Supplementary Submission No 311a

INQUIRY INTO MANAGEMENT OF PUBLIC LAND IN NEW SOUTH WALES

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Attachment 1

Key findings in the river red gum assessment

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1 Management – key findings and facts

Active interventions to manage forests (*Page 4 of the Commission's recommendation report and page 254 of the Commission's assessment report)*

- All river red gum forest ecosystems in the Riverina will need to be **intensively and actively managed** to support future economic, social and environmental **values.**
- All forest managers on **public land**, including those managing forests as reserves, should implement the following **active management** (as per principles described in Table 1 in this attachment):
  - ecological thinning
  - grazing by domesticated animals
  - fire management
  - silviculture
  - firewood collection.
- Large scale **trials of ecological thinning** should occur across all main river red gum forest groups, to promote conservation and production values.

Governance (Chapter 1 *of the Commission's recommendation report)*

- Biophysical processes interacting between scales – basin, water management units and individual forests - means we need **strong links** between planning, implementation, monitoring, accountability and adaptive responses.
- Management arrangements need institutional and governance structures that **drive innovation** in land management, and as such, red gum forests should be managed consistent with the Commission's **recommended management objectives** and tenures (see Tables 2 & 3 as an example).
- Management outcomes should be **audited and reported** every five years to ensure **accountability**.

Cross-jurisdictional water reform (*Page 5 of the Commission's recommendations report)*

- **Significant water reforms** and closer collaboration in water and forest management between jurisdictions are needed to respond to the decline in forest ecosystem health.

Maintaining human and social capital (*Chapters* 6 and 7 *of the Commission's recommendations report)*

- The Riverina region was deeply affected by the previous drought as **irrigated agriculture** was reduced.
- The capacity of the Riverina communities to adapt to the challenges of a water scarce future depends on maintaining economic and social diversity, and **investing in human and physical capital**.

New funding models for forests (*Page 9 of the Commission's recommendations report)*

- Lower growth rates and increasing management costs are undermining **the viability of a public trading enterprise** managing the red gum forests of the Riverina on a commercial basis.
- Sound reasons remain to manage some forests for multiple benefits and uses, such as timber production, conservation, tourism, and recreation, but new funding models must be developed to reflect the **diversity of ecosystem services**, **products and values** these forests support.

2 Socio-economic values – key findings and facts

Contribution of the red gum timber industry reliant on public land (*Page 111 of the Commission's assessment report)*

- The forestry industry reliant on public land hardwood forests of the Riverina bioregion contributes **less than 1 per cent** of the region's economy.
- The forestry industry reliant on river red gum forests on public land makes:
  - a **direct annual contribution of $23 million**
  - an indirect annual contribution of **$39 million** (value-added)
  - an annual **$86 million in annual direct and indirect** regional output or business turnover.

Employment (*Page 117 of the Commission's assessment report)*

- The forestry industry related to red gum **is a** significant employer for several towns in the region, employing **304 full-time equivalent (FTE) private and public sector staff** directly related to timber from public land.
- Of the **274 FTE staff** employed in commercial operations:
  - **149 FTE staff** work in mills which source quota quality timber from public land
  - **43 FTE staff** work with mobile mills which produce sleepers as a primary product
  - **82 FTE staff** work in firewood operations.
- Forests NSW employs **30 FTE employees.**

Forests NSW operations (*Page 113 of the Commission's assessment report)*

- Total royalties paid to Forests NSW for timber allocations are **$4.3 million per annum** in the Riverina Bioregion.
- The Auditor-General's 2009 report indicates that native forest operations across all of Forests NSW estate **operated at a loss of $14.4 million** in 2007-08 (Auditor-General of New South Wales, 2009).
- The total base allocation of river red gum timber per annum licensed to be harvested is around **60,000m³** for quota and ex-quota logs and over **101,000 tonnes** for residue logs.

Industry structure (*Page 114 of the Commission's assessment report)*

- There are **32 businesses** with licences to harvest timber from public land including 6 mills.

Products and key markets (*Page 11 7 of the Commission's assessment report)*

- Many mobile mills and operators derive a significant proportion of their revenue from **firewood and residue** products.
- The major markets for river red gum products are **metropolitan Melbourne** and regional Victoria. Adelaide, regional South Australia, Canberra and, to a lesser extent, Sydney are also destinations for some products. A small amount of river red gum product is exported.

Tourism (*Page 125 of the Commission's assessment report)*

- Total tourism expenditure was **$1.197 billion** (ending March 2009) across 34 relevant LGA's in the wider region.
- State Forests and National Parks within the region support **very different tourist activities**, and attract different types of tourists.
- Forest NSW estimate that the river red gum forests experience an estimated **500,000 visitor days per** year.

Other industries (*Page 123 of the Commission's assessment report)*

- Grazing and apiary on public land provide an **important source** of additional income to farmers and beekeepers in selected years.

3 Cultural and heritage values – key findings and facts

Indigenous nations in the bioregion (*Page 134-6 of the Commission's assessment report)*

- Indigenous communities of many nations have occupied the red gum forests for at least **10,000 years**.
- **Twenty one (21)** traditional tribal groups or nations are associated with the Riverina bioregion.
- **Fifteen (15)** Local Aboriginal Land Councils are associated with the Riverina bioregion.

Indigenous heritage values in the bioregion (*Page 134 of the Commission's assessment report)*

- Indigenous communities have a **strong spiritual connection** to the forests. **Access** to the forests and the ability to visit special places, and continue practices such as hunting, fishing, collecting foods, and telling stories is critical for cultural survival. Like environmental flows, cultural flows are also highly valued by Indigenous communities
- Recent use and occupancy mapping was conducted to explore Indigenous people's connection to the Werai Forest - so far, more than 10,000 locations have been identified by current generations.
- Local Indigenous communities highlighted that a role in forest management, supporting greater self-dependency and improving employment opportunities were their **primary concerns.**

Non-Indigenous heritage values in the bioregion (*Page 144 of the Commission's assessment)*

- Given the long history of interaction between local communities and the forests, for many residents the forests form a **key part of their identity** – either through their own connections, their family history or the history of the towns in which they live.
- The livelihood of people in river towns was **intrinsically linked** to the river and many current residents hold memories of this generational link to the river. Many of the current day timber industry owners and operators are descendants of early settlers or mill operators.

Influence of human interventions on the forests (*Page 23 of the Commission's assessment report)*

- Indigenous people in the Riverina actively managed the landscape to secure more sustainable livelihoods, for example using fire for hunting, regeneration, track clearing and as a defence against Europeans to dissuade them from entering the land.
- The relationship between the deliberate use of fire and vegetation structure **is contested**, and it is **difficult to draw conclusions** about the linkages between the use of fire and forest structure at the time of European settlement.
- In the period up to 1900, river red gum forests were used to support European settlement and early industry. There was little control of forest use or management during most of this period. Widespread grazing of domestic stock (sheep and cattle), and ringbarking was carried out to open up pastures.

4 Water flows – key findings and facts

Impacts of river regulation (*Page 162 of the Commission's assessment report)*

- It is estimated that the total public storage in the Murray-Darling Basin's larger storages (>10GL) is approximately **24,500 GL**. This storage volume equates to approximately **twice the average** annual discharge of the Murray-Darling.
- **More than 50%** of the average annual discharge has been allocated for consumptive use but recent experience had highlighted that such allocations could not be sustained during periods of extended drought.
- The total annual flow at the River Murray mouth has been reduced by **61 per cent** and the river now ceases to flow through the mouth **40 per cent** of the time, compared with 1 per cent prior to water resource development.
- The development of these storages and the water that is being extracted has greatly affected the **natural flow** and **flooding frequency** of rivers throughout the Murray-Darling Basin.
- For example, an **18,300 ML/day** flood at Yarrawonga weir on the Murray occurred every **1.1 years** in the pre-development (no regulation) flow history. That level of flood only occurs once every **2.6 years** under current development. **Con**

Impacts of predicted climate change (*Chapter 8 of the Commission's assessment report)*

- A further **substantial reduction** in the magnitude, frequency and duration of floods can be expected under **climate change** for the majority of forest stands, particularly the larger forests of Millewa, Koondrook-Perricoota and Werai. Large 'landscape restoration' floods are unlikely to occur.
- However, the delivery of **environmental water** to the Millewa forests and intervention works at Koondrook-Perricoota will assist in maintaining some moderate-sized floods.

Planning for climate change (*Page 167 of the Commission's assessment report)*

- The future health of the river red gum forests depends fundamentally on the success of COAG water reforms in restoring water to these stressed and over-allocated floodplain river ecosystems.
- Given the most recent scientific information, long-term management of the Murray and the red gum forests should at least be based on the **'medium' climate change scenario** in the CSIRO Sustainable Yields project.
- To maintain the **ecological character** of the Barmah-Millewa icon sites (the largest red gum forests in the central Murray, listed as iconic Ramsar wetland sites), the Commission calculates these forests require at least:
  - smaller floods once every two years of say **20GL/day** for between 60 and 150 days (i.e. total volumes of between 1,200 GL and 3,000 GL every two years)
  - a larger landscape restoration flood once in 11 years of **35GL/day** for 90 days, plus a peak of **45GL/day** for 15 days (i.e. about 3,825GL every 11 years).

5 Natural values – key findings and facts

Function of river red gum forests (*Page 60 of the Commission's assessment report)*

- River red gum forests provide **significant remnants** of forest vegetation in a heavily cleared and modified bioregion, and provide refugia to support a diversity of **ecological processes** and species assemblages in a changing climate.
- The forest ecosystems function as an important component of a **broader floodplain ecosystem** and provide a variety of valued **ecosystem services**. Major floods will be required to maintain the **resilience** of the forest ecosystems, and the floodplains they are a part of, so that they can continue to provide these services.

Extent of river red gum forests (*Page 107 of the Commission's assessment report)*

- The estimated current area of river red gum dominant and co-dominant forest and woodland in the NSW Riverina is **401,000 hectares** (or **54 per cent** of the pre-European extent).

Current condition of river red gum forests (*Page 60 of the Commission's assessment report)*

- The condition of river red gum within State Forests and elsewhere in the bioregion is generally in decline, largely as a result of poor health from substantially reduced river flows and altered flooding regimes.
- Many river red gum vegetation communities are expected to change as a consequence of river regulation and climate change, transitioning to drier vegetation type communities (e.g. Box gum woodlands)

Endangered species and ecological communities (*Page 86 of the Commission's assessment report)*

- The threat status of the river red gum forests is assessed as **vulnerable.**
- A total of **68 fauna species** listed as threatened under Commonwealth or NSW legislation are known to utilise river red gum forests, including **15 species** that are matters of national environmental significance.

Application of reserves system principles (*Page 105 of the Commission's assessment report)*

- At the time of the assessment, around **30, 400 ha** (7.5 per cent) of the total river red gum dominant and co-dominate forest and woodland in the **NSW Riverina** IBRA was contained in 'protected areas'.
- **21.1 per cent** of the total river red gum dominant and co-dominate forest and woodland in the **Riverina IBRA** had been protected when Victoria and NSW Riverina IBRA regions are combined (at the time of the assessment).
- Greater than **200, 000 ha** of river red gum forest and woodland would be required to achieve **JANIS**[ii] reservation targets (i.e. 60 per cent of the current extent) whether or not Victorian data is included.
- In summary, the Commission recommended:
  - **107, 614 ha** added to the National Reserve System or Indigenous Protected Areas (or 70 per cent of the total area assessed)
  - **35, 864 ha** remain State Forests (or 24 per cent of the total area assessed)
  - **8, 422 ha** converted to leasehold land, private covenanted land, conservation reserve or research and rehabilitation reserve (or 6 per cent of the total area assessed)
- Complementary **private land initiatives** will be integral part of landscape-scale protection of conservation values of the river red gum forests.

6 Consultation process – key facts

During the assessment (*Page 300 of the Commission's assessment report)*

- The Commission:
  - visited the Riverina region **9 times** during its assessment, meeting local indigenous communities, forest industry, environmental groups, local government, state agencies and community representatives
  - visited **50 state forests**
  - received **5,534 submissions** (259 were unique, the remainder were form letters or emails)
- published **4 information updates** to explain the progress of the Commission's assessment, including key consultation dates.

After the assessment

- The Commission, the Chair and members of the Technical Review Panel visited the Riverina region **4 times** in January 2010 after its assessment to explain its recommendations to local communities in Deniliquin, Barham, Mathoura and Balranald.

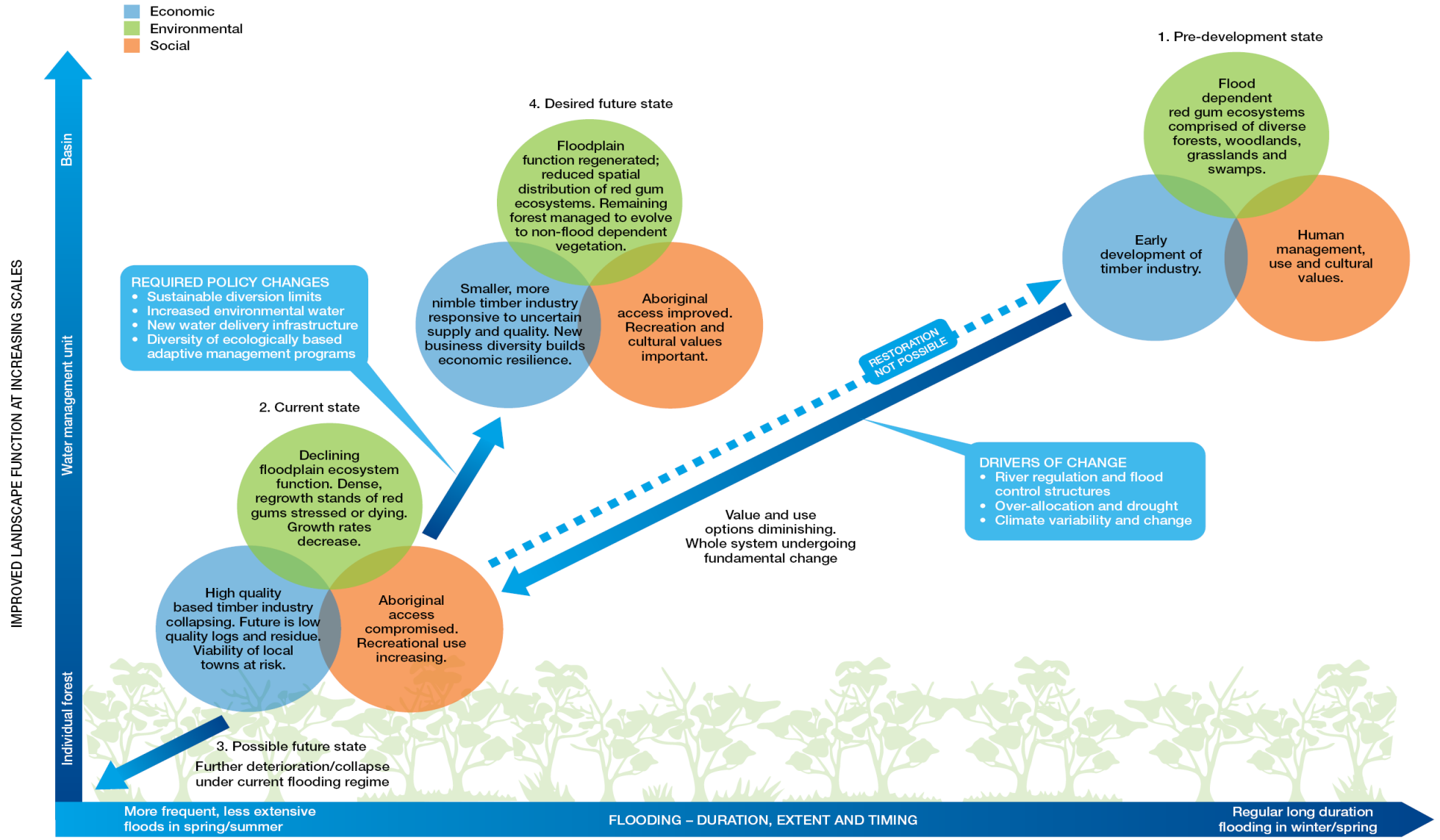


Figure 1: Social, economic and biophysical change in the river red ecosystems of the Riverina bioregion

Table 1: Principles for red gum floodplain ecosystem management

Principles for red gum floodplain ecosystem management
Principles for all red gum floodplain ecosystem management under environmental change
▪ ***Principle EM1:*** Sustain large-scale hydrological and geomorphological processes.
▪ ***Principle EM2:*** Maintain connectivity between communities, habitats and ecological processes across the bioregion.
▪ ***Principle EM3:*** Implement a range of management strategies across different spatial, temporal and institutional scales to spread risk.
▪ ***Principle EM4:*** Implement active management regimes within both protected and production areas.
▪ ***Principle EM5:*** Maintain forest complexity within production forest areas, including stand complexity, large trees and threshold levels of coarse woody debris, and variability across space and time.
▪ ***Principle EM6:*** Establish a comprehensive, adequate and representative series of reserved areas.
▪ ***Principle EM7:*** Enable environmental stewardship by individual and groups on private land.
▪ ***Principle EM8:*** Involve local communities in strategy development and implementation to ensure greater success in achieving identified goals.
▪ ***Principle EM9:*** Implement adaptive management in reserves and production forests to allow lessons to be learnt from management actions, and to allow their refinement.
Principles for ecological thinning
▪ ***Principle ET1:*** Ecological thinning can provide a valuable tool to achieve specified conservation outcomes in some river red gum forests, including those managed primarily for production and for conservation.
▪ ***Principle ET2:*** Ecological thinning can be undertaken in many different ways, with different impacts on forest structure, processes and biodiversity. Wherever thinning is undertaken to achieve conservation goals, these goals must be clearly specified, and the most appropriate technique must be used to ensure that goals can be met.
▪ ***Principle ET3:*** Ecological thinning should be applied to forest areas where clearly defined outcomes can be reasonably expected.
▪ ***Principle ET4:*** All ecological thinning should be implemented using an experimental, adaptive management framework to ensure desired outcomes are achieved, maximise learning outcomes and reduce uncertainty.
▪ ***Principle ET5:*** Thinning, like all other management activities, should be carried out in accordance with accepted principles for landscape management of forested areas (*Principles EM1–9)*.
Principles for fire management
▪ ***Principle FM1:*** Prescribed fire can be a valuable tool to control fuel levels and achieve specified ecological outcomes in some forest areas.
▪ ***Principle FM2:*** In areas managed for conservation rather than production values, prescribed fire can provide a useful tool to achieve management goals, such as manipulating vegetation structure and composition, thinning dense stands, reducing fuel loads, promoting tree and shrub regeneration and controlling the abundance of vigorous dominant wetland plants.

Principles for red gum floodplain ecosystem management

Principles for grazing

- ***Principle GM1:*** Uncontrolled or poorly managed livestock grazing has caused considerable damage to river red gum forests in the past, and has the potential to further degrade environmental attributes.
- ***Principle GM2:*** Notwithstanding Principle GM1, livestock grazing has potential to achieve positive outcomes for conservation values in limited parts of the forest, especially degraded and weedy areas, where it can help to reduce weed cover and control fuel loads.
- ***Principle GM3***: Livestock grazing should only be conducted where it achieves clearly specified management goals, and where stock can be contained to designated areas, to prevent unintended outcomes to sensitive features.
- ***Principle GM4:*** Ground vegetation (and fuel) levels vary greatly between seasons and years according to flooding and rainfall. On public lands, livestock grazing should only be permitted when vegetation and fuel levels are appropriate, and licensing or agistment arrangements must enable stock to be removed at short notice, to satisfy land management goals.
- ***Principle GM5:*** Where livestock grazing is conducted, it should be undertaken using an adaptive management approach so that positive and negative impacts can be monitored and reported.

Principles for silviculture

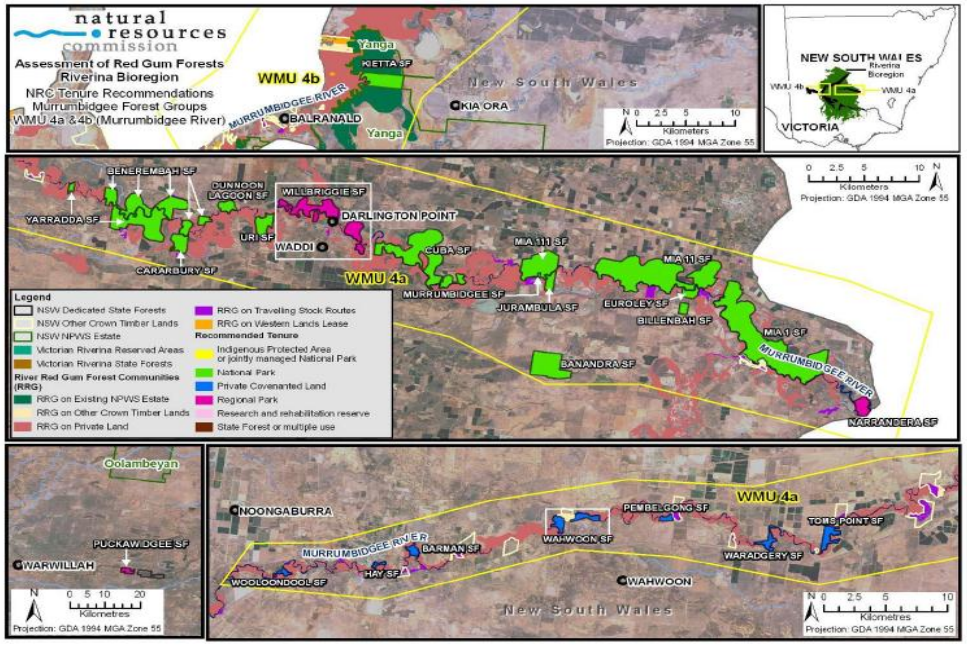
- ***Principle S1:*** 'Group selection' is an appropriate silvicultural technique for river red gum forests managed for production values, subject to the provision and maintenance of ecological values, principally retention of adequate habitat trees and coarse woody debris resources, and other constraints of intensity and implementation described by Principles S2–8.
- ***Principle S2:*** Group selection should only be applied to river red gum forests that are expected to receive adequate future watering.
- ***Principle S3:*** Habitat trees should be retained permanently and distributed across the forest landscape.
- ***Principle S4:*** Gap intensity needs to explicitly consider the ecological character of river red gum forests, particularly those which are Ramsar-listed.
- ***Principle S5:*** Selective harvesting in immature forests between 'gapped' areas should be constrained by timing and intensity, and ecological thinning should be guided by ecological principles.
- ***Principle S6:*** Coarse woody debris loads should be enhanced to threshold levels where practicable and consistent with other management objectives, such as fire management goals.
- ***Principle S7:*** Salvage logging has the potential to be ecologically damaging and should follow recognised best-practice guidelines and adhere to the silviculture principles above.
- ***Principle S8:*** Outcomes of river red gum silviculture, and the assumptions underpinning them, need to be monitored and tested in a structured and systematic manner to generate new knowledge and reduce uncertainty over time.

Principles for firewood collection

- ***Principle FC1:*** As per Principle S6, coarse woody debris loads at threshold levels should be retained where practicable and consistent with other (e.g. fire risk) management requirements..
- ***Principle FC2:*** Firewood collection is generally inappropriate in conservation areas unless undertaken to achieve specific ecological or management goals (e.g. fire management), or where used for in-park recreational use. In such instances the provisions of Principle FC1 should also be adhered to.

Table 2: Recommended management priorities and tenures for Murrumbidgee forests

Murrumbidgee forests					
Current condition and values	**Trajectory**	**Management considerations at different scales**			**Priority of management**
		Basin/bioregion scale	**Water management unit scale**	**Local scale**	
▪ Murrumbidgee wetland areas have declined appreciably over the past 50 years but some areas still in moderate condition ▪ Includes Nationally significant wetlands ▪ Significant habitat values and threatened species ▪ Forests around Darlington Point provide sawlog and lower grade timber resources for a mill and a few smaller mobile residue operations ▪ High recreation use, easy access and significant Indigenous cultural values	▪ Declining trend due to regulation, drying, loss of wetland areas, but relatively more easy to flood than some ▪ Continued loss of the extent of the major wetlands fed by the Murrumbidgee.	▪ Existing DECCW presence to build on - Yanga National Park at the downstream end of the system means that environmental water is more likely to be secured and delivered on the Murrumbidgee than in some other areas ▪ Some cross-scale habitat connectivity ▪ Opportunity for response diversity to maintaining habitat values across region	▪ significant storages in the upper parts of the Murrumbidgee catchment provide good opportunity for the establishment of environmental water allowances ▪ linear nature of the riparian forests also means that small volumes of environmental water can be used sequentially for multiple forests and associated values as water travels downstream.	▪ Limited value for forestry if 50m riparian corridor ▪ Opportunity for ecology, recreational, tourism and cultural values to prevail at low opportunity cost to industry ▪ Learning opportunity as partial transition is a precursor to others	1. Adaptive ecological management 2. Recreation



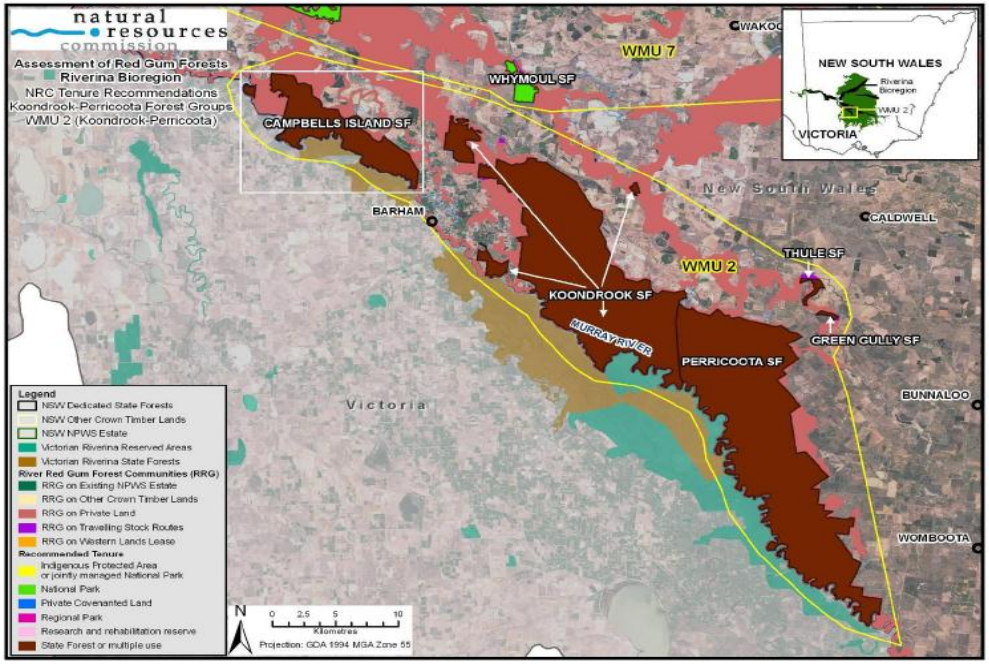
State Forest	Area	Recommended tenure
Mia I	3,187	Consolidated National Park along riparian corridor
Mia II	2,544	
Billenbah	98	
Euroley	134	
Banandra	762	
Jurambula	138	
Mia III	739	
Murrumbidgee	9	
Cuba	1,642	
Uri	267	
Dunnoon Lagoon	155	
Carabury	237	
Benerenbah	1,130	
Yarradda	1,021	

State Forest	Area	Recommended tenure
Maude	167	Regional Parks near towns
Willbriggie	944	
Narrandera	196	
Toms Point	190	Private covenanted land or public conservation reserve
Waradgery	116	
Pembelgong	51	
Wahwoon	198	
Barman	67	
Hay	30	
Wooloondool	47	
Packawidgee*	427	
Kietta	628	N Park (add to Yanga NP)

* Located outside the defined Murrumbidgee Forest Groups. Contains River Red Gum Tall Open Forest

Table 3: Recommended management priorities and tenures for Koondrook-Perricoota forests

Koondrook-Perricoota forests					
Current condition and values	**Trajectory**	**Management considerations at different scales**			**Priority of management**
		Basin/bioregion scale	**Water management unit scale**	**Local scale**	
▪ In general the condition of the forests is poor and continuing to decline. ▪ Campbell's Island is in moderate condition which is attributed to access to groundwater ▪ High recreational and cultural use. Easy access. ▪ Significant ecological asset under The Living Murray Program ▪ Ramsar listed and supports high biodiversity values including globally threatened species	▪ Koondrook-Perricoota forest group will continue its well-advanced transition to a drier, less flood-dependent ecology without management intervention ▪ Possible loss of 20-25% of forest over next 50 years. ▪ Expected 70% reduction in saw logs.	▪ Adjacent Gunbower forest primarily VIC State Forest ▪ Ramsar listing-international ecological values ▪ Current flooding regime insufficient to achieve interim ecological objectives for this TLM Icon Site ▪ Opportunity for existing FNSW management to continue as response diversity.	▪ Difficult to water without cutting required to maintain Ramsar-listed wetland values. ▪ TLM has made commitment to fund cutting and make water available from 500GL ▪ Environmental water that is recovered may be directed to higher priority sites such as Millewa and the Lower Lakes. ▪ Forest NSW have expertise required to complete and operate cutting	▪ Radical transformation without infrastructure and e-water. ▪ Local mill has veneering technology ▪ Barham highly dependent on industry ▪ Opportunity for ongoing multiple use forest with new governance and funding model	1 Economic (forestry) 2 Ecology (habitat) 3 Social (recreation)



State Forest	Area	Recommended tenure
Campbells Island	3,819	State Forest (or new institutional model for multiple use)
Koondrook	15,153	
Perricoota	16,891	
Thule	131	State Forest (or new institutional model for multiple use), or private covenanted land
Green Gully	48	

Table 4: Relative magnitude of the river red gum timber industry

	Gross O/P ($m)	Value-added ($m)	Income ($m)	Employment (no.)
Direct contribution	47.6	23.1	10.8	274[iii]
Total contribution	86.1	39.3	20.9	450
TOTAL REGION	21,000	4,800	2,300	47,511
% Direct contribution	0.2%	0.5%	0.5%	0.5%
% Total contribution	0.4%	0.8%	0.9%	0.9%

Note: the direct employment contribution does not include contractors or Forests NSW employees. These employees are included in the total contribution.

Table 5: Summary of base allocation of river red gum wood from NSW State Forests and Western Lands Leases

Resource	Base allocation (m^3/year)*
Quota logs	31,010 m^3
Ex-quota logs	28,107 m^3
Residue log	101,548 tonnes

* Information as at August 2008-09 was provided by Forests NSW, drawn from their management and accounting systems.

Table 6: Base allocation volumes by Management Area

Resource	Quota* (m^3/year)	Ex-quota* (m^3/year)	Residue* (tonnes/year)
Murray Management Area	23,450	17,607	63,148
Mildura, Murrumbidgee and Narrandera Management Areas	7,560	10,500	38,400
Total	**31,010**	**28,107**	**101,548**

* Information was provided by Forests NSW, drawn from their management and accounting systems.

Table 7: Summary of business types

Business type	No. sourcing from public land	Description
Fixed location mill (Quota)	5	Larger mills with quota licences that are in fixed locations, usually in or near towns. These are generally integrated operations that conduct a significant proportion of their own harvesting operations and transport to the mill.
Mobile mill (Quota)	1	Mobile operations that source quota and ex-quota quality logs. These operations are located close to the timber source. Most of these operations also source residue material.
Mobile operations (Ex-quota)	8	Mobile operations that source ex-quota quality logs. Most of these operations also source residue material.
Mobile operations (Residue)	18	Mobile businesses that source residue materials, predominantly for firewood.

Table 8: Percentage of total timber sourced from public land

Business type	Number of businesses	Average percentage of total base allocation from public land
Fixed location or mobile mills (Quota)	6	74
Mobile operations (Ex-quota)	8	91
Mobile operations (Residue)	18	98

Table 9: Number and location of operations

	Town of interest	Quota mills	Ex-quota mills	Residue operation	Total
Murray Management Area	**Barham-Koondrook**	3	2	-	5
	Deniliquin	1	-	2	3
	Mathoura	-	5	2	7
	Other Murray Management Area*	-	1	3	4
Subtotal		4	8	7	19
Murrumbidgee/ Narranderra Management Area	**Darlington Point**	1	-	-	1
	Other M'bidgee/Narra-nderra Management Area**	-	-	2	2
Subtotal		1	0	2	3
Mildura Management Area	**Balranald**	-	-	5	5
	Merbein	1	-	-	1
	Other Mildura Management Area* ***	-	-	4	4
Subtotal		1	0	9	10
TOTAL		**6**	**8**	**18**	**32**

* 'Other Murray Management Area' includes businesses based at Leitchville, Mulwala, Moama and Romsey which source timber from within the Riverina bioregion.

** 'Other Murrumbdigee/Narranderra Management Area' includes businesses based at Murrami and Leeton which source timber from within the Riverina bioregion.

*** 'Other Mildura Management Area' includes businesses based at Broken Hill and Pomona which source timber from within the Riverina bioregion

Table 10: Location of mills and sources of quota sawlogs

Mill name	Location	Percentage of quota from each Management Area (MA)				
		Murray MA			Mildura MA	M'bidgee/ Narranderra MA
		Millewa forests	Pericoota-Koondrook forests	Werai forest		
Bonum Sawmill (Rowes Timber Industries)	Barham-Koondrook	31	69	-	-	-
Arbuthnot Sawmill	Barham-Koondrook	23	77	-	-	-
O'Brien's Sawmill	Barham-Koondrook	51	49	-	-	-
Gulpa Sawmill	Deniliquin	98	-	2	-	-
Merbein Sawmill	Merbein	-	-	-	100	-
Darlington Point Sawmill	Darlington Point	-	-	-	-	100

* Information was provided by Forests NSW on the volumes of quota timber sourced from each forest between 2004-05 and 2007-08. This information was drawn from Forests NSW management and accounting systems.

Table 11: Description of river red gum products

Product	Description	Key markets
Furniture grade	Timbers for furniture and joinery	Melbourne
Veneers	Timbers for furniture and joinery	Melbourne
Weatherboards	Timbers for housing construction	Melbourne
Decking timbers	Timbers for housing construction	Melbourne
Sleepers	Replacement timbers for railways	Victoria and South Australia
Crossings timbers	Timbers for bridges and marine construction (both new and replacement)	Victoria and South Australia
Garden timbers	Landscape sleepers	National, Victoria and South Australia
Firewood	Split firewood	Melbourne, regional Victoria, Canberra, South Australia and Local
Woodchips	Residues used for landscaping	Local markets, Victoria and South Australia
Mulch	Residues used for landscaping	Melbourne, regional Victoria, South Australia
Sawdust	Residues for feedlots	Riverina

Table 12: Employment in the red gum timber industry reliant on public land (FTE) by business type

Employment category	Quota mills	Ex-quota mills	Residue operators	Total
Employees of commercial operations with timber licences	-	-	-	-
Surveyed businesses	149	26	48	223
Pro rata estimate for businesses not able to be surveyed*	0	17	34	51
Subtotal employees	**149**	**43**	**82**	**274**
Forests NSW employees	**-**	**-**	-	30
Subtotal employees directly related to timber on public land	-	-	-	**304**
Contractors to businesses with timber licences	-	-	-	15
Employees of downstream milling business	-	-	-	17

* Employment numbers for businesses not able to be surveyed have been estimated on a pro rata basis. This includes two ex-quota businesses responsible for 8 per cent of ex-quota timber base allocations, and 11 residue operators responsible for 30 per cent of residue base allocations.

Table 13: Employment in commercial operations directly related to public land (FTE) by town

Town	Direct employees of businesses with licences to harvest from public land (FTE)*	Estimated percentage of total employment in urban locality**	Number of businesses with licences to harvest from public land			
			Quota mills	Ex-quota mills	Residue operators***	Total
Barham-Koondrook (Vic)	119	16	3	2	-	5
Mathoura	31	14	-	5	2	7
Deniliquin	28	1	1	-	2	3
Merbein (Vic)	25	3	1	-	-	1
Balranald	24	5	-	-	5	5
Darlington Point	20	5	1	-	-	1
Other****	27	N/A	-	1	9	10
Total	**274**	**-**	**6**	**8**	**18**	**32**

* By location of employment.

** Based on comparing direct employees to ABS 2006 data for total employment in the relevant urban locality.

*** Some businesses licensed to harvest residue are included in the count of quota and ex-quota mills as these businesses have licences to harvest resides as well as quota or ex-quota timber.

**** Other locations include Leitchville, Mulwala, Moama, Romsey, Murrami, Leeton, Broken Hill and Pomona. Businesses located in these towns source timber from within the Riverina bioregion.

Table 14: Previously published estimates of employment

Source	Estimate	Reason for difference from NRC-surveyed employment numbers
GHD (on behalf of Forests NSW)[iv]	183	Estimate based on assessment of ABS data[v] and consultation with experts. Methodology not documented.
Forests NSW[vi]	463	Includes 150 employees related to firewood operations which source from private land.
NSW Forest Products Association	537	Includes at least 150 employees of businesses reliant on timber resource sourced from private land.
ABS[vii]	1,008	Covers a broader region than the NSW portion of the Riverina bioregion which encompasses the softwood plantations around Tumut; includes forestry from white cypress, plantations, and on public and private land; includes job categories not directly related to red gum timber industry.

Table 15: Overview of total tourism in the wider region

Region	Expenditure	'000 total visitors	'000 visitor nights	% of visitors to regional NSW
Murray[viii]	$418m	1,555	2,365	4.2
Riverina[ix]	$523m	2,019	2,014	5.1
Outback[x]	$256m	702	1,660	2.8

Notes: Includes major regional centres such as Albury and Wagga Wagga. Expenditure values exclude airfares and long distance transport costs.

Table 16: Overview of the visitor source for each tourism region

Region	Murray Region[xi]	Riverina Region[xii]	Outback[xiii]
Visitors from Victoria	62%	25%	22%
Visitors from regional NSW	19%	42%	39%
Visitors from Sydney	8%	20%	13%

Table 17: Visitor numbers and estimated expenditure in LGAs related to towns of interest

Local Government Area (LGA)	Annual visitors to LGA	Estimated expenditure	Notes
Wakool Shire[xiv]	80,000	$26 million	Includes the town of Barham
Ganawarra Shire (VIC)[xv]	62,000	$14 million	Includes the town of Koondrook
Deniliquin Shire[xvi]	97,000	$25 million	-
Murray Shire[xvii]	78,000	$33 million	Includes Mathoura
Murrumbidgee Shire	-	-	Data not available
Balranald Shire[xviii]	38,000	$7 million	-
Mildura Regional Shire[xix]	465,000	$153 million	Includes the town of Merbein
Total	**820,000**	**$258 million**	-

Table 18: Local Aboriginal Land Councils in the Riverina bioregion

Local Aboriginal Land Councils in the bioregion			
Albury and District	Balranald	Cummergunja	Dareton
Deniliquin	Griffith	Hay	Ivanhoe
Leeton and District	Moama	Murrin Bridge	Narrandera
Wagga Wagga	Wamba Wamba	Yota Yota	-

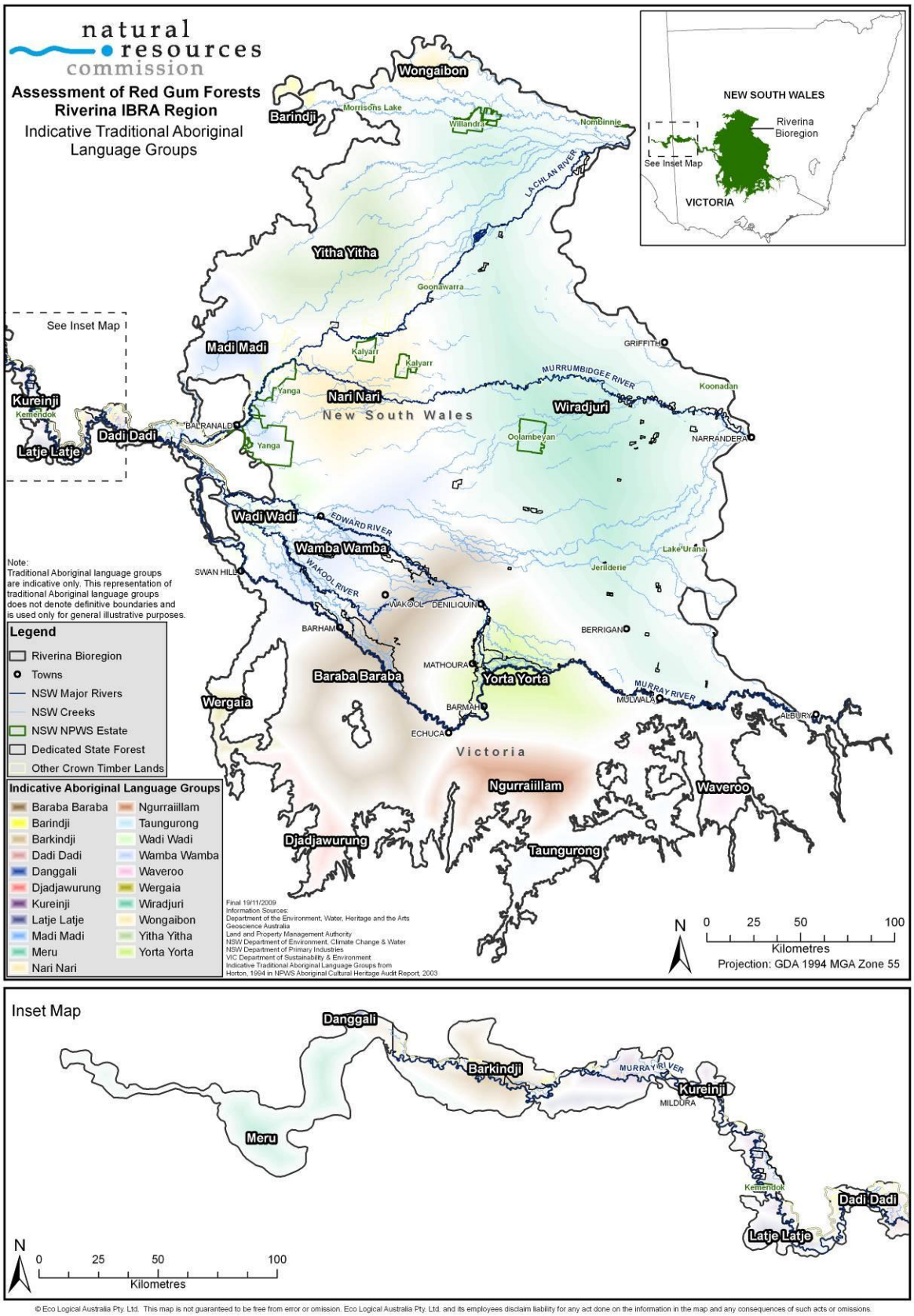


Figure 2: Indicative traditional Indigenous language groups

Table 19: Number of Indigenous heritage site recordings in State Forests with greater than 25 recorded sites[xx]

State Forest no.	State Forest name	Area of State Forest	No. of site recordings
90	Banangalite	1,294	39
384	Werai	9,454	349
398	Millewa	20,938	77
558	Gulpa lsland	5,478	76
576	Moira	10,578	84
615	Campbells Island	3,812	38
625	Koondrook	15,140	291
773	Lake Victoria	4,397	29
Sub total	**-**	**71,091**	**983**
Total in Riverina bioregion	**-**	**120,050**	**1,063**

Note: This table is indicative only and should be considered in the context of areas that were actually surveyed for Indigenous sites. The actual number of sites is expected to be far greater.

Table 20: Mean and median annual flows during natural and current conditions since 1892[xxi]

	Flows under natural conditions (GL/year)		Current flows under regulated conditions (GL/year)	
	Mean	Median	Mean	Median
Darling	3,042	1,746	2,272	1,053
Murrumbidgee	2,794	2,527	1,184	644
Goulburn, Broken and Campaspe	3,668	3,510	1,774	1,211
Loddon	247	202	100	37
Namoi	872	570	402	177
Murray	13,754	11,883	4,915	2,539

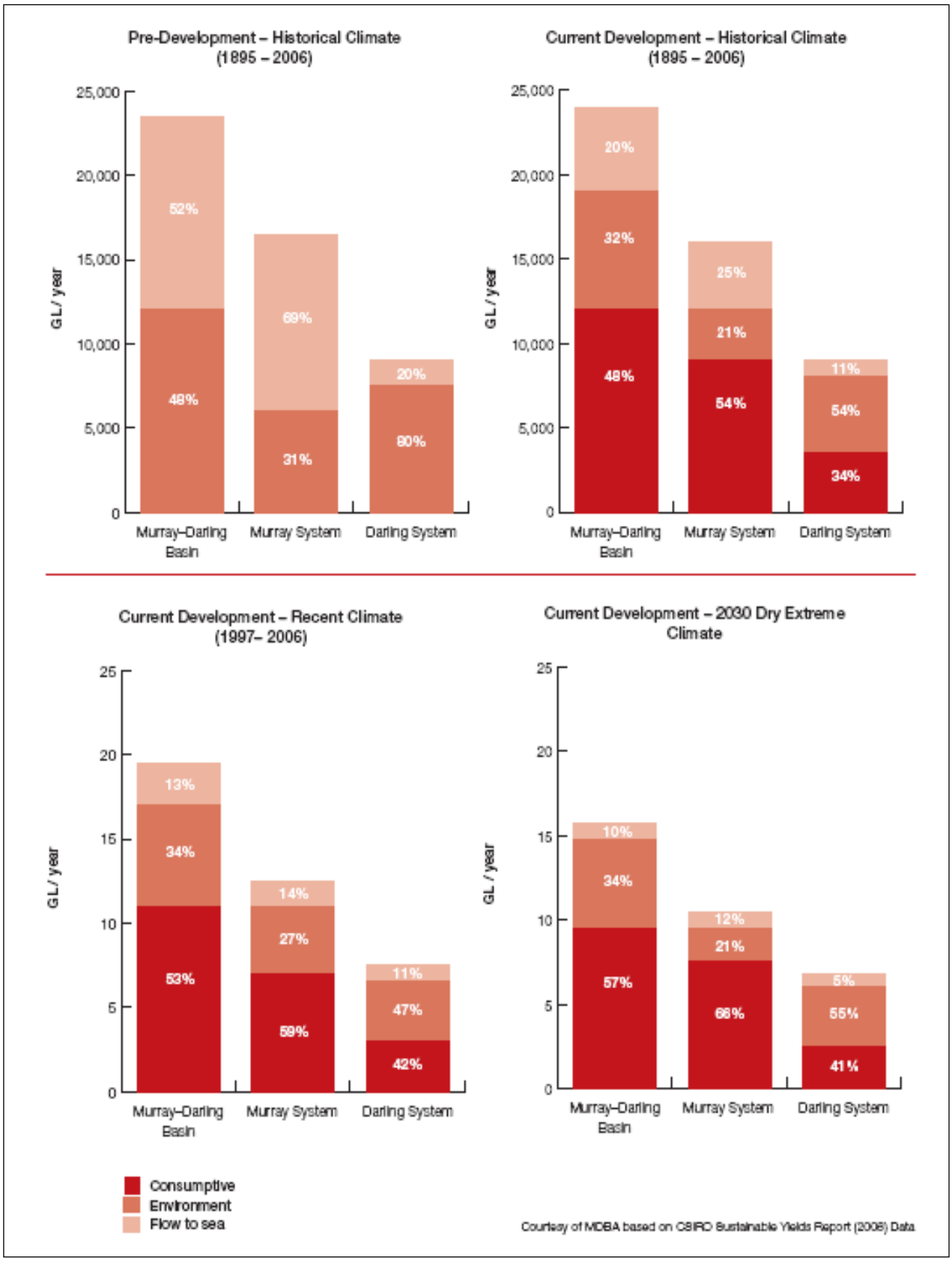


Figure 3: Murray-Darling Basin annual water availability, consumptive use, flows to floodplains and wetlands, flows to lakes, estuaries and marine environment over four climate and water resource development scenarios[xxii]

Table 21: Analysis of flood flows at Yarrawonga for four climate and water resource development scenarios[xxiii]

			Scenario P (historic climate, pre-development)			Scenario A (historic climate, current development)			Scenario B (step-change climate, current development)			Scenario Cmid (2030 climate change, current development)		
Flood Magnitude	Season	Duration	Frequency no. occurences	Avg period between floods years	Max period between floods years	Frequency no. occurences	Avg period between floods years	Max period between floods years	Frequency no. occurences	Avg period between floods years	Max period between floods years	Frequency no. occurences	Avg period between floods years	Max period between floods years
ML/D														
18,300	Aug - Dec	60+ days	74	1.1	3.8	36	2.6	10.9	11	8.2	34	26	3.5	13.6
25,300	Aug - Dec	60+ days	45	1.9	5.7	25	3.2	12.7	6	14.2	37.7	16	5.4	17.6
35,000	Aug - Dec	60+ days	21	4.4	10.6	9	9.1	24.0	2	38.6	38.6	5	14.2	37.8
35,000	Aug - Dec	30+ days	54	1.7	6.0	25	3.7	12.8	4	19.1	24.8	10	8.6	17.7
45,000	Aug - Dec	30+ days	30	3.0	12.7	11	7.4	24.0	1	N/A	N/A	6	12.6	37.9
45,000	Aug - Dec	60+ days	7	12.2	37.8	3	28.1	38.5	1	N/A	N/A	2	17.9	17.9
60,000	Aug - Dec	1+ days	141	0.8	9.8	77	1.2	13.3	19	4.5	38.7	43	2.1	17.0
60,000	Aug - Dec	10+ days	68	1.3	6.8	23	3.5	24.1	2	0.0	0.0	11	5.8	37.8
60,000	Aug - Dec	30+ days	11	7.8	24.1	4	18.8	37.8	0	N/A	N/A	1	N/A	N/A
80,000	Aug - Dec	1+ days	72	1.3	6.8	39	2.4	17.9	9	9.5	38.7	20	4.3	37.8
80,000	Aug - Dec	10+ days	24	3.4	15.9	8	8.2	37.8	0	N/A	N/A	1	N/A	N/A
80,000	Aug - Dec	30+ days	2	63.8	63.8	1	N/A	N/A	0	N/A	N/A	0	N/A	N/A
100,000	Aug - Dec	1+ days	53	1.8	13.6	23	3.7	20.8	3	29.0	56.6	7	12.7	37.9
100,000	Aug - Dec	10+ days	8	11.2	25.0	2	38.7	38.7	0	N/A	N/A	0	N/A	N/A
100,000	Aug - Dec	30+ days	0	N/A	N/A	0	N/A	N/A	0	N/A	N/A	0	N/A	N/A

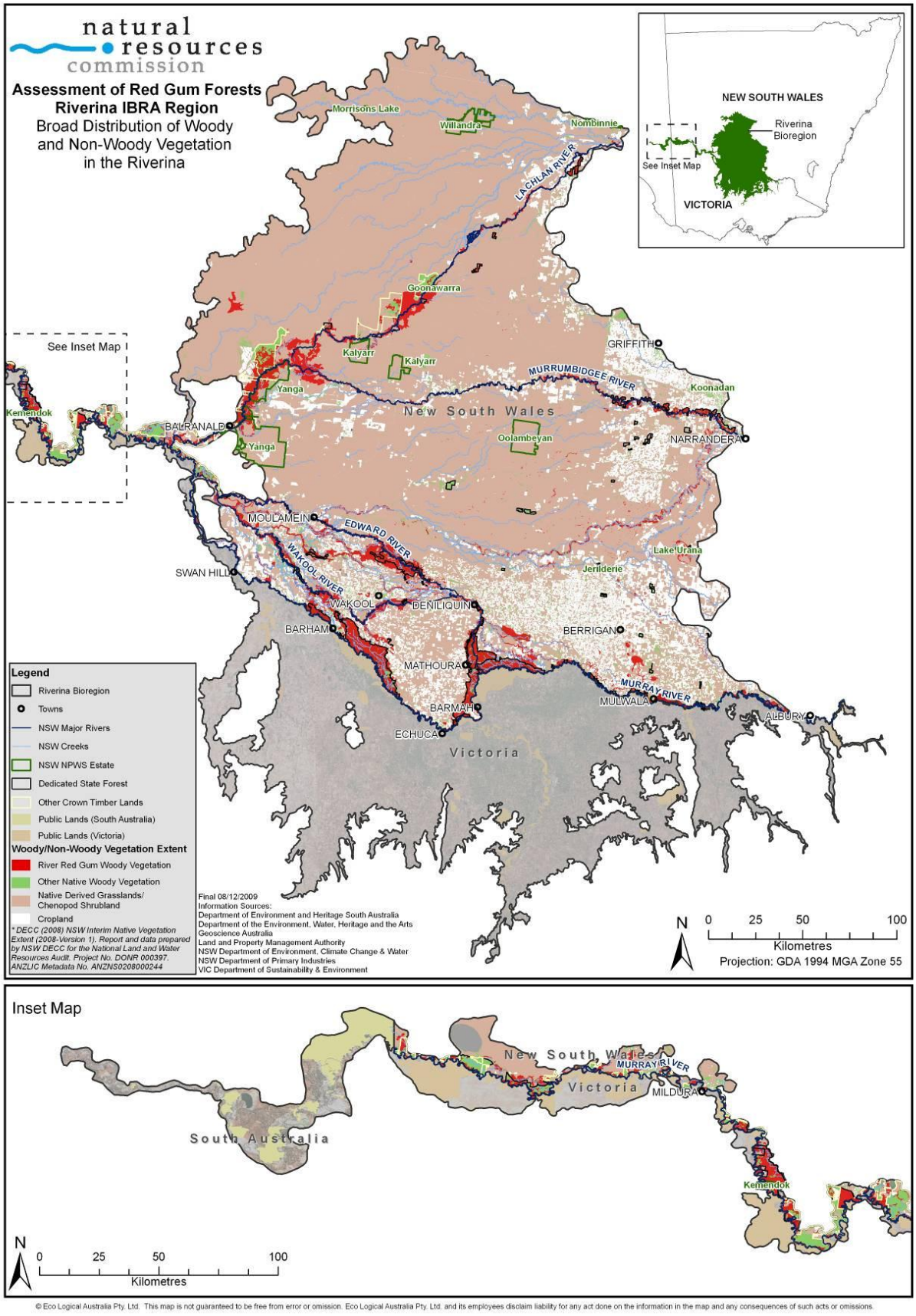


Figure 4: Broad distribution of woody and non-woody vegetation in the NSW Riverina

Table 22: Area statistics for river red gum and other woodland types

	NSW only					NSW and Victoria**				
Vegetation group	**Pre-European**	**Current**	**Reserved***	**% cleared**	***** % reserved**	**Pre-European**	**Current**	**Reserved**	**% cleared**	***** % reserved**
River red gum types										
River Red Gum Very Tall Forest	35,000	30,000	5,700	14.3	19.0	72,000	62,400	20,700	13.3	33.2
River Red Gum Tall Open Forest	115,000	94,000	3,800	18.3	4.0	162,000	134,000	23,500	17.3	17.5
River Red Gum Woodland	131,500	75,000	12,700	43.0	16.9	222,000	116,400	30,000	47.6	25.8
River Red Gum–Box Woodland	465,000	202,000	8,200	56.6	4.1	602,000	269,600	48,800	55.2	18.1
All River Red Gum types	***746,500***	***401,000***	***30,400***	***46.3***	***7.6***	***1,058,000***	***582,400***	***123,000***	***45.0***	***21.1***
Black Box Woodland	700,000	350,000	9,100	50.0	2.6	839,000	417,700	22,600	50.2	5.4
ALL	***1,446,500***	***751,000***	***39,500***	***48.1***	***5.3***	***1,897,000***	***1,000,100***	***145,600***	***47.3***	***14.6***
Other woodland types										
Box–White Cypress	1,400,800	188,200	900	86.6	0.5	1,518,000	202,400	1,700	86.7	0.8
Ironbark Shrubby	120,000	50,000	5,100	58.3	10.2	120,000	50,000	5,100	58.3	10.2
Mallee	500	240	100	52.0	41.7	2,000	700	200	65.0	28.6
Semi-arid Acacia	2,242,000	678,500	38,800	69.7	5.7	2,242,000	678,500	38,800	69.7	4.7
Semi-arid Oak	1,358,000	701,000	47,100	48.4	6.7	1,458,000	749,400	67,700	48.6	9.0
Slender Cypress	4,000	800	0	80.0	0.0	15,000	2,500	0	83.3	0.0
White Cypress	506,000	150,800	1,600	70.2	1.1	513,000	153,100	2,500	70.2	1.6
ALL	5,631,300	1,769,540	93,600	68.6	5.3	5,868,000	1,836,600	116,000	68.8	6.3

* Informed by the NSWVCA database[xxiv] and DECCW unpublished data
** Also informed by VEAC (2008) EVC area data[xxv]. Includes draft proposal reservation areas in reserved extent.
*** Percentage of current extent.

Table 23: Health of the Millewa, Koondrook and Werai forests[xxvi]

Site/water management unit	Health /trend
Millewa forests	**Poor** Despite the 2005–06 environmental watering allocation managed flood only 20 per cent of the river red gums in the Forest remain in a healthy state. **Declining** 75 per cent of the Forest now in a state of decline and a further 5 per cent considered to be in poor health (MDBC 2006a).
Koondrook forests	**Very Poor** In 2007–08, 87 per cent classed as 'unhealthy' (Turner and Kathuria, 2008). **Declining** The forests have not been extensively flooded since 2001 and so health is continuing to deteriorate (MDBC, 2006b).
Werai forests	**Poor** Majority unhealthy, including 92 per cent of site quality 2 sampled 'highly stressed, near dead and dead' (Jurskis et al., 2005). **Trend** unknown, probably declining.

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Table 24: EPBC- and TSC-listed fauna species of the Riverina, and their broad habitat requirements

		Status		Habitat feature				
Scientific name	**Common name**	**TSC**	**EPBC**	**Connectivity**	**Wetlands**	**Vegetation mosaic**	**Tree hollows**	**Coarse woody debris**
Amytornis textilis ssp *modestus*	Thick-billed Grass-wren (eastern subspecies)	CE	V	✓				
Botaurus poiciloptilus	Australasian Bittern	V	-		✓			
Burhinus grallarius	Bush Stone-curlew	E1	-					✓
Cacatua leadbeateri	Major Mitchell's Cockatoo	V	-			✓	✓	
Calyptorhynchus lathami	Glossy Black-cockatoo	V	-			✓	✓	
Cinclosoma castanotus	Chestnut Quail-thrush	V	-	✓				✓
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V	-			✓	✓	✓
Crinia sloanei	Sloane's Froglet	V	-		✓			
Dasyurus maculatus	Spotted-tailed Quoll	V	E	✓		✓		✓
Falco hypoleucos	Grey Falcon	V	-		✓	✓		
Glossopsitta porphyrocephala	Purple-crowned Lorikeet	V	-				✓	
Glossopsitta pusilla	Little Lorikeet	V	-				✓	
Grantiella picta	Painted Honeyeater	V	-			✓		

		Status		Habitat feature				
Scientific name	**Common name**	**TSC**	**EPBC**	**Connectivity**	**Wetlands**	**Vegetation mosaic**	**Tree hollows**	**Coarse woody debris**
Grus rubicunda	Brolga	V	-		✓	✓		
Hamirostra melanosternon	Black-breasted Buzzard	V	-			✓		
Hylacola cauta	Shy Heathwren	V	-	✓				
*Lasiorhinus krefftii**	Northern Hairy-nosed Wombat	Presumed extinct	E					
Lathamus discolor	Swift Parrot	E1	E			✓		
Leipoa ocellata	Malleefowl	E1	V	✓				
Litoria raniformis	Southern Bell Frog	E1	V	✓	✓			✓
Lophoictinia isura	Square-tailed Kite	V	-	✓		✓		
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V	-	✓		✓		
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	-	✓		✓		
Myotis macropus	Large-footed Myotis	V	-		✓	✓	✓	
Neobatrachus pictus	Painted Burrowing Frog	E1	-		✓	✓		✓
Neophema pulchella	Turquoise Parrot	V	-	✓		✓	✓	

		Status		Habitat feature				
Scientific name	**Common name**	**TSC**	**EPBC**	**Connecti vity**	**Wetlands**	**Vegetatio n mosaic**	**Tree hollows**	**Coarse woody debris**
Ninox connivens	Barking Owl	V	-			✓	✓	
Ninox strenua	Powerful Owl	V	-			✓	✓	
Nyctophilus corbeni	Greater Long-eared Bat (south-eastern form)	V	V				✓	✓
Oxyura australis	Blue-billed Duck	V	-		✓	✓		
Pachycephala inornata	Gilbert's Whistler	V	-			✓		✓
Pachycephala rufogularis	Red-lored Whistler	CE	V			✓		
Pedionomus torquatus	Plains-wanderer	E1	V	✓				
Petaurus norfolcensis	Squirrel Glider	V	-	✓		✓	✓	
Petroica rodinogaster	Pink Robin	V	-			✓		
Phascogale tapoatafa	Brush-tailed Phascogale	V	-	✓			✓	
Phascolarctos cinereus	Koala	V	-					
Polytelis anthopeplus monarchoides	Regent Parrot (eastern subspecies)	E1	V	✓		✓	✓	
Polytelis swainsonii	Superb Parrot	V	V	✓		✓	✓	
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V	-			✓		

		Status		Habitat feature				
Scientific name	**Common name**	**TSC**	**EPBC**	**Connectivity**	**Wetlands**	**Vegetation mosaic**	**Tree hollows**	**Coarse woody debris**
Pyrrholaemus sagittatus	Speckled Warbler	V	-	✓		✓		✓
Rostratula australis	Australian Painted Snipe	E	V		✓			
Saccolaimus flaviventris	Yellow-bellied Sheathtail bat	V	-			✓	✓	
Stagonopleura guttata	Diamond Firetail	V	-			✓		✓
Stictonetta naevosa	Freckled Duck	V	-		✓			
Tiliqua occipitalis	Western Blue-tongued Lizard	V	-					✓
Tyto novaehollandiae	Masked Owl	V	-			✓	✓	
Vespadelus baverstocki	Inland Forest Bat	V	-			✓	✓	
Climacteris affinis	White-browed Treecreeper population in the Carrathool LGA south of the Lachlan River and Griffith LGA	End. pop	-	✓				✓
Anthochaera phrygia	Regent Honeyeater	E1	E			✓		

Table 25: EPBC-listed CAMBA and JAMBA bird species of the Riverina

		Status		Habitat feature				
Scientific name	**Common name**	**EPBC-listed migratory birds of the Riverina**	**JAMBA / CAMBA/ ROKAMBA**	**Connectivity**	**Wetlands**	**Vegetation mosaic**	**Tree hollows**	**Coarse woody debris**
Apus pacificus	Forked-tailed Swift	M	J, C, R					
Ardea alba	Great Egret	M	J, C		✓			
Ardea ibis	Cattle Egret	M	J, C		✓			
Calidris acuminata	Sharp-tailed Sandpiper		J, C, R		✓			
Calidris ruficollis	Red-necked Stint		J, C, R		✓			
Gallinago hardwickii	Latham's Snipe	M	J, C, R		✓	✓		
Haliaeetus leucogaster	White-bellied Sea-Eagle	M	C		✓			
Hirundapus caudacutus	White-throated Needletail	M	J, C					
Hydropogne caspia	Caspian Tern	M	J, C		✓			
Plegadis falcinellus	Glossy Ibis		C		✓			
Rostralula benghalensis	Australian Painted Snipe	E, M	C		✓			
Tringa nebularia	Greenshank	M	J, C, R		✓			
Tringa stagnatilis	Marsh Sandpiper	M	J, C, R		✓			
Anatidae	Waterfowl	M	-		✓			

		Status		Habitat feature				
Scientific name	**Common name**	**EPBC-listed migratory birds of the Riverina**	**JAMBA/ CAMBA/ ROKAMBA**	**Connectivity**	**Wetlands**	**Vegetation mosaic**	**Tree hollows**	**Coarse woody debris**
(14 species in region)								
Grus spp. (1 species in region)	Cranes	M	-		✓			
Scolopacidae (5 species in region)	Snipe	M	-		✓			
Recurvirostridae, Charadriidae (6 species in region)	Shorebirds	M	-		✓			
Accipitridae (3 species in region)	Raptors	M	-			✓		

M, Migratory; E, endangered under EPBC Act; J, Japan–Australia Migratory Bird Agreement (JAMBA); C, China–Australia Migratory Bird Agreement (CAMBA)

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Table 26: JANIS targets for river red gum types in the Riverina

Vegetation types (assumes all types 'vulnerable'*)	NSW-only area (ha)				NSW and Victoria combined area (ha)			
	Current	60% Current	Reserved	New reserves to meet target	Current	60% Current	Reserved	New reserves if target was to be meet target
River Red Gum Very Tall Forest	30,000	18,000	5,700	12,300	62,400	37,440	20,700	16,740
River Red Gum Tall Open Forest	94,000	56,400	3,800	52,600	134,000	80,400	23,500	56,900
River Red Gum Woodland	75,000	45,000	12,700	32,300	116,400	69,840	30,000	39,840
River Red Gum-Box Woodland	202,000	121,200	8,200	113,000	269,600	161,760	48,800	112,960
All River Red Gum types	***401,000***	***240,600***	***30,400***	***210,200***	***582,400***	***349,440***	***123,000***	***226,440***
Black Box Woodland	350,000	210,000	9,100	200,900	417,700	250,620	22,600	228,020
ALL	***751,000***	***450,600***	***39,500***	***411,100***	***1,000,100***	***600,060***	***145,600***	***454,460***

* Vulnerable does not mean listed under the TSC Act or EPBC A

Table 27: Timeline, consultation and communication

12 August 2009	Government provides Terms of Reference
14 August 2009	NRC issues Notice of Assessment
20 – 22 August 2009	Regional tour (Deniliquin)
28 August 2009	Public submissions close on Terms of Reference
4 September 2009	Information update 1
10 – 15 September 2009	Regional tour (Deniliquin/Balranald)
18 September 2009	Information Update 2
30 September 2009	Preliminary Assessment Report to Government
9 October 2009	Information Update 3
19 – 22 October 2009	Regional tour (Albury/Deniliquin) including workshops
23 October 2009	Public submissions close on Preliminary Assessment Report
26 October 2009	Balranald public forum
27 October 2009	Barham public forum
28 October 2009	Deniliquin public forum including workshop
2 November 2009	Sydney public forum
6 November 2009	Information Update 4
21 December 2009	Final Assessment Report to Government

Table 28: Regional consultation – dates and location

Date	Event/Group consulted	Location
19–21 August 2009	Regional tour	
10–15 September 2009	Regional tour	
19–22 October 2009	Regional tour	
19 and 28 October 2009	Forestry Industry	
19 and 28 October 2009	Riverina and Murray Regional Organisation of Councils	
19 October 2009	Environmental groups (National Parks Association and The Wilderness Society)	
21–22 October 2009	Murray Lower Darling Indigenous Nations	
26 October 2009	Public forum	Balranald
27 October 2009	Public forum	Barham
28 October 2009	Public forum	Deniliquin
29 October 2009	Regional tour	
2 November 2009	Public forum	Sydney

Table 29: Submission received

Submissions on Terms of Reference – from organisations	
▪ Arbuthnot Sawmills Pty Ltd	▪ Murray Shire Council
▪ Balranald Shire Council	▪ Nambucca Valley Conservation Association
▪ Berrigan Shire Council	▪ National Parks Association of NSW
▪ Bird Observation and Conservation Australia	▪ Nature Conservation Council NSW
▪ Bullatale Creek Landholders	▪ North East Forest Alliance
▪ Bullatale Creek Trust	▪ Northern Inland Council for the Environment
▪ Bushwalking Victoria	▪ NSW Forest Products Association
▪ Citizens Wildlife Corridors Armidale Inc.	▪ NSW Red Gum Forest Action Inc.
▪ Combined submission – Farmers, irrigators and landholders	▪ Save Manly Dam Catchment Committee Inc.
▪ Conargo Shire Council	▪ South East Forest Rescue
▪ Culpra Milli Aboriginal Corporation	▪ The Colong Foundation for Wilderness Ltd
▪ Cummergunja	▪ The Friends of Eastern Otways
▪ Ecological Surveys and Planning	▪ The Nationals, Member for Burrinjuck
▪ Falbrook Wildlife Refuge	▪ The Wilderness Society Sydney
▪ Friends of the Earth Australia	▪ Timber Communities Australia
▪ Hunter Community Environment Centre	▪ Total Environment Centre Inc.
▪ J and G Coulter Pty Ltd	▪ Victorian National Parks Association
▪ Lower Murray-Darling CMA	▪ Wiringal
Submissions on preliminary assessment report – from organisations	
▪ ANGAIR Inc.	▪ National Parks Association of NSW
▪ Australian Centre for Biodiversity	▪ National Parks Association – Coffs Harbour and Bellingen
▪ Australian Conservation Foundation	▪ National Parks Association – Reserve Committee
▪ Balranald Shire Council	▪ National Parks Association – Three Valleys

Submissions on Terms of Reference – from organisations	
▪ Bird Observation and Conservation Australia	▪ Nature Conservation Council of NSW
▪ Bird Observation and Conservation Australia – Echuca	▪ North Central Catchment Management Authority
▪ Byron Environmental and Conservation Organisation	▪ North Coast Environment Council Inc.
▪ Campi Bulk Transport Pty Ltd	▪ North East Forest Alliance
▪ Canopy Native Forest Committee	▪ Northern Beaches Greens
▪ Central West Environment Council	▪ Northern Inland Environment Council
▪ Clarence Environment Centre	▪ NSW Apiarists Association Inc.
▪ Clarence Valley Conservation Coalition Inc.	▪ NSW Forest Products Association
▪ Conargo Shire Council	▪ NSW Red Gum Forest Action Inc.
▪ Deniliquin Council	▪ Oatley Flora and Fauna Conservation Society Inc.
▪ Department of Agriculture, Fisheries and Forestry	▪ Pikapene and Cherry Tree Environment Centre Inc.
▪ Environment groups	▪ Rainforest Information Centre
▪ Firewood and Log Residue Working Group	▪ Redgum Timber Producers (Australia) Pty Ltd
▪ Friends of the Earth Australia	▪ Riverina and Murray Regional Organisation of Councils
▪ Friends of the Koala Committee	▪ Rivers and Red Gum Environment Alliance
▪ Glen Eira Environment Group	▪ Shire of Wakool
▪ Gulpa Sawmills Pty Ltd	▪ South East Forest Rescue
▪ Hay Shire Council	▪ STEP Inc.
▪ High Country Conservation Alliance Inc.	▪ Terania Native Forests Action Group
▪ Humane Society International	▪ The Colong Foundation for Wilderness
▪ Hunter Environment Lobby Inc.	▪ The Habitat Advocate
▪ Inland Rivers Network	▪ The Institute of Foresters of Australia
▪ Mathoura Chamber of Commerce and	▪ The Nationals

Submissions on Terms of Reference – from organisations	
Citizens Inc.	
▪ Mudgee District Environment Group	▪ The Wilderness Society Sydney
▪ Murray Catchment Management Authority	▪ Victorian Apiarists Association Inc.
▪ Murray-Darling Basin Authority	▪ Wingham Forest Action
▪ Murray Lower Darling Rivers Indigenous Nations	▪ Wombat Forestcare Inc.
▪ Murrumbidgee Field Naturalists	▪ Yarkuwa Indigenous Knowledge Centre Aboriginal Corporation
▪ Nambucca Valley Conservation Association Inc.	▪

Table 30: Technical Review Panel

Technical Review Panel member	Title and organisation
Professor Andy Bennett	School of Life and Environmental Sciences Deakin University
Ms Di Bentley	Natural Resources Commission
Mr Ian Burns/Mr Michael Jones	Murray Darling Basin Authority
Dr Leon Bren	Associate Professor, Department of Forest and Ecosystem Science University of Melbourne
Dr Matthew Colloff	Floodplain Ecosystem Function Commonwealth Scientific and Industrial Research Organisation
Dr Michael Harris	Faculty of Agriculture Food and Natural Resources
Professor Barry Hart	Emeritus Professor, Water Studies Monash University
Dr Terry Hillman	Former Director Murray Darling Freshwater Research Centre
Professor Peter Kanowski (Technical Chair)	Forest and Environment Policy Australian National University
Dr Glen Kile	Director Plant Health Australia
Dr Ian Lunt	School of Environmental Sciences Charles Sturt University
Dr Brian Walker	CSIRO Research Fellow Resilience Alliance Program Director and Chair of Board Commonwealth Scientific and Industrial Research Organisation
Dr David Williams	Institute for Applied Ecology University of Canberra

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Attachment 2

Commission briefing on estimated sustainable yields

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This briefing was provided to the interagency committee led by Mr Peter Duncan, Deputy Director General, Department of Premier and Cabinet, established by the Government to coordinate the Government's implementation of the Commission's recommendations.

Summary

- In its assessment report, the Commission reported estimates for the Millewa and Koondrook-Perricoota/Campbells Island forests were 4,500 to 8,500 m^3/year of quota sawlogs.
- The Commission has revised its estimates of long term sustainable quota yield from the Millewa and Koondrook-Perricoota/Campbell's Island to 6,300 to 13,600 m^3/year.
- The Commission notes Forests NSW estimates annual yields of 14,000 to 17,000 m^3/year from all Central Murray forests.
- However, the Commission's view is that Forests NSW estimates are based on a more optimistic set of assumptions than the Commission believes are appropriate.
- The Commission believes that appropriate 5, 10 or 20 year transitional yields should be determined once tenure and management regimes have been specified and a detailed inventory of the current volume and quality of timber has been prepared for each forest.

Long term sustained yield

- Long term sustained yield is an estimate of the average volume of wood a given forest area can produce over a long timeframe, without reducing potential future yields. It is customary to express this as a volume which is available on an annual basis. This figure is one of the significant factors which forest managers take into account when allocating sawlogs to industry. Long term sustainable yield estimates are normally reviewed on a regular basis (say, each 5 – 10 years) to account for updated information e.g. on forest health, structure and growth rates.
- As Forests NSW manages river red gums for wood production on a planned rotation of 90 to 120 years, the Commission nominated 100 years as an appropriate timeframe over which to estimate long term sustained yield. Long-term sustained yield estimates are subject to relatively high levels of uncertainty compared to those estimates for shorter periods, because of the extended timeframe over which they are made, and their consequent sensitivity to underlying assumptions.
- In its Final Assessment Report the Commission published estimates of long term sustainable yields of quota and ex-quota sawlogs for selected forests in the Central Murray area (section 10.3 of the assessment report). Long term sustainable yield estimates were prepared for the Millewa and Koondrook-Perricoota/Campbells Island forests because:
  - inundation modelling was available for these areas
  - they account for 86% of current timber yield (and a greater percentage of quota yield) from the Central Murray, and
  - advice from Forests NSW and local experts indicated that the long term sustainable yields from other forests were likely to be minimal.
- The Commission's published estimates for the Millewa and Koondrook-Perricoota/Campbells Island forests were 4,500 to 8,500 m^3/year of quota sawlogs. After consultation with Forests NSW, these have been revised to 6,300 to 13,600 m^3/year of quota sawlogs. An outline of the level of uncertainty and assumptions behind these ranges is provided in the next two sections.

- Separate to the Commission's estimates, Forests NSW has estimated an average minimum yield of 14,000 m^3/year and a drought impacted yield of 17,000 m^3/year of quota sawlogs from all Central Murray State Forests. This includes yields from Werai and other areas not incorporated in the Commission's estimates. The Commission's view is that these estimates are more optimistic than is warranted by the scenarios outlined in the Final Assessment Report.

Estimates for Millewa and Koondrook-Perricoota/Campbells Island forests published in the Commission's Final Assessment Report

- The Commission published estimates of long term sustained yield in its Final Assessment Report of 4,500 to 8,500 m^3/year, based on the long term growth rate of the forests. Because of data and methodological limitations, the Commission estimates of growth rates assumed no active management of the forests over the 100 year growing cycle. This assumption generates conservative estimates of yield, which the Commission considered was appropriate given the uncertainty of future water availability for many areas of the forests.
- As the future health and growth, and therefore productive yield, of the river red gum forests is highly dependent on water availability, the Commission presented yield estimates for three watering scenarios in its Final Assessment Report. These watering scenarios were based on hydrological modelling of likely areas of flooding in the Millewa forest group and Koondrook-Perricoota/Campbell's Island forests, given assumed availability of water (and delivery infrastructure) under predicted climate change scenarios.
- Areas of forest which were modelled as receiving regular inundation were assumed to maintain historic growth rates of sawlogs and to produce quota as well as ex-quota timber. Areas which were modelled as not receiving inundation were assumed to yield only 25% of historic growth rates of sawlogs, and to produce only ex-quota timber (ie to transition to Site Quality 3 condition).
- Table A1.1 shows the Commission's published estimates of long-term sustainable yield of quota and ex-quota sawlogs from the Millewa forest group and Koondrook-Perricoota/Campbell's Island forests under three different watering scenarios.

  A 'minimum watering' scenario1, which was assessed as having a reasonable likelihood of being achieved. This produced 4,500 m3/year of quota sawlogs.

  An 'upper bound watering' scenario2, which was assessed as having a low likelihood of being achieved. This produced 8,500 m3/year of quota sawlogs.

  A 'continuation of historic growth' scenario in which all areas of forest received sufficient water to maintain historic growth and sawlog yield. This produced 16,000 m3/year of quota sawlogs.
- The Commission's published estimates of long-term sustainable yield of quota and ex-quota sawlogs did not include yields from Werai or other smaller forests in the Central Murray area. These areas were considered unlikely to produce significant volumes of sawlogs over a 100 year timeframe due to their relatively small size and poor condition.

[1] The 'minimum watering' scenario assumed flooding related to flow regimes of 18,300 ML/day for 60+ days for the Millewa forests and 2,000 ML/day for the Koondrook-Perricoota forests. Campbells Island was assumed to have the same extent of flooding as for Koondrook-Perricoota.
[2] The 'upper bound watering' scenario assumed flooding related to flow regimes of 35,000 ML/day for 60+ days for the Millewa forests and up to 6,000 ML/day for the Koondrook-Perricoota forests. Campbells Island was assumed to have the same extent of flooding as for Koondrook-Perricoota.

Table A1.1: Estimates of long term sustainable yield of quota and ex-quota timber from Millewa, Koondrook-Perricoota and Campbells Island forests published in the Commission's Final Assessment Report (m³/year)[xxvii]

	Areas flooded		Areas not flooded (assumed to produce ex-quota sawlogs)	Total
	Quota	Ex-quota		
Minimum watering scenario				
Millewa Forests	2,000	1,400	3,600	7,000
Koondrook-Perricoota & Campbells Island forests	2,500	1,700	1,400	5,700
Total	**4,500**	**3,200**	**5,000**	**12,700**
Upper bound watering scenario				
Millewa forests	5,000	3,500	2,300	10,700
Koondrook-Perricoota & Campbells Island forests	3,500	2,500	1,000	7,000
Total	**8,500**	**6,000**	**3,300**	**17,700**
Continuation of historic growth				
Millewa forests	10,500	7,300	-	17,800
Koondrook-Perricoota & Campbells Island forests	5,700	4,100	-	9,800
Total	**16,200**	**11,400**	-	**27,600**

Commission's revised estimates for Millewa and Koondrook-Perricoota/Campbells Island

- After further discussion with (and modelling by) Forests NSW, the Commission has prepared revised estimates of long term sustainable yield under the 'minimum watering' and 'upper bound watering' scenarios to take into account:

  More precise estimates of growth rates for forest areas predicted to be in the 'watered' and 'non-watered' zones, based on Forests NSW strategic inventory plots located in those zones in each forest area[3].

[3] Growth rates were derived over a 50 year period for current standing stock, assuming no silviculture and therefore no silviculture-induced regeneration of new trees. The Commission acknowledged in its Final Assessment Report that this estimate takes a conservative view of the potential impact of silviculture on growth rates. The Commission believes this is warranted for two reasons. The first is the Commission's judgement the likely long-term impacts of water stress will over-ride any silvicultural enhancement of growth rates, particularly in forests which do not receive regular watering. The second is that future silvicultural interventions are expected to be more conservative (in line with the Commission's

Forests NSW expert advice that the Commission's assumption, that all forest areas not modelled as receiving regular watering would transition to a condition in which they yielded no quota quality sawlogs, was too pessimistic.

- Table A2.2 shows the Commission's revised estimates of quota long term sustainable yield from the Millewa forest group and Koondrook-Perricoota/Campbell's Island forests. The main differences between the Commission's initial estimates and revised estimates are due to:

  Adjustment of the Net Harvestable Area and growth rates for watered areas to match more precise estimates from FRAMES. This accounts for an additional 0 – 3,900 m^3/year, and

  The assumption that 36%of sawlogs from areas previously modelled as unwatered could be of quota quality. This accounts for an additional 1,800 – 1,200 m^3/year of quota yield.

- In the absence of better data, the Commission assumed the percentage of sawlogs of quota quality produced by sites modelled as 'non-watered' would be equivalent to that realised from Koondrook forest over the past 3 years.
- While the recent proportion of quota quality sawlogs produced from Koondrook will to some extent reflect the growth of trees prior to river regulation, the Commission's view is that this is the best available estimate of the proportion of sawlogs of quota quality able to be produced by Site Quality 1 and 2 sites that do not receive regular watering.
- Monitoring to provide updated data on stand dynamics and the growth rate of quota quality trees in these areas will be necessary to test this assumption and should be conducted in line with regular reviews of long term sustainable yield estimates.

recommendations and the provisions of any IFOA) than those practiced in the past, limiting the extent to which enhanced growth rates can be achieved in practice.

Table A2.2: Comparison of the Commission's published and revised estimates of long term sustained yield of quota sawlogs (m^3/year)

	'Minimum watering' scenario			'Upper bound watering' scenario		
	Millewa	Koondrook-Perricoota	Total	Millewa	Koondrook-Perricoota	Total
Published estimates of quota sawlogs	2,000	2,500	**4,500**	5,000	3,500	**8,500**
Adjustment to quota sawlogs from regularly flooded areas						
Adjustment for more precise area estimates	-1,100	100	**- 1,000**	500	200	**700**
Adjustment for more precise growth rate estimates*	300	700	**1,000**	2,000	1,200	**3,200**
Adjustment to quota sawlogs from non-flooded areas						
Published estimates of sawlogs from non-flooded areas (assumed all ex-quota)	3,600	1,400	**5,000**	2,300	900	**3,200**
Revised percentage of quota sawlogs from non-flooded areas**	36%	36%	**36%**	36%	36%	**36%**
Adjustment for percentage of quota sawlogs	1,300	500	**1,800**	850	350	**1,200**
Revised estimates of quota sawlogs	2,500	3,800	**6,300**	8,350	5,250	**13,600**

* Revised growth rates for quota quality sawlogs were based on strategic inventory plots matched to areas modelled as being inundated under the scenarios used in the Commission's Final Annual Report. A growth rate of 0.64 m3/ha/year was used for the Millewa forests, and a growth rate of 0.34 m3/ha/year for Koondrook-Perricoota and Campbells Island. By comparison, growth rates used to prepare the estimates in the Final Assessment Report were 0.60 m3/ha/year for SQ1 areas and 0.26 m3/ha/year for SQ2 areas.

** Based on production of quota sawlogs as a proportion of all sawlogs from Koondrook forest between 2007 and 2009.

- The Commission's revised long term sustainable yield estimates acknowledge that some better quality (SQ1 and SQ2) sites in modelled non-watered areas have potential to produce quota quality sawlogs due to:

  A greater extent of flooding being realised in practice than was predicted by the Water Tech and TLM modelling, through 'smart' local management of available water, subject to well-managed delivery infrastructure being in place and being used.

  The application of silviculture to improve the health (rather than the growth rate) of remaining trees in areas receiving minimal water.
- The Commission has not revised its assessment of the likelihood of the 'minimum watering' and 'upper bound watering' scenarios being achieved, but has revised its assessment of the likely outcome from a given amount of water.
- The Commission's judgement is that, overall, the modelled non-watered areas will continue to receive enough water to produce proportions of quota timber intermediate between well watered sites and SQ3 sites. This takes into account Forests NSW and other expert local knowledge on the extent of inundation achievable with good local-level water management and appropriate infrastructure, compared to hydrological modelling predictions.
- However, the extent to which good local-level water management occurs in practice, and generates associated higher wood yields, obviously depends on the investment of resources (both expertise and infrastructure) necessary to realise the maximum extent of inundation for a given watering regime.
- Table A2.3 below summarises the key assumptions behind the Commission's revised estimates of long term sustainable quota yields.

Table A2.3: Comparison of key assumptions associated with long term sustainable yield estimates (Commission's assumptions shown in bold)

Issue	Conservative assumptions	Optimistic assumptions
Growth rates	**Growth rates on all areas assume no response due to silviculture, reflecting in part the greater constraints of IFOA requirements.**	Growth rates for regularly watered areas reflect historic (1970-2002) responses to silviculture. Those for 'non-watered' areas reflect recent drought impacted (2003 – 2008) responses. Additional silvicultural constraints have little impact on average yields.
Extent of inundation	**Areas receiving regular watering are per the Water Tech and TLM modelling from the Final Assessment Report .**	"Smart" local water management extends the area inundated beyond the modelled area.
Quota log yield	Quota log yield from non-watered areas is zero.	**Quota log yield from non-watered areas is 36% of total sawlog volumes**.
Wood production from other forests	**Negligible wood production from Werai and other Central Murray forests.**	Over 1,500 m^3/year from other forests.

Forests NSW estimates

- Forests NSW have also prepared estimates of long term yield that may be achieved by harvesting according to rules agreed with the Commission as approximating the implementation of the Commission's silvicultural recommendations[4].
- These estimates of the long term sustained yield of quota sawlogs from all Central Murray forests are between 14,000 and 17,000 m^3/year. These estimates include yields from Werai and other Central Murray forests. The Commission did not include all of these areas in its published estimates. This reflected their low potential to produce quota sawlogs given what the Commission understands to be the current condition and harvesting history of these forests.
- The growth rates used by Forests NSW are less conservative than those used by the Commission, as they assume active management of the forests reduces competition between trees and delivers a growth response in the residual stand. For watered areas, 75% AGS and 25% STS was applied. For non-watered areas, only STS was applied. Both forms of harvesting drive a modest response in growth rates and therefore yields.
- However, there are two principal sources of uncertainty in these estimates. The first is the extent to which the AGS assumptions will be met in practice; the second is the extent to which reducing stand density through STS in non-watered areas can overcome the impact of long term lack of access to water (compared with improving stand stand health). In the Commission's view, current PGP data sets do not adequately reflect the cumulative effects of long term river regulation and associated depletion of groundwater on forest health, growth and sawlog yield.

Standing stock volumes

- As noted in the Commission's Final Assessment Report, some proportion of current standing stock could be harvested in the near term, for a defined period of time, as part of a managed industry transition strategy. As noted in the Final Assessment Report, this is a defensible management option as long as:
  - The basis for any decision on near term yields is transparent
  - The silvicultural principles outlined in the Commission's Final Assessment Report are respected
  - The consequences in terms of the ultimate reduction in long term sustainable yields are clear
  - A strategy is put in place to manage the ultimate decline in timber volumes available to the red gum forestry industry.
- **Table A2.4** shows Forests NSW estimates of the standing stock of quota sawlogs available for harvest by forest group. These estimates have been adjusted to take account of a range of issues that reduce the volume of sawlogs available for harvest compared to total assessed standing volumes. Issues considered include: appropriate threatened species management; application of Forests NSW silvicultural regimes; implementation of Commission recommendations for adaptive management and future forest structures; and the commercial viability of harvesting operations, amongst others.
- While these figures provide a useful frame of reference for considering the yield of quota sawlogs that may be produced by each forest over defined shorter-term timeframes (eg 5, 10

[4] These approximate those which might apply under an Integrated Forestry Operations Approval.

or 20 years), the Commission is not able to assess the accuracy or otherwise of these standing stock estimates. However, it is not clear that estimates based on Forests NSW strategic inventory data take sufficient account of the cumulative impacts of river regulation and drought on the standing volume of quota timber.

- The Commission believes that, in practice, the process of setting transitional yields should involve:
  - Specifying the tenure for each forest area, and thus the management objectives and constraints
  - Conducting a detailed inventory of the current volume and quality of timber in each forest area
  - Estimating the yields that would be realised from the application of appropriate silviculture to each forest area. These estimates should include yields that may come from managing specific for fire hazard reduction, asset protection and enhancement of stand health.

Table A2.4: Forests NSW estimates of available standing quota volume

Forest group	Net harvestable area (ha)	Harvestable standing quota volume	
		(m^3/ha)	(m^3)
Murray Management Area			
Koondrook-Perricoota/Campbells Island SF	27,779	6.2	173,400*
Millewa SF	15,399	19.0	292,600**
Gulpa Island SF	4,520	13.1	59,200
Werai SF	8,309	3.3	27,700
Other Murray SF	12,815	9.8	125,300
Mildura Management Area			
Mildura SF	7,531	0.2	1,800
Mildura WLL	24,126	1.6	38,600
Murrumbidgee Management Area	10,629	5.4	57,400

* Harvesting since 2008 has reduced available quota within Koondrook-Perricoota and Campbells Island forests by approximately 20,000 m^3.

** Harvesting since 2008 has reduced available quota within Millewa State Forest by approximately 15,000 m^3.

[i] Japan-Australia Migratory Bird Agreement

[ii] JANIS is the Nationally Agreed Criteria for the Establishment of a Comprehensive, Adequate and Representative Reserve System for the Forests in Australia (1997)

[iii] This is a revised figure (274). The original figure (2531) presented in the assessment report's appendice was a typographical error. The revised figure in this table is consistent with the figure (274) presented on page 117 of the main assessment report.

[iv] Forests NSW (2009) *Harvesting and associated road work operations in South-Western NSW – Environmental Impact Statement.* Available at http://pandora.nla.gov.au/tep/122363

[v] ABS (2006) *Census of Population and Housing*. Australian Bureau of Statistics.

[vi] See note iii.

[vii] See note iv.

[viii] Tourism NSW (2009) *Travel to the Murray (Year Ending March 2009)*, available online at http://corporate.tourism.nsw.gov.au/Sites/SiteID6/objLib18/The%20Murray%20YE%20Mar%2009.pdf.

[ix] Tourism NSW (2009) *Travel to Riverina (Year Ending March 2009),* available online at http://corporate.tourism.nsw.gov.au/Sites/SiteID6/objLib18/Riverina%20YE%20Mar%2009.pdf

[x] Tourism NSW (2009) *Travel to Outback NSW (Year Ending March 2009)*, available online at http://corporate.tourism.nsw.gov.au/Outback_NSW_p919.aspx.

[xi] See note vii

[xii] See note viii

[xiii] See note ix

[xiv] Tourism Research Australia (2008) *Tourism Profile for Wakool Shire*, available online at http://www.tra.australia.com/content/documents/LGA%20Profiles/NSW/Wakool%20LGA.pdf.

[xv] Tourism Research Australia (2008) *Tourism Profile for Gannawarra Shire*, available online at http://www.tra.australia.com/content/documents/LGA%20Profiles/VIC/Gannawarra%20LGA.pdf.

[xvi] Tourism Research Australia (2008) *Tourism Profile for District of Deniliquin*, available online at http://www.tra.australia.com/content/documents/LGA%20Profiles/NSW/Deniliquin%20LGA.pdf.

[xvii] Tourism Research Australia (2008) *Tourism Profile for Murray Shire*, available online at http://www.tra.australia.com/content/documents/LGA%20Profiles/NSW/Murray%20LGA.pdf.

[xviii] Tourism Research Australia (2008) *Tourism Profile for Balranald Shire*, available online at http://www.tra.australia.com/content/documents/LGA%20Profiles/NSW/Balranald%20LGA.pdf .

[xix] Tourism Research Australia (2008) *Tourism Profile for Mildura*, available online at http://www.tra.australia.com/content/documents/LGA%20Profiles/VIC/MilduraRural%20LGA.pdf.

[xx] Forests NSW (2008) *Ecologically Sustainable Forestry Management Plan – Riverina Region NSW*, Department of Primary Industries, Sydney, NSW.

[xxi] MDBMC (1995) *An audit of water use in the Murray-Darling Basin*, Murray-Darling Basin Ministerial Council, Canberra.

[xxii] Courtesy of MDBA based on CSIRO Sustainable Yield Report data – CSIRO (2008a) *Water Availability in the Murray-Darling Basin*, a report to the Australian Government from the CSIRO Murray-Darling Basin Sustainable Yields Project, Australia.

[xxiii] Data courtesy of CSIRO.

[xxiv] Benson, JS, Allen, C, Togher, C and Lemmon, J (2006), 'New South Wales Vegetation Classification and Assessment: Part 1. Plant communities of the NSW Western Plains', *Cunninghamia*, Vol. 9, No. 3, pp. 383–451.

[xxv] VEAC (2008), *River Red Gum Forests Investigation,* final Report, Victorian Environment Assessment Council.

[xxvi] GHD (2009) *Draft Ecological Character Description – NSW Central Murray State Forests*, report prepared by GHD for Forests NSW, January 2009.

[xxvii] Page 238 of the commission's assessment report.