mangrove	35	No quantitative data are available for this assemblage. The dominant species is *Aegiceras corniculata* which varies in stature from a shrub to a small tree. There may be a sparse cover of herbaceous species that are associated more commonly with Saltmarsh (Map Unit SL p509). Estuarine Wetland (River Mangrove) is restricted to the upper tidal zone on mudflats north from Merimbula Lake, where the dominant species reaches its southern limit. *A. corniculata* also occurs as an emergent in Saltmarsh of other estuaries within the region (e.g. Bermagui River). Its distribution continues further north along the New South Wales coast. Mangroves have an important role in estuarine productivity and in supporting breeding populations of fish and other marine organisms. The principal threats entail degradation associated with foreshore and catchment development, and intensifying recreational use of the lake.	No floristic summary. *Aegiceras corniculata is dominant.*
Riverbank Forest	36	Riverbank Forest is a distinctive tall River Oak forest with an open shrub layer and a dense or patchy groundcover of grasses and forbs. It is found on sand/gravel alluvium strewn with cobbles along swift-flowing reaches of streams, at elevations from 20-800m ASL. Riverbank Forest occurs widely across the study area along major streams including the Coxs, Abercrombie, Wollondilly, Shoalhaven, Deua and Brogo River systems, and Araluen and Wandella Creeks. This Map Unit occurs on a range of substrates, however none of the sites assigned to this unit were located on Hawkesbury or Narrabeen Sandstones, where similar habitat is occupied by Sandstone Riparian Scrub (FOW p58). Riverbank Forest is part of the Eastern Riverine Forests vegetation class (Keith 2004). Some areas of Riverbank Forest have been cleared, although some regrowth has occurred. Its riparian habitat is susceptible to weed invasion and degradation where livestock are unconstrained. Significant examples are represented within the Warragamba Special Area along the Wollondilly and Kowmung Rivers, and in Abercrombie River, Tarlo River and Morton National Parks.	**Trees:** *Casuarina cunninghamiana* . **Shrubs**: *Hymenanthera dentata, Urtica incisa.* **Climbers**: *Stephania japonica, Pandorea pandorana.* **Groundcover:** *Microlaena stipoides, Lomandra longifolia, Oplismenus aemulus, Dichondra repens*
Sandstone Riparian Scrub	21	Sandstone Riparian Scrub is a scrub or low forest with clumped shrubs and a clumped groundcover dominated by sedges and ferns. It is distributed around the edges of the Sydney basin on streams draining Triassic Hawkesbury and Narrabeen sandstone, in the Blue Mountains, Hornsby, Woronora and Nattai Plateaux. Sandstone Riparian Scrub is restricted to shallow sand and gravel alluvium over rock on the bed and banks of streams subjected to occasional high-velocity floods. This unit falls within the Eastern Riverine Forests vegetation class (Keith 2004). Several examples are represented within conservation reserves, though these are susceptible to polluted runoff and weed invasion from urban areas in the stream catchments.Representation of this unit on the vegetation map was dependent upon API delineation of narrow strips of riparian scrub, which may have been undetected in some situations (eg. in deep gorges). As a result, the extent of FOW p58 is likely to be underestimated, and some of the sampled locations of this unit will be mapped as surrounding vegetation types (eg. DSF p140, DSF p142, WSF p102).	**Trees**: *Tristaniopsis laurina, Ceratopetalum apetalum.* **Shrubs**: *Lomatia myricoides, Tristania neriifolia, Leptospermum morrisonii.* **Groundcover:** *Lomandra longifolia, Entolasia stricta, Schoenus melanostachys, Lomandra fluviatilis, Sticherus flabellatus*
Sandstone Scarp Warm Temperate Rainforest	113	Sandstone Scarp Warm Temperate Rainforest is a closed forest characterised by a dense tree canopy with occasional emergents, lianes, a mesic shrub and small tree stratum and an open fern-dominated groundcover. This unit is distributed as small occurrences within the dissected sandstone plateaux of the Sydney Basin, from 400 - 800m ASL, in areas receiving more than 850mm annual rainfall. These conditions are found mainly on the escarpments of the Blue Mountains, Budderoo and Morton plateaux. Within these areas Sandstone Scarp Warm Temperate Rainforest is restricted to moist gully heads and sheltered slopes below sandstone clifflines. Sandstone Scarp Warm Temperate Rainforest is related to Coastal Warm Temperate Rainforest (RF p113) which differs in being restricted to sandstone substrates below 400m ASL. Sandstone Scarp Warm Temperate Rainforest falls within the Northern Warm Temperate Rainforests vegetation class (Keith 2004). Little of its original extent has been cleared and it is represented in several large conservation reserves.	**Trees:** *Ceratopetalum apetalum, Syzygium (syn. Acmena) smithii, Doryphora sassafras.* **Shrubs:** *Cyathea australis, Todea barbara, Tasmannia insipida.* **Climbers**: *Morinda jasminoides, Smilax australis.* **Groundcover:** *Blechnum cartilagineum* .
Seagrass Meadow (Halophila)	7	No quantitative data are available for this unit. The dominant species is *Halophila ovalis* which may co-occur with other seagrass species (Map Units SL e68 - SL e70). Seagrass Meadows (Halophila) are restricted to soft substrates in the sub-tidal zone of coastal estuaries such as Wallagoot Cuttagee and Wallaga Lakes. More work is required to establish its relationship to other seagrass assemblages. Sea grass meadows have an important role in estuarine productivity and in supporting breeding populations of fish and other marine organisms. Potential threats include degradation caused by development or pasture improvement in estuary catchments, although the relevant catchments are partially protected in conservation reserves.	No floristic summary

Vegetation Type	Total Illawarra extent (ha)*	Description (after Tozer *et al.* 2006)	Floristic Summary (after Tozer *et al.* 2006)
Seagrass Meadow (Ruppia)	1	No quantitative data are available for this unit. The dominant species are *Ruppia polycarpa* and *R. megacarpa* which may co-occur with other seagrass species (Map Units SL e67, SL e 68 & SL e 70). Seagrass Meadows (Ruppia) are restricted to soft substrates in the sub-tidal zone of coastal estuaries. Scattered occurrences include Curalo Lagoon near Eden, Middle Lagoon, Baragoot Lake and Wallaga Lake. More work is required to establish its relationship to other seagrass assemblages in the region. Sea grass meadows have an important role in estuarine productivity and in supporting breeding populations of fish and other marine organisms. Potential threats include degradation caused by development or pasture improvement in estuary catchments, although the some of the catchments are partially protected in conservation reserves.	No floristic summary
Seagrass Meadow (Zostera)	34	No quantitative data are available for this unit. The dominant species is *Zostera capricorni* which may co-occur with other seagrass species (Map Units SL e67 - SL e69). Seagrass Meadows (Zostera) are restricted to soft substrates in the sub-tidal zone of coastal estuaries. Further work is required to establish its relationship to other seagrass assemblages in the region. This is the most widespread seagrass assemblage. Sea grass meadows have an important role in estuarine productivity and in supporting breeding populations of fish and other marine organisms. Potential threats include degradation caused by development or pasture improvement in estuary catchments, although some of these catchments are partially protected in conservation reserves.	No floristic summary
Shale-Basalt Sheltered Forest	53	Shale-Basalt Sheltered Forest represents a tall eucalypt forest with an open shrub layer and a moist herbaceous groundcover. This unit is distributed along moist elevated ridgetops and peaks on fertile soils in the Blue Mountains, the upper Woronora plateau and in the Southern Highlands. Within this distribution Shale-Basalt Sheltered Forest occurs on shale derived soils and soils developed along the shale/basalt boundary between 450 and 900m ASL, usually in areas receiving a mean annual rainfall of more than 1200mm. On the Southern Highlands plateau Shale-Basalt Sheltered Forest grades into Southern Highlands Shale Forest (WSF p268) with decreasing rainfall. On adjacent Basalt substrates Shale-Basalt Sheltered Forest encompases both Blue Mountains Shale Cap Forest and Southern Highlands Shale Woodland as listed on Schedule 1 of the NSW Threatened Species Conservation Act (1995). Substantial areas have been cleared, particularly around Bilpin and in the Southern Highlands. Shale-Basalt Sheltered Forest falls within the Southern Tableland Wet Sclerophyll Forests vegetation class (Keith 2004).	***Trees:*** *Eucalyptus piperita, E. globoidea E. cypellocarpa.* ***Shrubs:*** *Leucopogon lanceolatus, Indigofera australis, Goodenia ovata, Polyscias sambucifolia subsp A.* ***Climbers:*** *Tylophora barbata, Eustrephus latifolius, Glycine clandestina, Clematis aristata.* ***Groundcover:*** *Dianella caerulea, Microlaena stipoides, Lomandra longifolia, Pteridium esculentum, Viola hederacea, Dichondra spp., Pratia purpurascens, Doodia aspera, Hydrocotyle peduncularis, Adiantumaethiopicum, Blechnum cartilagineum, Galium binifolium.*
Shoalhaven Riparian Scrub	10	Shoalhaven Riparian Scrub is characterised by an open but clumped shrub canopy and patchy groundcover of sedges and forbs. It is restricted to shallow alluvial sediments over rock along regularly flooded sections of the beds of higher southern tableland rivers, including sections of the Woronora and Cordeaux catchments in the Illawarra. It occurs on alluvium derived from a range of metasediment and granitoid substrates, at elevations 500-1000m ASL. This unit occurs extensively along the upper Shoalhaven River and its tributaries, and was sampled at Oallen Ford, the Bombay Road crossing and at Krawarree.Representation of this unit on the vegetation map was dependent upon API delineation of narrow strips of riparian scrub, which in some situations may not have been separated from adjacent forest vegetation. As a result, the extent of FRW p56 is likely to be underestimated, and some of the sampled locations of this unit will be mapped as surrounding vegetation types (eg. GW p220, GW p520). Shoalhaven Riparian Scrub falls within the Montane Bogs and Fens vegetation class (Keith 2004). It is restricted to a very specialised habitat and is vulnerable to disturbances within the catchment and degradation of the riparian	**Shrubs:** *Leptospermum obovatum, Melaleuca ericifolia, Callistemon sieberi, Leptospermum grandifolium, Hakea microcarpa, Acacia dealbata* . **Groundcover:** *Carex gaudichaudiana, Scirpus polystachyus, Carex tereticaulis, Chenopodium pumilio, Dichelachne inaequiglumis, Hydrocotyle peduncularis, Juncus usitatus, Lomandra longifolia, Microlaena stipoides, Persicaria hydropiper, Poa labillardierei, Senecio diaschides.*
Shoalhaven Sandstone Forest	471	Shoalhaven Sandstone Forest is an open eucalypt forest or woodland with an abundant sclerophyll shrub stratum and a groundcover dominated by sedges. This unit occurs on sandstone plateaux up to 700m ASL in the lower Shoalhaven district from Meryla south as far as Pigeon House Mountain, where average annual rainfall is 950-1600mm. This vegetation type occurs as narrow bands along the western margins of the Shellharbour and Kiama LGAs. Within this distribution Shoalhaven Sandstone Forest occurs on sandy loam soils derived primarily from Hawkesbury or Nowra sandstone, or the Berry formation. Shoalhaven Sandstone Forest shares several species with Morton-Budawang Sandstone Woodland (DSF p248), which occurs in higher country further west on the Morton plateau and on the Budawang ranges to the south Shoalhaven Sandstone Forest belongs to the Sydney Coastal Dry Sclerophyll Forests vegetation class (Keith 2004). Examples are represented in Morton National Park and Parma Nature Reserve. Large areas outside reserves generally have not been subject to intensive land uses.	**Trees:** *Corymbia gummifera, Eucalyptus sclerophylla, E. sieberi.* **Shrubs:** *Lambertia formosa, Persoonia levis, Banksia spinulosa, Petrophile pedunculata, Leptospermum trinervium, Lomatia ilicifolia, Bossiaea heterophylla, Hakea laevipes, Platysace linearifolia, Pimelea linifolia, Tetratheca thymifolia.* **Groundcover:** *Lomandra obliqua, Patersonia sericea, Entolasia stricta, Caustis flexuosa, Cyathochaeta diandra*

Vegetation Type	Total Illawarra extent (ha)*	Description (after Tozer *et al.* 2006)	Floristic Summary (after Tozer *et al.* 2006)
South Coast Grassy Woodland	2,124	South Coast Grassy Woodland is a eucalypt woodland with an open shrub layer and a continuous grassy groundcover, found on lower slopes in coastal rainshadow valleys, below 350m ASL, from Wollongong to Milton and west to Yalwal. These areas receive mean annual rainfall of 850-1500mm, and have loamy soils derived from a variety of substrates. South of Milton this unit is replaced in similar habitats by the closely-related South East Lowland Grassy Woodland (GW e20p229). South Coast Grassy Woodland falls within the Coastal Valley Grassy Woodlands vegetation class (Keith 2004). South Coast Grassy Woodland is included within Illawarra Lowlands Grassy Woodland EEC as listed on Schedule 1 of the NSW Threatened Species Conservation Act (1995). It has been depleted throughout its range by land clearing. Remnants are generally small, located largely on freehold lands, and exposed to continuing attrition by overgrazing, frequent fire and small-scale clearing.	**Trees:** *Eucalyptus tereticornis, E. eugenioides.* **Shrubs:** *Pittosporum undulatum, Breynia oblongifolia, Myrsine variabilis.* **Climbers:** *Geitonoplesium cymosum, Eustrephus latifolius, Glycine clandestina, Pandorea pandorana* . **Groundcover:** *Dichondra spp., Desmodium gunnii, Microlaena stipoides, Oplismenus imbecillis, Carex longebrachiata, Poa labillardierei, Commelina cyanea, Pratia purpurascens, Themeda australis*
Southern Highlands Basalt Forest	11	Southern Highlands Basalt Forest (WSF p266) is a tall eucalypt forest with an open shrub layer and a moist herbaceous groundcover. This unit is restricted to moist, elevated areas on fertile soils associated with Tertiary volcanics on the Robertson plateau, Sassafras and at The Vines in Morton National Park. Southern Highlands Basalt Forest occurs on soils derived from Tertiary basalt, basanite and microsyenite between 650 and 850m ASL, where mean annual rainfall is between 1000-1350mm. Southern Highlands Basalt Forest matches unit 6k Robertson Basalt Tall Forest identified by Benson and Howell (1994c) and includes both Robertson Basalt Tall Open-forest EEC and Mount Gibraltar Forest EEC as listed on Schedule 1 of the NSW Threatened Species Conservation Act (1995). About two-thirds of this community has been cleared, and remants are exposed to the ongoing impacts of weed invasion, grazing and small-scale clearing. It belongs to the Southern Escarpment Wet Sclerophyll Forests vegetation class (Keith 2004).	**Trees:** *Acacia melanoxylon, Eucalyptus fastigata, E. cypellocarpa, E. radiata.* **Climbers**: *Clematis aristata, Tylophora barbata, Eustrephus latifolius, Glycine clandestina, Hibbertia scandens, Hardenbergia violacea.* **Groundcover:** *Lomandra longifolia, Pteridium esculentum, Viola hederacea, Dichondra spp., Microlaena stipoides, Poa labillardierei, Dianella caerulea, Hydrocotyle peduncularis, Poranthera microphylla, Echinopogon ovatus, Geranium potentilloides, Helichrysum scorpioides, Schelhammera undulata, Stellaria pungens, Veronica plebeia, Adiantum*
Subtropical Complex Rainforest	2,583	Subtropical Complex Rainforest is a complex closed forest characterised by a dense and diverse tree canopy supporting various lianes, a subcanopy layer of small trees, a sparse shrub layer, an open fern dominated groundcover and occasional large trees emerging above the closed canopy. This unit is distributed in the Illawarra between Scarborough and Cambewarra, with a disjunct ocurrence further south at Milton. Within this distribution Subtropical Complex Rainforest is restricted to soils derived from Gerringong Volcanics near Kiama, soils derived from monzonite in gullies around Milton, and slopes and benches of the Illawarra scarp from 0 - 300m ASL where latite, shale and coal seams are exposed and annual rainfall is greater than 1300mm. With decreasing moisture availability Subtropical Complex Rainforest intergrades with the closely related Subtropical Dry Rainforest (RF p111). On poorer soils Subtropical Complex Rainforest is replaced by Coastal Warm Temperate Rainforest (RF p113). Subtropical Complex Rainforest is included within the Illawarra Subtropical Rainforest EEC listed on Schedule 1 of the Threatened Species Conservation Act 1995, and falls within the Subtropical Rainforests vegetation class (Keith 2004). Being restri	**Trees:** *Livistona australis, Doryphora sassafras, Syzygium (syn. Acmena) smithii, Diospyros australis, Claoxylon australe, Dendrocnide excelsa, Pittosporum undulatum, Streblus brunonianus, Diploglottis australis, Ficus coronata, Alectryon subcinereus, Toona ciliata* . **Small Trees:** *Cassine australis, Clerodendrum tomentosum, Pennantia cunninghamii, Eupomatia laurina. Shrubs: Pittosporum multiflorum.* **Climbers:** *Eustrephus latifolius, Arthropteris tenella, Marsdenia rostrata, Microsorum scandens, Pandorea pandorana, Piper novae-hollandiae, Smilax australis.* **Groundcover:** *Gymnostachys anceps, Adiantum formosum, Pseuderanthemum variabile, Doodia aspera*
Subtropical Dry Rainforest	1,742	Subtropical Dry Rainforest occurs on coastal lowlands between Mt Kiera and Nowra with a southern occurrence near Milton. Within this range it is largely restricted to dry slopes on fertile soils associated with Gerringong volcanics, Milton Monzonite or Cordeaux Crinanite at altitudes less than 350m ASL and with a mean annual rainfall of 1000-1600mm. Subtropical Dry Rainforest is closely related to Subtropical Complex Rainforest (RF p112), both occuring on fertile soils in the Kiama and Milton areas, however Subtropical Dry Rainforest replaces Complex rainforest in sites experiencing lower moisture availability due to either rainfall, aspect, topographic position and soil depth or some combination of these factors.The original distribution of Subtropical Dry Rainforest is now highly fragmented by land clearing, and it is listed on Schedule 1 of the NSW Threatened Species Conservation Act (1995) as Illawarra Subtropical Rainforest in the Sydney Basin Bioregion and as Milton Ulladulla Subtropical Rainforest in the Sydney Basin Bioregion. Its relationship with these two communities reflects its transitional status between two vegetation classes; Subtropical Rainforests and Dry Rainforests (Keith 2004)	**Trees:** *Streblus brunonianus, Alectryon subcinereus, Pittosporum undulatum, Diospyros australis* . **Shrubs:** *Notelaea venosa, Cassine australis, Clerodendrum tomentosum, Pittosporum multiflorum, Breynia oblongifolia, Croton verreauxii, Myrsine variabilis, Maclura cochinchinensis, Pittosporum revolutum.* **Climbers**: *Geitonoplesium cymosum, Eustrephus latifolius, Pandorea pandorana, Parsonsia straminea, Marsdenia rostrata, Smilax australis.* **Groundcover:** *Oplismenus imbecillis, Pellaea falcata, Pseuderanthemum variabile, Asplenium flabellifolium, Gymnostachys anceps, Doodia aspera.*

Vegetation Type	Total Illawarra extent (ha)*	Description (after Tozer *et al.* 2006)	Floristic Summary (after Tozer *et al.* 2006)
Sydney Shale-Ironstone Cap Forest	1,144	Sydney Shale-Ironstone Cap Forest is usually a low eucalypt forest with a very diverse, mixed understorey of shrubs, forbs and grasses. Sydney Shale-Ironstone Cap Forest occurs on coastal sandtone plateaux (Woronora and Hornsby plateaux) between Lake Cataract and Duffy's Forest. In this area Sydney Shale-Ironstone Cap Forest is restricted to shale lenses and ironstone mantles on ridges up to 400m ASL with an average annual rainfall from 1100-1550mm. Sydney Shale-Ironstone Cap Forest is generally associated with ridgetop units of the surrounding sandstone plateaux (DSF p131 Coastal Sandstone Ridgetop Woodland, and HL p117 Coastal Sandstone Plateau Heath).Much of this naturally restricted vegetation type was cleared for orchards and small farms during the early development of Sydney. The small remnants are mainly associated with the urban and rural-residential interface and are exposed to continuing degradation through high fire frequencies, rubbish dumping, polluted runoff and weed invasion. Sydney Shale-Ironstone Cap Forest includes Duffy's Forest EEC and O'Hares Creek Shale Forest EEC, both listed on Schedule 1 of the NSW Threatened Species Conservation Act (1995). This unit falls within the Northern Hinterland V	**Trees:** *Corymbia gummifera, Angophora costata, Ceratopetalum gummiferum, Eucalyptus sieberi, E. capitellata, E. globoidea.* **Shrubs:** *Lomatia silaifolia, Banksia spinulosa, Persoonia levis, Acacia myrtifolia, Phyllanthus hirtellus, Micrantheum ericoides, Xanthosia tridentata, Epacris pulchella, Xanthorrhoea media, Lasiopetalum ferrugineum, Hakea sericea, Persoonia pinifolia, Platysace linearifolia, Bossiaea obcordata* **. Climbers:** *Billardiera scandens, Cassytha pubescens.* **Groundcover:** *Entolasia stricta, Dianella caerulea, Pteridium esculentum, Austrostipa pubescens, Lomandra obliqua, Cyathochaeta diandra, Lepidosperma laterale, Lindsaea linearis, Patersonia glabrata, Brunoniella pumilio, Gonocarpus teucrioides, Imperata cylindrica* var *major, Lomandra multiflora, Dampiera stricta*
Tableland Swamp Forest	15	Tableland Swamp Flats Forest is an open eucalypt forest with sparse shrubs and dense grassy groundcover. It occurs on coarse sandy alluvial soils along drainage channels and flats on the tablelands at elevations between 500 and 900m ASL where average annual rainfall ranges from 650 to 1000mm.. Tableland Swamp Flats Forest was sampled at localities from Jenolan to Bombala, and probably extends further in areas of similar habitat. Two related communities (Southern Tableland Flats Forest (GW p220) and Tableland Granite Grassy Woodland (GW p420)) partially overlap with the distribution of GW 520, but they occur on drier, flat to gently undulating terrain. Tableland Swamp Flats Forest has been extensively cleared and few examples are represented in conservation reserves. The remnants are exposed to small-scale clearing, weed invasion and grazing. Tableland Swamp Flats Forest are transitional between the Subalpine Woodlands and Tableland Clay Grassy Woodlands vegetation classes (Keith 2004).	**Trees:** *Eucalyptus viminalis, E. pauciflora.* **Shrubs:** *Rubus parviflorus* . **Groundcover:** *Microlaena stipoides, Dichondra spp., Acaena novae-zelandiae, Hydrocotyle laxiflora, Stellaria pungens, Poa labillardierei, Echinopogon ovatus, Geranium solanderi, Desmodium varians*
Tableland Swamp Meadow	3	Tableland Swamp Meadow is characterised by a dense groundcover of water-tolerant, soft-leaved sedges and forbs. Scattered trees may be present, and an open to dense shrub layer is occasionally present. Vegetation structure and species composition varies locally in response to water table gradients. Tableland Swamp Meadow is restricted to deep, waterlogged peats and humic loams in sediment-filled valleys 200-1100m ASL where mean annual rainfall is 700-1300mm. Examples are scattered throughout the tablelands, from the Blue Mountains south to the Shoalhaven headwaters, and in the far south at Genoa and Yambulla. There are small examples of this vegetation type in the Cataract catchment. Examples include Burralow Swamp in Blue Mountains NP; Burra Burra Lake north of Taralga; Bent Hook Swamp in the Bindook Highlands; Wingecarribee Swamp on the Robertson plateau; Long Swamp on the Southern Highlands; Jembaicumbene Swamp near Braidwood; Sheep Station Creek swamp in Bondi State Forest, and Snob Creek swamp at Yambulla Clearing and habitat degradation is widespread throughout the distribution of Tableland Swamp Meadow. Domestic livestock and feral pigs have major impacts on the structure of vegetation ar	**Shrubs:** *Leptospermum juniperinum, L. obovatum, Lythrum salicaria.* **Groundcover:** *Baumea rubiginosa, Carex gaudichaudiana, Eleochaeris sphacelata, Hydrocotyle peduncularis, Isachne globosa, Juncus usitatus, Lepyrodia anarthria, Phragmites australis, Ranunculus inundatus.*
Temperate Dry Rainforest	3	Temperate Dry Rainforest is a simple closed forest characterised by a dense tree canopy, lianes, a mesic shrub stratum and a sparse patchy groundcover. This dry rainforest has a widespread distribution as small occurrences in gullies and on lower slopes of gorges and foothills below 400m ASL, predominantly south of Nowra in the Ettrema Gorge and the Clyde, Deua and Tuross hinterlands. Within this distribution Temperate Dry Rainforest typically occupies dry shale gullies with an annual rainfall from 850 – 1250mm. North of the Shoalhaven, Temperate Dry Rainforest is largely replaced by Grey Myrtle Dry Rainforest (RF p38) in the Blue Mountains and Cumberland Plain margins, while south of Cobargo it grades into and is replaced by Southeast Dry Rainforest (RF e1) Temperate Dry Rainforest is within the Dry Rainforests vegetation class (Keith 2004). It is highly sensitive to fire, and remnants on private lands are likely to be subject to grazing and weed invasion.	**Trees:** *Backhousia myrtifolia, Syzygium (syn.Acmena) smithii, Pittosporum undulatum.* **Shrubs**: *Pittosporum revolutum, Breynia oblongifolia, Ficus coronata, Notelaea venosa, Myrsine howittiana.* **Climbers:** *Morinda jasminoides, Cissus hypoglauca, Eustrephus latifolius, Pandorea pandorana, Smilax australis, Marsdenia rostrata, Geitonoplesium cymosum, Parsonsia straminea.* **Groundcover:** *Doodia aspera, Pseuderanthemum variabile, Oplismenus imbecillis* .

Vegetation Type	Total Illawarra extent (ha)*	Description (after Tozer *et al.* 2006)	Floristic Summary (after Tozer *et al.* 2006)
Temperate Littoral Rainforest	194	Temperate Littoral Rainforest is a closed forest characterised by a dense tree canopy, lianes, a sparse shrub stratum and an open groundcover. This rainforest is restricted to sandspits and coastal gullies within a few hundred metres of the ocean. Within the study area small occurences are distributed along the coast south from Sutherland, in places where annual rainfall exceeds 950mm. Local concentrations occur from Garie to Stanwell Park and on the Beecroft Peninsula. Temperate Littoral Rainforest shares some species with Subtropical Dry Rainforest, Subtropical Complex Rainforest and Warm Temperate Layered Forest (RF p111, RF p112 and WSF p110) and replaces these units where Littoral influences predominate Temperate Littoral Rainforest has been significantly depleted by clearing for coastal development and, in the Kiama district, for agricultural development. Some stands are represented within conservation reserves, but these face intense pressures from recreational use and weed invasion. All stands are included within the Littoral Rainforest EEC as listed on Schedule 1 of the NSW Threatened Species Conservation Act (1995).	**Trees:** Syzygium (syn.*Acmena) smithii, Guioa semiglauca, Livistona australis, Diospyros australis, Podocarpus elatus, Eucalyptus botryoides, Pittosporum undulatum, Synoum glandulosum, Cassine australis.* **Shrubs:** *Eupomatia laurina, Ripogonum album.* **Climbers:** *Marsdenia rostrata, Sarcopetalum harveyanum, Stephania japonica, Smilax australis, Eustrephus latifolius, Cissus hypoglauca, Geitonoplesium cymosum. Groundcover: Oplismenus imbecillis, Viola hederacea, Pellaea falcata, Gahnia aspera.*
Warm Temperate Layered Forest	9,771	Warm Temperate Layered Forest is a tall eucalypt forest characterised by an open eucalypt canopy, a dense small tree subcanopy and a moist shrubby understorey. Warm Temperate Layered Forest occurs predominantly south from the Hacking River along the Illawarra scarp, to Nowra and throughout the Kangaroo Valley. Localised occurrences are also recorded from sites as far south as Durras Mountain and as far north as Ku-ring-gai Chase National Park. Within this area it is found below 400m on sheltered slopes in gullies and on escarpments with loamy soils where mean annual rainfall exceeds 1000mm. Warm Temperate Layered Forest frequently adjoins Subtropical and Warm Temperate rainforest map units, and contains several rainforest taxa below its eucalypt canopy Warm Temperate Layered Forest is included within North Coast Wet Sclerophyll Forests vegetation class (Keith 2004). About half of its original range has been cleared, mainly in the Illawarra lowlands, adjoining lower slopes of the escarpment and in the Kangaroo valley.	**Trees:** *Syzygium (syn.) Acmena smithii, Livistona australis, Synoum glandulosum, Pittosporum undulatum, Cryptocarya glaucescens, Eucalyptus salignaXbotryoides, E. quadrangulata.* **Shrubs:** *Notelaea venosa, Clerodendrum tomentosum, Eupomatia laurina.* **Climbers:** *Eustrephus latifolius, Smilax australis, Pandorea pandorana, Geitonoplesium cymosum, Morinda jasminoides, Marsdenia rostrata, Tylophora barbata, Stephania japonica* **. Groundcover:** *Doodia aspera, Pseuderanthemum variabile, Oplismenus imbecillis, Gymnostachys anceps, Blechnum cartilagineum.*
Yarrawarra Temperate Rainforest	175	Yarrawarra Temperate Rainforest is a closed forest characterised by a low, dense tree canopy, a mesic shrub stratum, lianes and a fern-dominated groundcover. This rainforest is restricted to basalt derived soils of the Robertson plateau from 650 to 800m ASL where annual rainfall exceeds 1300mm. Yarrawarra Temperate Rainforest is closely related to Intermediate Temperate Rainforest (RF p116) which occupies fertile clay soils derived from shale on the Southern Highlands plateau or narrow bands of shales/volcanics/coal seams on the upper Illawarra Escarpment. Yarrawarra Temperate Rainforest occurs in conjuction with Southern Higlands Basalt Forest (WSF p266) and their distributions may reflect historic fire frequencies Yarrawarra Temperate Rainforest is referrable to Robertson Rainforest in the Sydney Basin Bioregion listed on Schedule 1 of the NSW Threatened Species Conservation Act (1995), much of its original distribution having been fragmented by clearing for agriculture. It represents a transitional community between two vegetation classes; Southern Warm Temperate Rainforests and Cool	**Trees***: Syzygium (syn.Acmena) smithii, Acacia melanoxylon, Doryphora sassafras.* **Shrubs***: Dicksonia antarctica, Coprosma quadrifida, Hedycarya angustifolia, Myrsine howittiana.* **Climbers:** *Pandorea pandorana, Pyrrosia rupestris, Smilax australis, Marsdenia rostrata, Eustrephus latifolius, Microsorum scandens, Morinda jasminoides.* **Groundcover:** *Asplenium flabellifolium, Urtica incisa, Lastreopsis acuminata, Pellaea falcata.*
Total	**65,816**		

* Total extent figures are likely to be over estimated as they are based on aerial photos several years old.

It should be noted that many of the communities described in this mapping have been derived from datasets much larger than the Illawarra, therefore, the floristic summary may indicate species that are not common or present within

There are also other locally occurring vegetation types not well described in this mapping. Refer to the Biodiversity Strategy data auddit for more information.

APPENDIX 12 VEGETATION COMMUNITY PRIORITIES

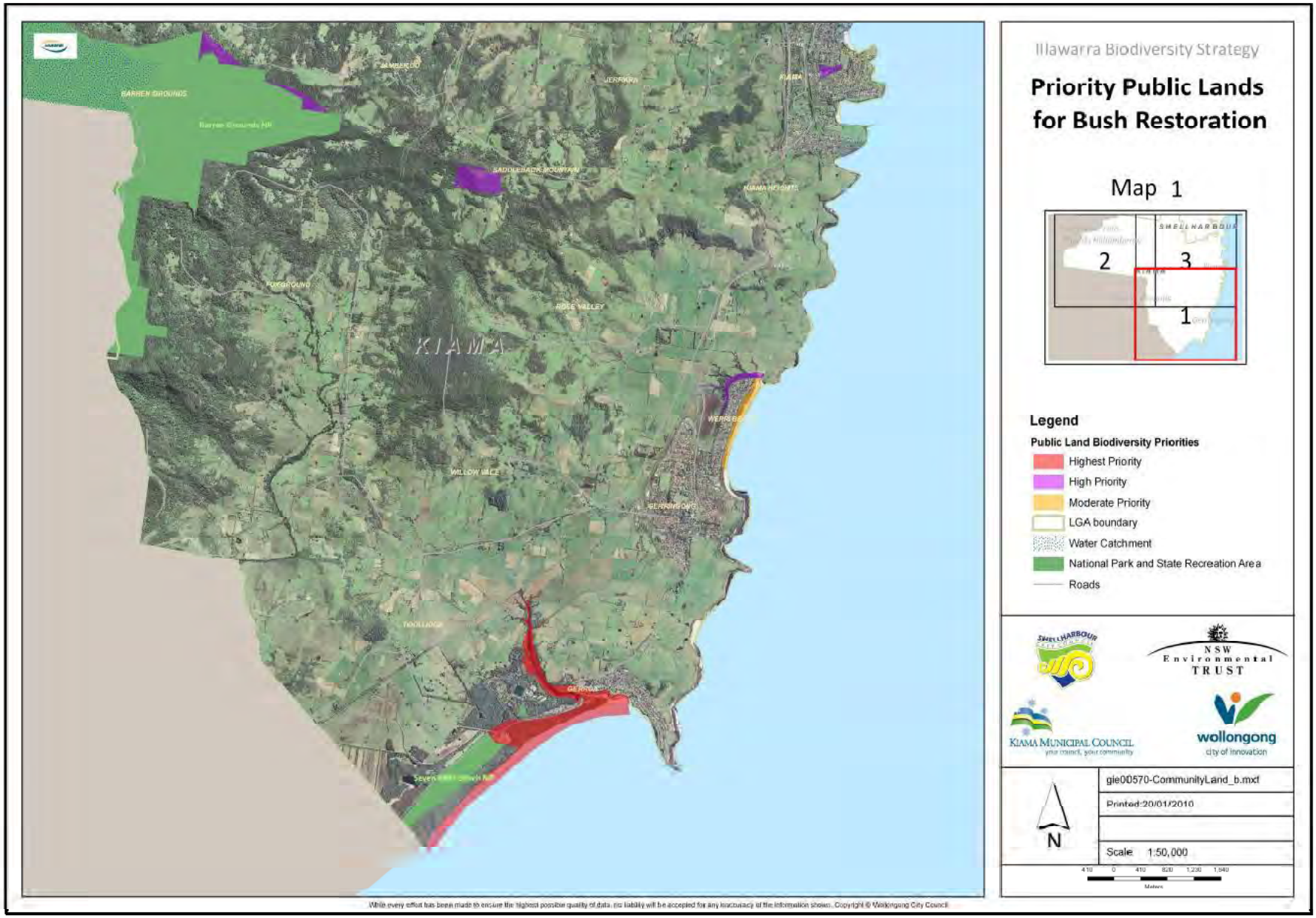
Vegetation type (Tozer *et al* . 2006)	Kiama (Ha)	Shellharbour (Ha)	Wollongong (Ha)	Total Illawarra extent (ha)*	SCIVI extent (total beyond SRCMA) (ha)	Endemism - % of total distribution occurring within the Illawarra	Area reserved in Illawarra NPWS Estate (ha)	% of extant distribution reserved in NPWS estate in the Illawarra	Vegetation priority	Endangered Ecological Community name
Basalt Hilltop Scrub	70	161	0	231	387	59.7	0	0	Priority 1	*Melaleuca armillaris* Tall Shrubland
Blue Mountains - Shoalhaven Hanging Swamps	876	0	330	1,205	4,938	24.4	820	68	Priority 3	
Blue Mountains Heath	0	0	1	1	7,821	0.0	0	0	Priority 2	
Budderoo Temperate Rainforest	197	1	0	198	402	49.3	87	44	Priority 3	
Budderoo-Morton Plateau Forest	2,046	6	0	2,052	5,534	37.1	1,836	89	Priority 3	
Coastal Freshwater Lagoon	0	46	98	145	3,391	4.3	0	0	Priority 2	Freshwater Wetlands on Floodplains OR Sydney Freshwater Wetland*
Coastal Rock Plate Heath	0	0	88	88	254	34.7	4	4	Priority 2	
Coastal Sand Forest	234	40	63	338	11,114	3.0	60	18	Priority 2	Bangalay Sand Forest
Coastal Sand Swamp Forest	8	0	12	20	1,380	1.5	0	0	Priority 2	Swamp Sclerophyll Forest
Coastal Sandplain Heath	0	0	24	24	1,004	2.4	0	0	Priority 2	
Coastal Sandstone Gully Forest	0	8	9,733	9,741	24,368	40.0	717	7	Priority 2	Southern Sydney Sheltered Forest (part)
Coastal Sandstone Plateau Heath	1,032	12	166	1,210	16,044	7.5	1,031	85	Priority 3	
Coastal Sandstone Ridgetop Woodland	0	9	16,711	16,720	110,964	15.1	1,352	8	Priority 2	
Coastal Scrub & Beach Strand	9	12	191	212	3,020	7.0	3	1	Priority 2	
Coastal Upland Swamp	0	0	2,854	2,854	4,793	59.5	342	12	Priority 1	Temperate Highland Peat Swamp
Coastal Warm Temperate Rainforest	267	128	2,579	2,974	15,160	19.6	757	25	Priority 2	
Escarpment Foothills Wet Forest	1,319	295	2,841	4,455	31,528	14.1	762	17	Priority 2	
Estuarine Creekflat Scrub	14	21	14	48	3,645	1.3	0	0	Priority 2	Swamp Oak Floodplain Forest
Estuarine Fringe Forest	14	37	2	53	832	6.4	0	0	Priority 2	Swamp Oak Floodplain Forest
Estuarine Mangrove Forest	24	24	0	47	3,111	1.5	0	0	Priority 2	
Estuarine Saltmarsh	40	54	45	138	1,837	7.5	0	0	Priority 2	Coastal Saltmarsh
Floodplain Swamp Forest	60	101	193	354	2,279	15.5	0	0	Priority 2	Swamp Oak Floodplain Forest or River-flat Eucalypt
Headland Grassland	0	2	4	6	30	19.3	1	18	Priority 2	*Themeda* Grasslands on Seacliffs and Coastal Headlands
Hinterland Sandstone Gully Forest	0	0	269	269	91,001	0.3	0	0	Priority 2	
Illawarra Gully Wet Forest	82	32	2,417	2,532	7,126	35.5	525	21	Priority 2	
Illawarra Lowland Swamp Woodland	28	111	327	465	770	60.5	0	0	Priority 1	Illawarra Lowlands Grassy Woodland (part)
Intermediate Temperate Rainforest	446	86	11	542	2,959	18.3	132	24	Priority 2	
Littoral Thicket	2	64	202	268	1,789	15.0	137	51	Priority 2	Littoral Rainforest (part)

Vegetation type (Tozer *et al*. 2006)	Kiama (Ha)	Shellharbour (Ha)	Wollongong (Ha)	Total Illawarra extent (ha)*	SCIVI extent (total beyond SRCMA) (ha)	Endemism - % of total distribution occurring within the Illawarra	Area reserved in Illawarra NPWS Estate (ha)	% of extant distribution reserved in NPWS estate in the Illawarra	Vegetation priority	Endangered Ecological Community name
Morton Mallee-Heath*	17	37	0	54	37,539	0.1	0	0	Priority 1	*This is being treated as Basalt Hilltop Scrub as it is an error in the vegetation map. It is incorreclty mapped over Dunmore Hills distribution of Basalt Hilltop Scrub,
Nepean Shale Cap Forest	0	0	24	24	661	3.6	0	0	Priority 2	
River Mangrove	19	17	0	35	544	6.5	0	0	Priority 2	
Riverbank Forest	30	6	0	36	9,308	0.4	0	0	Priority 2	
Sandstone Riparian Scrub	0	0	21	21	2,867	0.7	8	40	Priority 3	
Sandstone Scarp Warm Temperate Rainforest	32	66	14	113	6,778	1.7	66	58	Priority 3	
Seagrass Meadow (Halophila)	0	0	7	7	604	1.1	0	0	Priority 2	
Seagrass Meadow (Ruppia)	1	0	0	1	144	0.4	0	0	Priority 2	
Seagrass Meadow (Zostera)	4	16	13	34	1,342	2.5	0	0	Priority 2	
Shale-Basalt Sheltered Forest	21	6	26	53	2,456	2.1	10	19	Priority 2	Southern Highlands Shale Woodland
Shoalhaven Riparian Scrub	0	0	10	10	1,279	0.8	0	0	Priority 2	
Shoalhaven Sandstone Forest	285	61	124	471	56,462	0.8	308	65	Priority 3	
South Coast Grassy Woodland	30	944	1,150	2,124	3,315	64.1	47	2	Priority 1	Illawarra Lowlands Grassy Woodland (part)
Southern Highlands Basalt Forest	0	0	11	11	1,969	0.6	0	0	Priority 2	Robertson Basalt Tall Open Forest (part)
Subtropical Complex Rainforest	1,809	219	556	2,583	4,046	63.8	266	10	Priority 1	Illawarra Subtropical Rainforest (part)
Subtropical Dry Rainforest	299	1,007	435	1,742	2,339	74.5	108	6	Priority 1	Illawarra Subtropical Rainforest (part)
Sydney Shale-Ironstone Cap Forest	0	0	1,144	1,144	2,637	43.4	399	35	Priority 2	O'Hares Creek Shale Forest
Tableland Swamp Forest	0	1	15	15	1,733	0.9	1	4	Priority 2	
Tableland Swamp Meadow	0	0	3	3	3,599	0.1	0	0	Priority 2	Montane Peatlands and Swamps
Temperate Dry Rainforest	0	0	3	3	7,449	0.0	1	29	Priority 2	
Temperate Littoral Rainforest	1	4	189	194	470	41.4	166	85	Priority 2	Littoral Rainforest - all stands
Warm Temperate Layered Forest	3,471	1,676	4,624	9,771	21,454	45.5	1,696	17	Priority 2	
Yarrawarra Temperate Rainforest	56	0	120	175	856	20.5	0	0	Priority 2	Robertson Rainforest
Total	**12,841**	**5,309**	**47,666**	**65,816**	**1,804**		11,643	18		

*Spatial extents of vegetation communities have been derived from vegetation mapping that is based on aerial photography compiled between 1991-2002 (Tozer et al. 2006). They are therefore likely to be an over estimation of current extent.

This mapping does not acknowledge the distribution of some communities in certain LGAs, especially where their distribution is small, e.g.;
- Coastal Freshwater Lagoon also occurs in Kiama.
- Coastal Upland Swamp also occurs in Kiama, at Barren Grounds.
- Headland Grassland also occurs in Kiama.

There may also be other anomalies.


Illawarra Biodiversity Strategy
Priority Public Lands for Bush Restoration
Map 1
2
3
1
KIAMA
BARREN GROUNDS
SADDLEBACK MOUNTAIN
FOXGROUND
ROSE VALLEY
WILLOW VALE
Legend
Public Land Biodiversity Priorities
Highest Priority
High Priority
Moderate Priority
LGA boundary
Water Catchment
National Park and State Recreation Area
Roads
NSW Environmental TRUST
KIAMA MUNICIPAL COUNCIL
wollongong
city of innovation
N
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Scale 1:50,000
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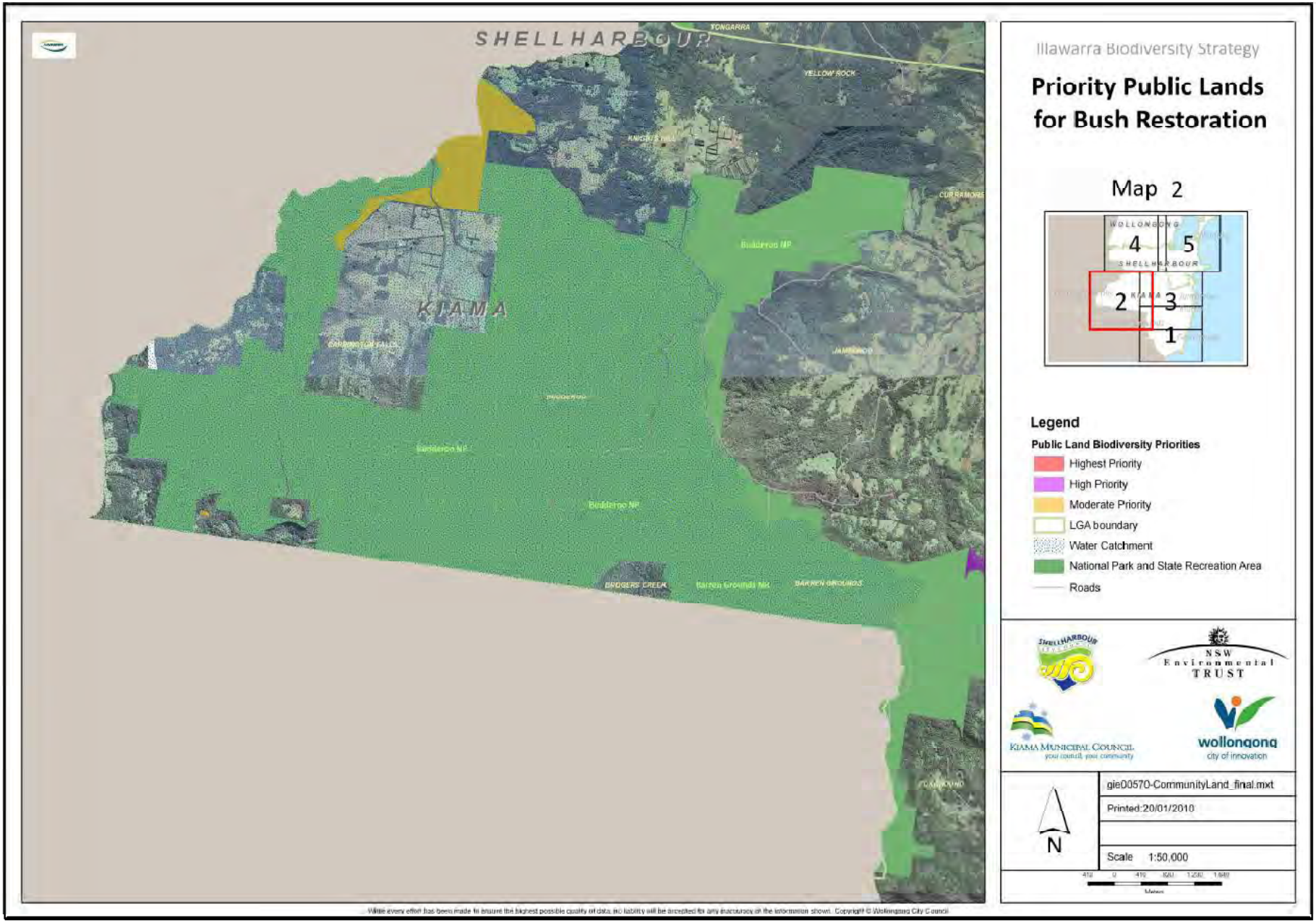

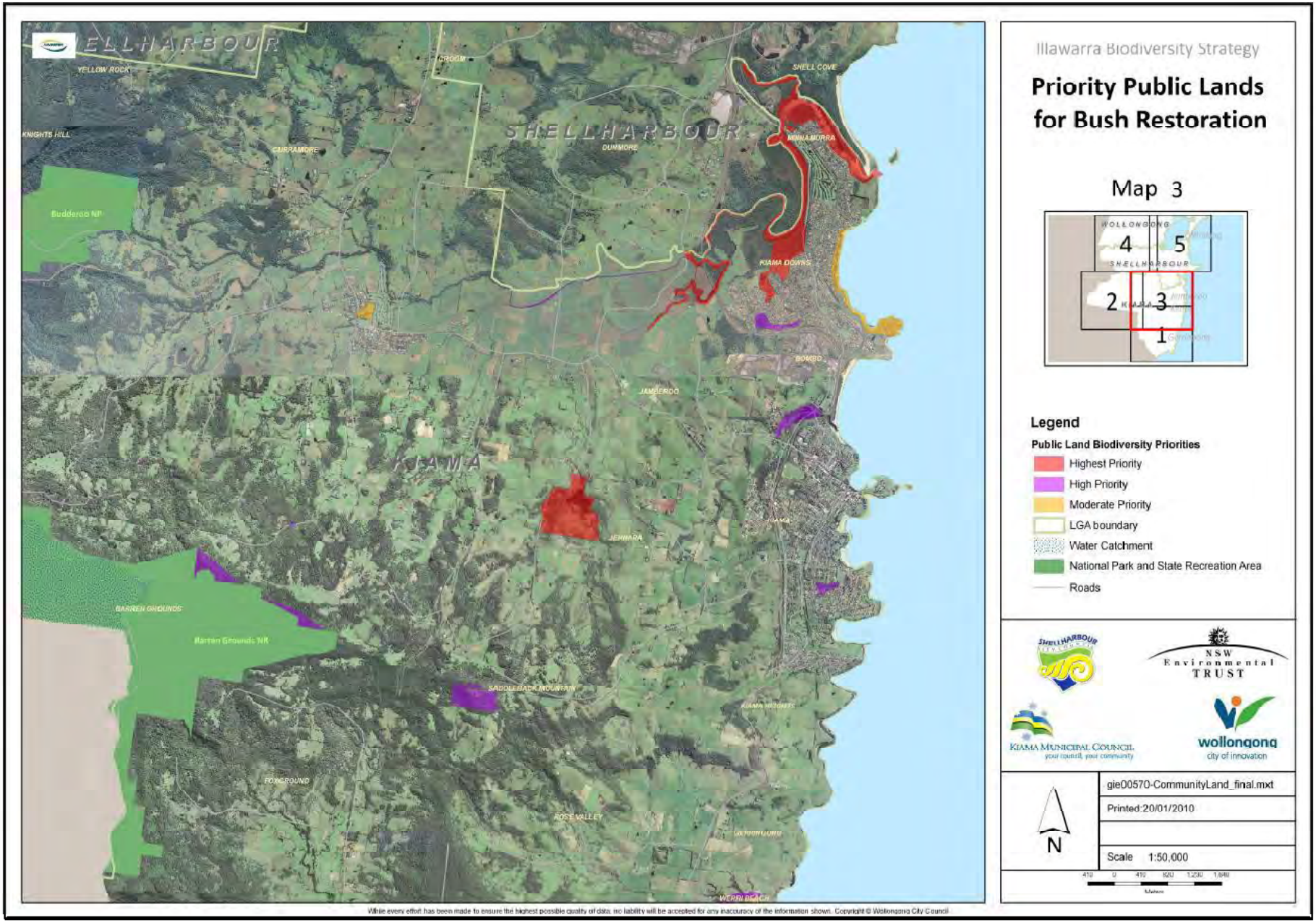
Illawarra Biodiversity Strategy
Priority Public Lands for Bush Restoration
Map 3
WOLLONGONG
SHELLHARBOUR
KIAMA
4
5
2
3
1
Legend
Public Land Biodiversity Priorities
Highest Priority
High Priority
Moderate Priority
LGA boundary
Water Catchment
National Park and State Recreation Area
Roads
NSW Environmental TRUST
Kiama Municipal Council
your council, your community
wollongong
city of innovation
N
gie00570-CommunityLand_final.mxt
Printed:20/01/2010
Scale 1:50,000
410 0 410 820 1,230 1,640
Metres
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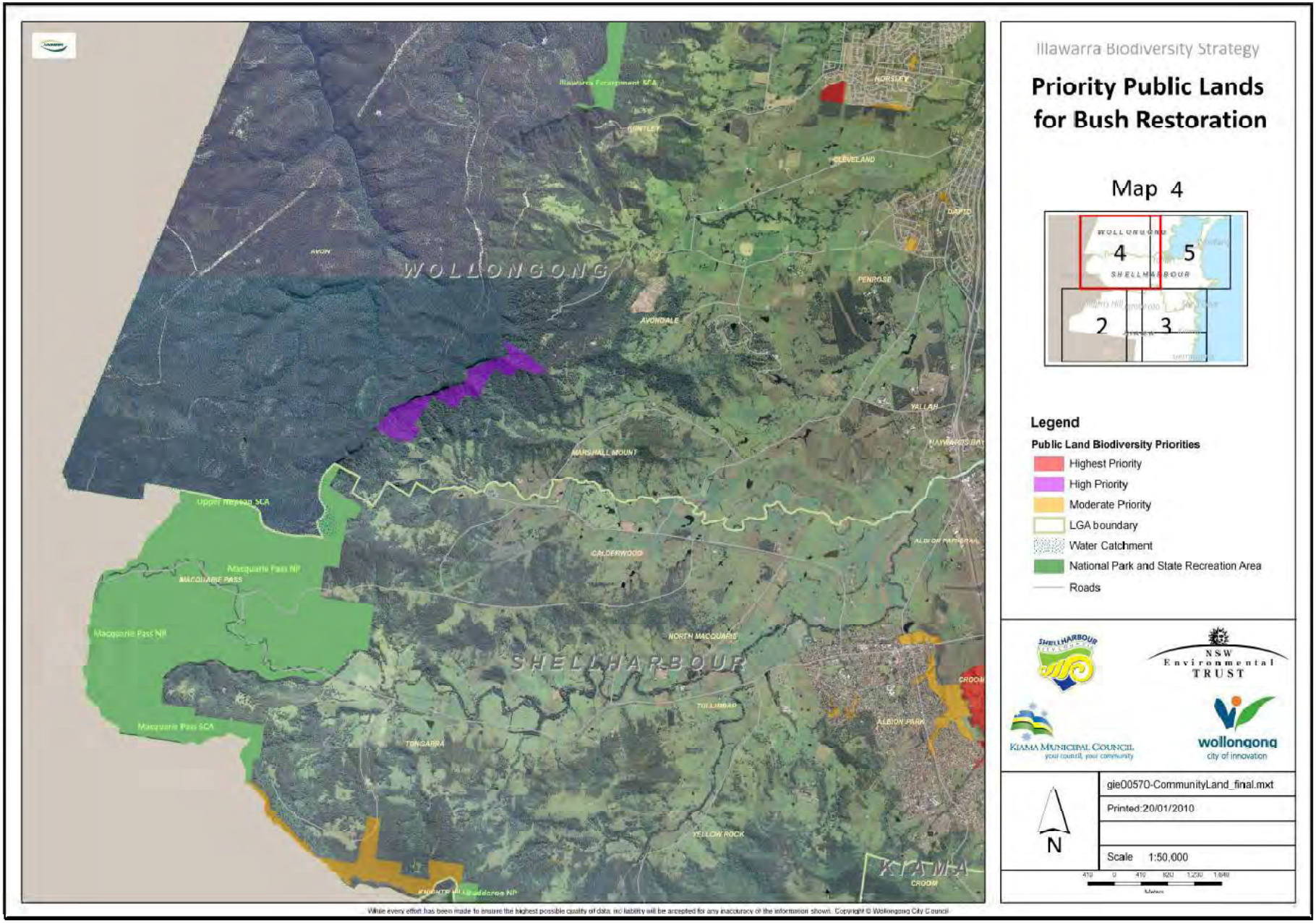
Illawarra Biodiversity Strategy
Priority Public Lands for Bush Restoration
Map 4
Legend
Public Land Biodiversity Priorities
Highest Priority
High Priority
Moderate Priority
LGA boundary
Water Catchment
National Park and State Recreation Area
Roads
WOLLONGONG
SHELLHARBOUR
KIAMA
Illawarra Escarpment SCA
Upper Nepean SCA
Macquarie Pass NP
Macquarie Pass SCA
NORTH MACQUARIE
CALDERWOOD
MARSHALL MOUNT
AVONDALE
PENROSE
YALLAH
TONGARRA
YELLOW ROCK
ALBION PARK
CROOM
NSW Environmental TRUST
Kiama Municipal Council
your council, your community
wollongong
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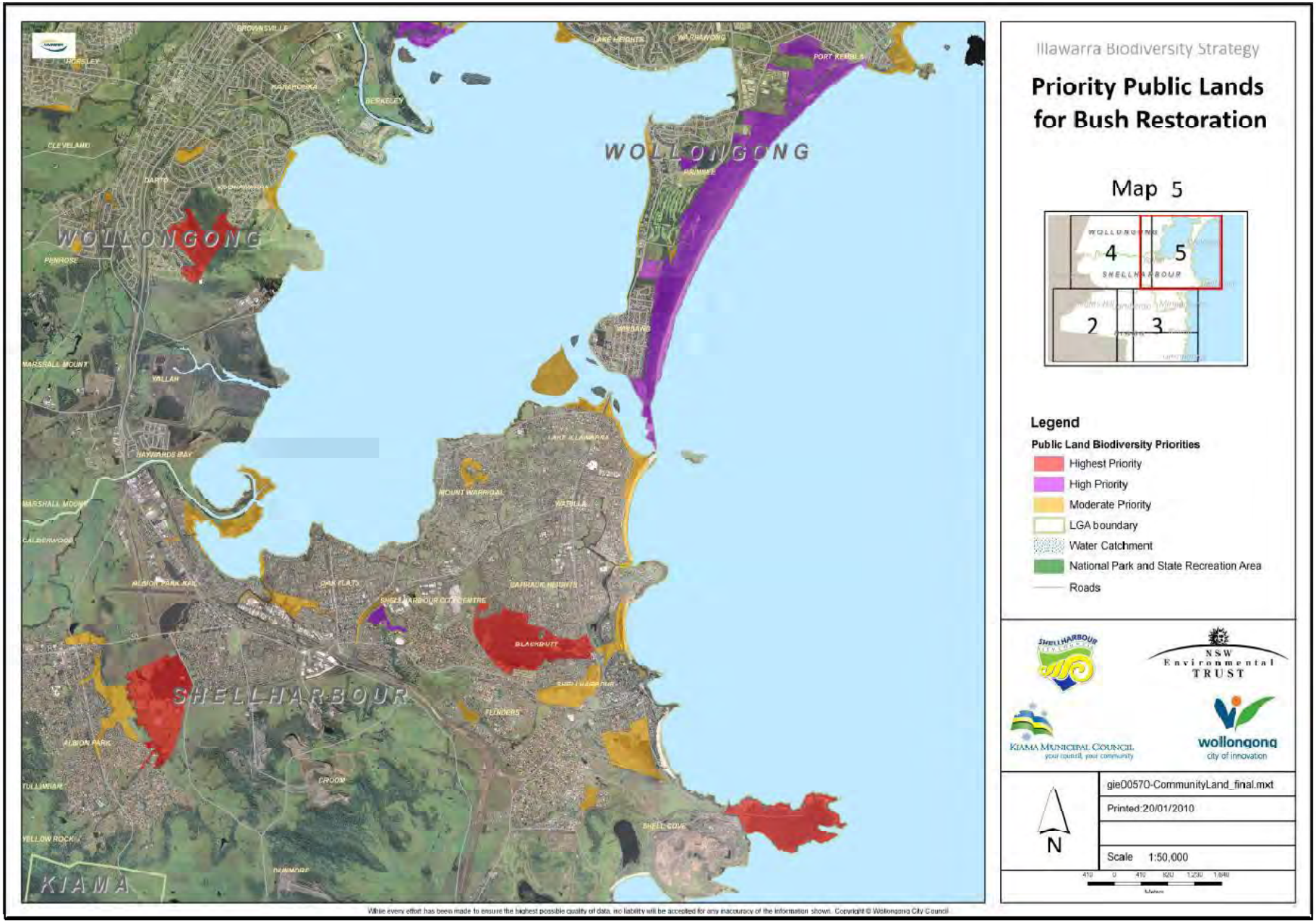
Illawarra Biodiversity Strategy
Priority Public Lands for Bush Restoration
Map 5
4
5
2
3
Legend
Public Land Biodiversity Priorities
Highest Priority
High Priority
Moderate Priority
LGA boundary
Water Catchment
National Park and State Recreation Area
Roads
NSW Environmental TRUST
Kiama Municipal Council
your council, your community
wollongong
city of innovation
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Scale 1:50,000
N
WOLLONGONG
SHELLHARBOUR
KIAMA
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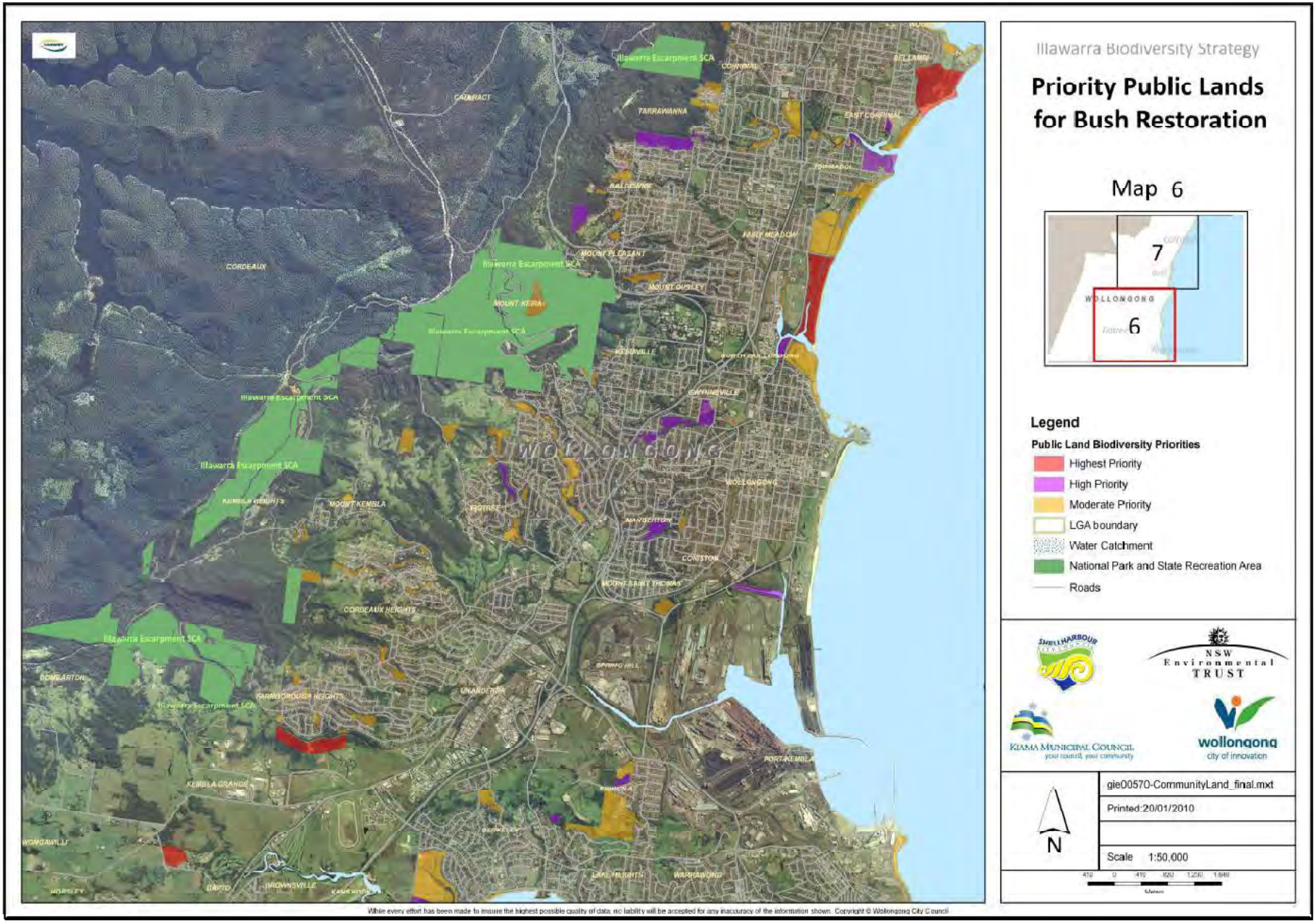
Illawarra Biodiversity Strategy
Priority Public Lands for Bush Restoration
Map 6
7
6
WOLLONGONG
Legend
Public Land Biodiversity Priorities
Highest Priority
High Priority
Moderate Priority
LGA boundary
Water Catchment
National Park and State Recreation Area
Roads
Illawarra Escarpment SCA
CORDEAUX
CATARACT
TARRAWANNA
MOUNT PLEASANT
MOUNT KEIRA
MOUNT OUSLEY
KEIRAVILLE
CORDEAUX HEIGHTS
MOUNT KEMBLA
MOUNT SAINT THOMAS
CONISTON
WOLLONGONG
UNANDERRA
FAIRY MEADOW
BELLAMBI
EAST CORRIMAL
KEMBLA GRANGE
WONGAWILLI
BROWNSVILLE
DAPTO
WORRIGEE
WARRAWONG
LAKE HEIGHTS
PORT KEMBLA
NSW Environmental TRUST
KIAMA MUNICIPAL COUNCIL
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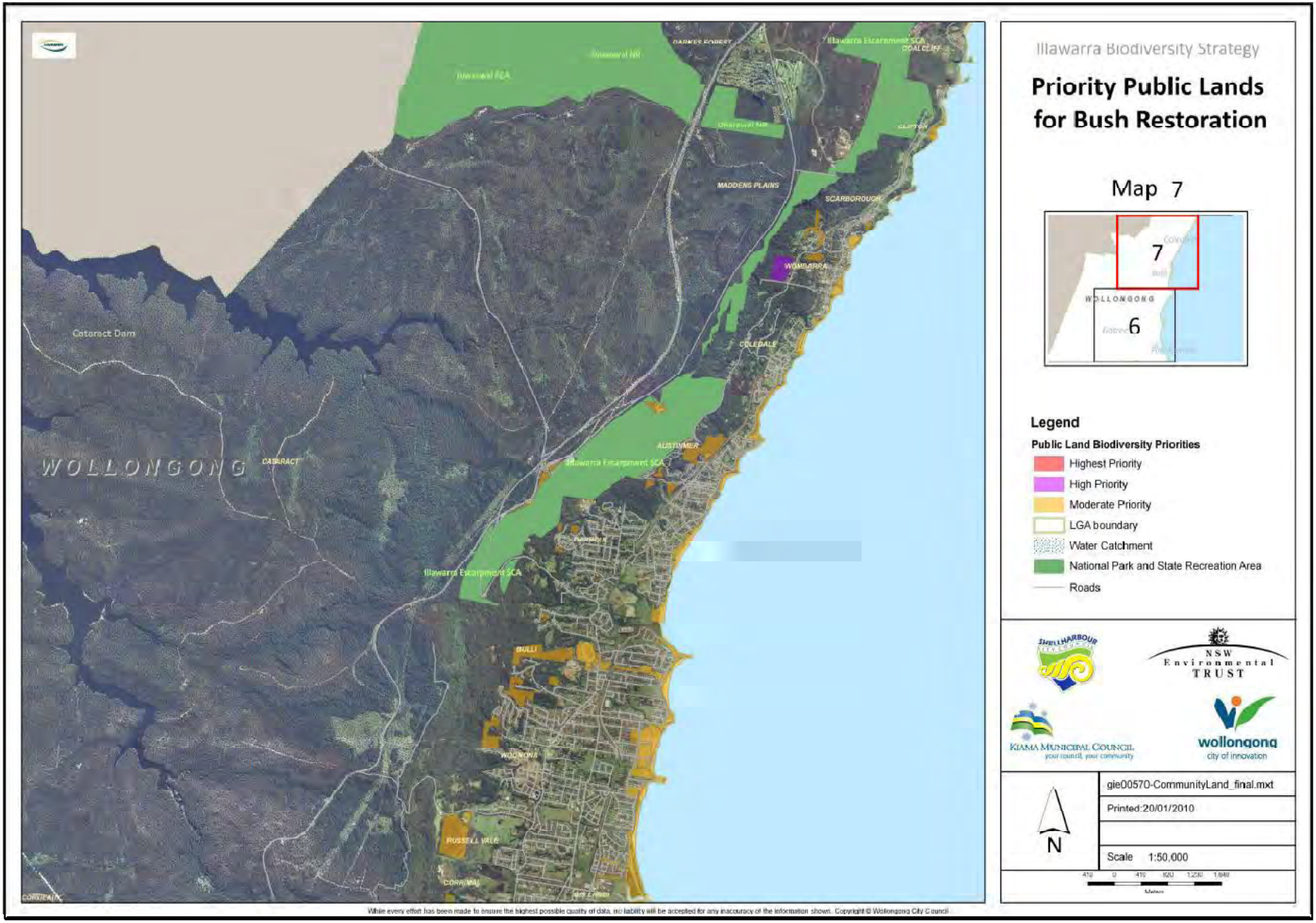
Illawarra Biodiversity Strategy
Priority Public Lands for Bush Restoration
Map 7
7
6
WOLLONGONG
Legend
Public Land Biodiversity Priorities
Highest Priority
High Priority
Moderate Priority
LGA boundary
Water Catchment
National Park and State Recreation Area
Roads
Cataract Dam
WOLLONGONG
CATARACT
Illawarra Escarpment SCA
MADDENS PLAINS
SCARBOROUGH
WOMBARRA
COLEDALE
AUSTINMER
BULLI
WOONONA
RUSSELL VALE
CORRIMAL
Kiama Municipal Council
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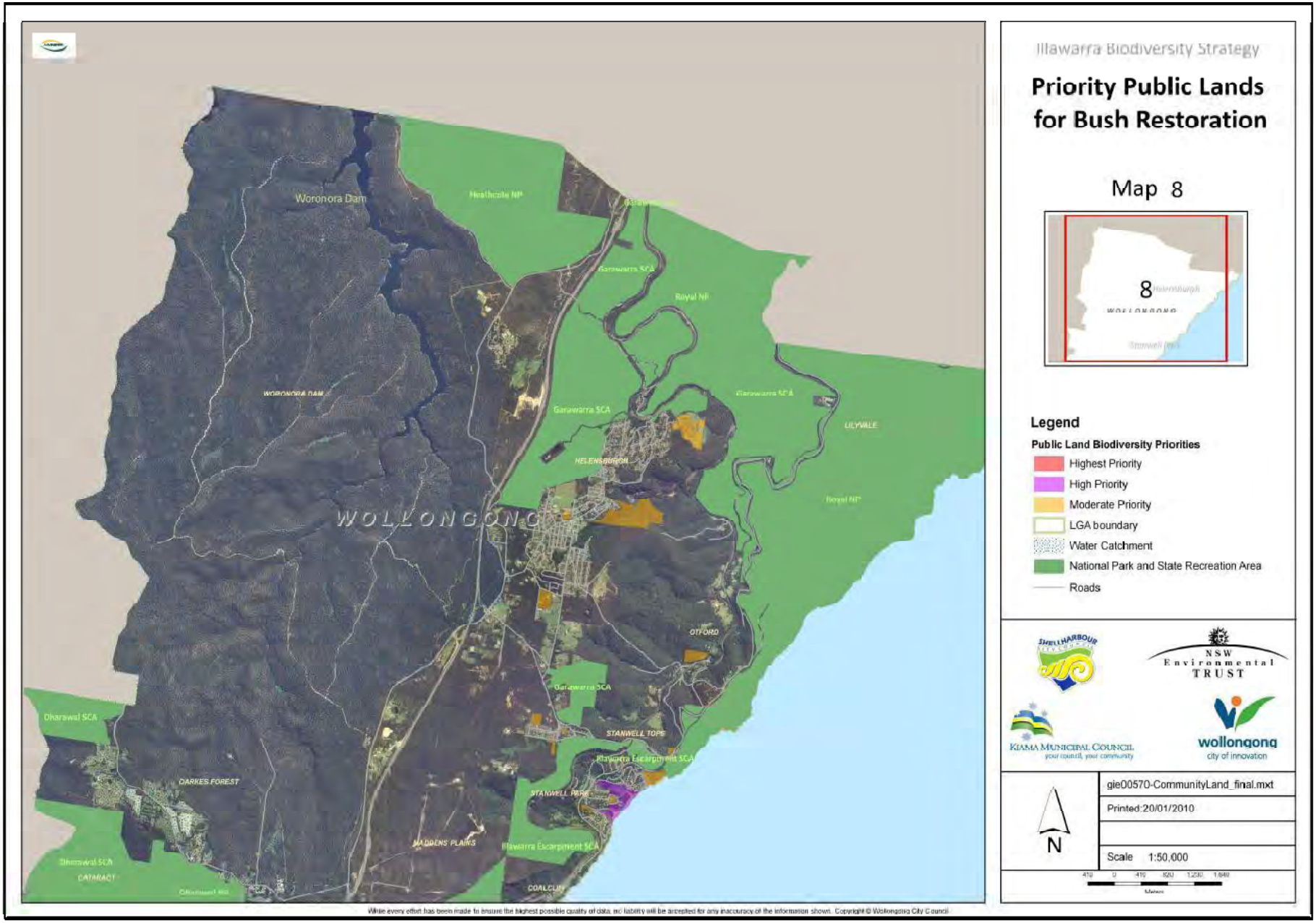
Illawarra Biodiversity Strategy
Priority Public Lands for Bush Restoration
Map 8
Legend
Public Land Biodiversity Priorities
Highest Priority
High Priority
Moderate Priority
LGA boundary
Water Catchment
National Park and State Recreation Area
Roads
Woronora Dam
Heathcote NP
Garawarra SCA
Royal NP
WOLLONGONG
ULLADULLA
HELENSBURGH
OTFORD
STANWELL TOPS
Illawarra Escarpment SCA
STANWELL PARK
DARKES FOREST
MADDENS PLAINS
Dharawal SCA
Shimawal SCA
CATARACT
COALCLIFF
NSW Environmental TRUST
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