NSW Vegetation Classification - Vegetation ID

Vegetation Community ID 85

Common Name: **River Oak forest and woodland wetland of the NSW South-western Slopes and South Eastern Highlands Bioregions**

Scientific Name: *Casuarina cunninghamiana subsp. cunninghamiana / Callistemon sieberi - Pteridium esculentum - Urtica incisa / Microlaena stipoides var. stipoides - Carex appressa - Poa labillardierei var. labillardierei - Lomandra longifolia*

Veg. Comm. ID.: **85** ***Original Entry:*** John Benson 31/12/2005

Photo 1: ID85a_PC266-10.jpg Casuarina cunninghamiana riparian tall open forest, Turon River south of Hill End, [AGD66 33°4'1.1"S 149°24'55.7"E], 10/05/2005, Jaime Plaza.

Photo 2: ID85b_DX27755.jpg River Oak (Casuarina cunninghamiana) with some River Red Gum (Eucalyptus camaldulensis) tall open forest on the Murrumbidgee River near Jugiong, [AGD66 34°49.632'S 148°19.862'E], 29/04/06, Jaime Plaza.

Photo 3: ID85c_PC263-9.jpg Casuarina cunninghamiana riparian open forest with a willow infestation on Cudgegong River, near Gulgong, [AGD66 32°24.341'S 149°19.573'E], 8/5/2005, Jaime Plaza.

Characteristic Vegetation: (Combination of Quantitative Data and Qualitative Estimate)

Trees: *Casuarina cunninghamiana subsp. cunninghamiana; Eucalyptus blakelyi; Angophora floribunda; Eucalyptus melliodora; Eucalyptus viminalis.*

Shrubs/Vines/Epiphytes: *Callistemon sieberi; Ptyridium esculentum; Grevillea floribunda; Acacia dealbata; Acacia implexa; Pomaderris prunifolia var. prunifolia; Dodonaea viscosa subsp. cuneata; Melicytus dentatus; Leptospermum myrtifolium; Bursaria spinosa subsp. spinosa.*

Ground Cover: *Microlaena stipoides var. stipoides; Austrostipa verticillata; Carex appressa; Cynodon dactylon; Poa labillardierei var. labillardierei; Lomandra longifolia; Oplismenus aemulus; Urtica incisa; Dichondra repens; Commelina cyanea; Alternanthera denticulata; Stephania japonica var. discolor; Clematis glycinoides var. glycinoides; Rumex brownii; Pellaea falcata; Themeda australis; Amyema cambagei; Amyema miraculosum subsp. boormanii; Acaena novae-zelandiae; Echinopogon caespitosus var. caespitosus; Geranium solanderi var. solanderi; Senecio quadridentatus; Cassinia aculeata; Persicaria decipiens; Austrostipa scabra subsp. scabra; Austrodanthonia racemosa var. racemosa; Gratiola peruviana; Galium propinquum; Juncus usitatus; Phragmites australis.*

Weed Species: *Rubus discolor; Holcus lanatus; Phalaris aquatica; Verbena bonariensis; Salix alba var. alba; Salix babylonica; Rosa rubiginosa.*

Weediness: Very high (>30%) with 10-30% cover.

Threatened Plants: Not assessed.

Threatened Fauna: Not assessed.

Mean Species Richness: Not assessed.

Rainforest Structure (Webb): Not applicable.

Structure (WH): Open Forest; Woodland.

Height Class (WH): Tall; Very Tall.

Vegetation Description: Tall or very tall open forest or woodland of River Oak (Casuarina cunninghamiana subsp. cunninghamiana) often with other tree species such as Ribbon Gum (Eucalyptus viminalis), Blakely's Red Gum (Eucalyptus blakelyi) or Yellow Box (Eucalyptus melliodora). Shrub layer generally sparse including species such as River Bottlebrush (Callistemon sieberi), Silver Wattle (Acacia dealbata), Melicytus dentatus, Bracken (Pteridium esculentum), Lomandra longifolia and Stinging Nettle (Urtica incisa). Ground cover sparse to dense containing native grasses such as Microlaena stipoides, Poa labillardieri, Austrodanthonia racemosa and couch grass (Cynodon dactylon), along with forbs such as Geranium solanderi var. solanderi, Bidgee-Widgee (Acaena novae-zelandiae) and Kidney Weed (Dichondra repens. Sedges such as Carex spp. and Juncus spp.are common. Weeds are common. Blackberry (Rubus discolor), Phalaris aquatica and Willow (Salix spp.) are major weeds. Occurs on gravels, sands and loams on various substrates along major watercourses in the NSW South-western Slopes Bioregion and western edge of the South East Highlands Bioregion excluding the Murray River valley where it is absent. Grades into River Red Gum communities (including ID79) at lower elevations to the west and grades into various box eucalypt woodlands upslope from the rivers. A threatened community due to clearing and weed infestation.

Level of Classification: Alliance / Sub-formation. ***Classification Confidence Level:*** High.

Formation Group: Casuarina Woodlands of the Inland Slopes and Plains.

State Veg Map (Keith 2004): Eastern Riverine Forests.

State Landscape (Mitchell 2002): Not Assessed.

NVIS Major Veg Sub-Groups: Casuarina and Allocasuarina forests and woodlands.

Forest Type (RN 17): 211 - River Oak (P).

Authority(s): (Combination of Expert Opinion and Quantitative Data). Western part of Vegetation Group 53 (Thomas et al. 2000) (they include the south coast and this has been split from the western slopes). Mid-Lachlan Regional Vegetation Committee (1999). Includes community 45 in Austin et al. (2000) for central Lachlan region. Includes Biolandscape SouA74 in Priday (2006). Described by Porteners (2000) and Lembit & Skelton (1998). Equivalent to group types 13 in Doherty (1997). Includes BVT 29 in DEC (2006a). This covers the River Oak community for the NSW South-western Slopes Bioregion and western part of the Southern Tablelands Bioregion. Listed as a sub-formation due to variation in ground cover with altitude and different substrates.

Interstate Equivalent(s): None.

Mapped/Modelled: Current extent partly mapped or modelled. ***Plot Sampling:*** Inadequate.

Mapping Info: Very mappable due to signature of crowns and riparian position on aerial photographs. Partly mapped in Thomas et al. (2000) but undersampled in western areas Mapped in some reserves.

Climate Zone: Montane: no dry season (mild summer); Temperate: no dry season (warm summer).

IBRA Bioregion (v6): NSW South-western Slopes (>70%); South Eastern Highlands (1-30%).

IBRA Sub-Region: Bathurst (1-30%); Bondo (1-30%); Crookwell (1-30%); Hill End (1-30%); Murrumbateman (1-30%); Oberon (1-30%); Orange (1-30%); Upper Slopes (30-70%).

Botanical Division: Central Western Slopes (CWS) (30-70%); South Western Slopes (SWS) (30-70%); Southern Tablelands (ST) (1-30%).

Local Govt. Areas: Blayney (1-30%); Boorowa (1-30%); Cabonne (1-30%); Cootamundra (1-30%); Cowra (1-30%); Forbes (1-30%); Gundagai (1-30%); Harden (1-30%); Junee (1-30%); Lachlan (1-30%); Mid-Western Regional (1-30%); Temora (1-30%); Weddin (1-30%); Wellington (1-30%); Yass Valley (1-30%); Young (1-30%); Australian Capital Territory (1-30%).

CMAs: Lachlan (30-70%); Murrumbidgee (30-70%).

MD Basin: Yes.

Substrate Mass: Alluvium; Metamorphic rocks; Plutonic rocks; Sedimentary rocks.

Lithology: Consolidated rock (unidentified); Granite; Gravel; Igneous rock (unidentified); Limestone; Metamorphic rock (unidentified); Quartzite; Sand; Sandstone; Silt.

Great Soil Group: Alluvial soil.

Soil Texture: Clayey sand; Loam; Loamy sand; Sand; Sandy loam; Silty clay loam; Silty loam.

Landform Patterns: Flood plain.

Landform Elements: Bank (streambank); Bar (streambar); Channel bench; Stream bed; Stream channel.

Land Use: Grazing.

Impacts of European Settlement: Major alteration of species composition; Medium reduction (30-70%) in extent and/or range.

Pre-European Extent: 30000 ha ±50%. Estimated from pre-European map: part range.

Pre-European Extent Comments: Thomas et al. (2000) modelled 10525 ha for the southern CRA area including the coast. This is estimate accounts for areas to the north and excludes the coastal component which is treated as a separate community.

Current Extent: 8000 ha ±50% or 27% ± 80% of pre-European extent remaining.

Current Extent Comments: (Estimated from mapped extant vegetation: part range). Partly sampled and modelled for upper slopes sub-region in Thomas et al. (2000). They included extant area of 8107 for coast and western slopes. This is halved to cover compenent on western slopes but then has been tripled to cover areas to the north in the Lachlan catchment. 178 of estimated original extent of 737 ha remains in Boorowa Shire - ie. 24% (NPWS 2002a). More River Oak has been cleared on the slopes than on the coast

Conservation Reserves: Abercrombie River NP 205 (M); Barton NR 3 (M); Brindabella NP 220 (M); Copperhannia NR 25 (M); Evans Crown NR 5 (E1); Girralang NR 50 (E2); Mullion Range SCA 100 (E2); Narrandera NR 1 (E1); Tarlo River NP 200 (E2); Turon NP 350 (E2); Wee Jasper NR 4 (M); Oak Creek NR 5 (E1); Black Andrew NR 37 (E1).

Reserves Total Area: 1205 ha. ***No. Representatives in Reserves:*** 13

Protected Area Explanation: Areas in Barton,, Coperhannia, Dapper and Boginderra Hills Nature Reserves from Lembit and Skelton (1998). Wee Jasper NR and Abercrombie River NP from Thomas et al. (2000). Girralang NR, Mullion Range SRA from Porteners (2000). Area in Brindabella NP from Doherty (1997). Turon River from Also add Murrumbidgee River reserve in ACT. Black Andrew and Oak Creek NRs from Thomas et al.(2000). Naranderra NR estimate by J Benson April 2002.

Secure Property Agreements: None.

Secure PAs Total Area: 0 ha. ***No. Representatives in Secure Property Agreements:*** 0

Protected Current Extent: 15.06% 1205 ha ± 30%. ***No. Representatives in Protected Areas:*** 13

Protected Pre-European Extent: 4.01% which is inadequately protected across distribution.

Common in 1750: Code 4a: 1-5% of pre-European extent in protected areas (>10,000 ha).

Key Sites for Protection: Moderately well conserved in a number of reserves. Off-reserve protection of remnants on private land is required.

Degree of Fragmentation: Human induced fragmented stands with <60% >30% extent remaining and moderate edge to area ratio.

Recoverability: Poor health as structure and/or composition significantly altered. But sufficient biota remain for natural regeneration if causal factors and their secondary impacts removed and dynamic processes reinstated.

Variation & Disturbance: Cohorts of River Oak appear after flood events. Recruitment can only be achieved if some of these gain maturity.

Fire Regime: Rarely burnt and River Oak is probably susceptible to intense fire.

Adjoining Communites: Grades into River Red Gum at lower elevations to the west and mixes with other communities at higher altitudes to the east.

Threatening Processes: Further clearing for agriculture, weed invasion particularly by Blackberry (Rubus discolor) and erosion of river banks. In most cases adjoining vegetation has been cleared exposing this community to edge effects. Salinity and recreational use affects some locations. Changes in water hydrology through weirs or irrigation can affect flooding regimes.

Threatening Process List: Clearing for agriculture; Clearing on small lots (hobby farms); Climate change; Chemical pollution (incl. herbicides, pesticides); Hydrology (disruption of natural flooding regimes); Irrigated cropping (incl. horticulture); Nutrient changes through fertilizers or runoff; Recreation over-use; Salinity; Sedimentation; Soil erosion, water: gully, tunnel, landslips; Unsustainable grazing and trampling by stock; Weed (exotic) invasion.

Threat Category: Near Threatened. ***Threat/Protected Area Code:*** NT/4a ***Threat Criteria:*** 5; 4; 1.

Planning Controls:

Planning and Management: Protection of riparian vegetation in regional vegetation plans. Control of weeds including Blackberry.

Listed Under Legislation: None.

Recovery Plan: Doesn't exist, but required.

Reference List: (183; 181; 179; 67; 180; 163; 336; 356; 373). Austin, M.P., Cawsey, E.M., Baker, B.L., Yialeloglou, M.M., Grice, D.J. & Briggs, S.V. (2000) Predicted vegetation cover in the central Lachlan region. National Heritage Trust Project AA 1368.97. (CSIRO Division of Wildlife and Ecology: Canberra); Doherty, M. (1997) Vegetation survey and mapping of Brindabella National Park and adjacent vacant Crown lands. Report to NSW National Parks and Wildlife Service: Queanbeyan; Lembit, R. & Skelton, N. (1998) Vegetation survey of Copperhannia, Barton, Dapper and Boginderra Hills Nature Reserves. Report to the NSW National Parks and Wildlife Service: Central West; Mid-Lachlan Regional Vegetation Committee (1999) Plan Draft Mid-Lachlan Regional Vegetation Management Plan for Public Exhibition. (Mid-Lachlan RVC: Forbes); Porteners, M.F. (2000) Vegetation survey of Mullion Range SRA and Wambool, Freemantle, Girralang and Eugowra Nature Reserves. Report to NSW National Parks and Wildlife Service: Central West; Thomas, V., Gellie, N. & Harrison, T. (2000) Forest ecosystem classification and mapping for the southern CRA region. Volume 2 Appendices. (Department of Urban Affairs and Planning: Sydney); NSW National Parks and Wildlife Service (2002a) The native vegetation of Boorowa Shire (NSW National Parks and Wildlife Service: Hurstville); Priday, S. (in prep. 2006) The native vegetation of the New South Wales South Western Slopes Bioregion (Lachlan, Murrumbidgee and Murray Catchments). Unpublished report to DEC Southern Office Queanbeyan; DEC (2006a) Reconstructed and extant distribution of native vegetation in the Lachlan Catchment. Unpublished report (NSW Department of Environment and Conservation: Dubbo).

NSW Vegetation Classification - Vegetation ID

Vegetation Community ID 2

Common Name: **River Red Gum-sedge dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW**

Scientific Name: *Eucalyptus camaldulensis subsp. camaldulensis / Eleocharis acuta -Centipeda cunninghamii - Ranunculus inundatus - Pseudoraphis spinescens*

Veg. Comm. ID.: **2** ***Original Entry:*** John Benson 31/12/2005 ***Last Modified:*** J.S. Benson 27/06/2007

Photo 1: ID2a_Img372ps.jpg Eucalyptus camaldulensis-Eleocharis acuta-Pseudoraphis spinescens open-forest, Moira State Forest (south of Mathoura) NSW, Moira Creek Road, approx. 0.5 km south of Moira Lake inlet, 30/1/1988, Peter Smith.

Photo 2: ID2b_img160pc.jpg Eucalyptus camaldulensis forest, Bullatale Creek, near Deniliquin, [AGD66 35°46'13.7"S, 145°08'25.3"E], 10/4/02, Jaime Plaza.

Characteristic Vegetation: (Combination of Quantitative Data and Qualitative Estimate)

Trees: *Eucalyptus camaldulensis subsp. camaldulensis.*

Shrubs/Vines/Epiphytes: *Acacia stenophylla; Amyema miquelii.*

Ground Cover: *Eleocharis acuta; Centipeda cunninghamii; Ranunculus inundatus; Pseudoraphis spinescens; Persicaria prostrata; Rumex brownii; Eleocharis pusilla; Carex inversa; Cyperus gymnocaulos; Cyperus exaltatus; Carex gaudichaudiana; Carex tereticaulis; Juncus amabilis; Juncus flavidus; Lachnagrostis filiformis; Paspalidium jubiflorum; Austrodanthonia duttoniana; Alternanthera denticulata; Senecio quadridentatus; Centipeda minima var. minima; Triglochin procerum; Stellaria angustifolia; Azolla filiculoides; Myriophyllum crispatum; Marsilea drummondii; Oxalis perennans; Potamogeton ochreatus; Ottelia ovalifolia subsp. ovalifolia; Myriophyllum verrucosum.*

Weed Species: *Bromus catharticus; Bromus hordeaceus; Carduus tenuiflorus; Hypochaeris radicata; Hypochaeris glabra; Lolium perenne; Paspalum distichum; Aster subulatus; Cirsium vulgare; Conyza bonariensis; Sonchus asper subsp. glaucescens; Sonchus oleraceus; Phyla canescens; Vulpia myuros; Cyperus eragrostis; Leontodon taraxacoides subsp. taraxacoides.*

Weediness: Very high (>30%) with <10% cover.

Threatened Plants: Not assessed.

Threatened Fauna: Suberb Parrot.

Mean Species Richness: 20±10 with 3-10 exotic spp. per plot (average of the floristic communities 1 and 2 in Smith & Smith 1990 in 20x20 m plots).

Rainforest Structure (Webb): Not applicable.

Structure (WH): Open Forest.

Height Class (WH): Very Tall.

Vegetation Description: Very tall open forest dominated by River Red Gum (Eucalyptus camaldulensis subsp. camaldulensis) that grow to over 30 m high and sometimes exceed 45 m. Shrubs are usually absent. The ground cover may be sparse and covered in litter or mid-dense to dense. It is dominated by sedges such as Eleocharis acuta, Eleocharis pusilla, Carex inversa, Cyperus xaltatus, Cyperus gymnocaulos, Carex gaudichaudiana and Carex tereticaulis along with the rushes Juncus amabilis and Juncus flavidus. Grass species include Spiny Mudgrass (Pseudoraphis spinescens), Blown Grass (Lachnagrostis filiformis) and Warrego Grass (Paspalidium jubiflorum). Forb species include Centipeda cunninghamii, Persicaria prostrata, Rumex brownii, Alternanthera denticulata, Senecio quadridentatus, Centipeda minima var. minima, Stellaria angustifolia and the pond waterplants Triglochin procerum and Myriophyllum crispatum. Weed species may be common and include Bromus hordeaceus, Hypochaeris radicata, Hypochaeris glabra, Paspalum distichum, Aster subulatus, Cirsium vulgare, Conyza bonariensis, Sonchus oleraceus and Phyla canescens. Occurs on black to grey silty-loam-clay alluvial (often self-mulching) soils in frequently flooded sites bordering stream channels, ox-bows and in nearby low-lying areas including intermittent lakes. Mainly distributed along the Murray River with smaller areas along the Murrumbidgee and Lachlan Rivers in the Riverina and Murray-Darling Basin Bioregions of New South Wales and Victoria with small areas in the NSW South-western Slopes Bioregion. The largest areas occur in the middle sections of the Murray River in NSW and Victoria. Many of the forests have been extensively logged so the River Red Gum trees are of smaller stature than prior to logging but some unlogged areas remain. Poorly represented in protected areas as of 2008 but largely uncleared due to its location near river channels. Weed invasion, inappropriate logging and lack of flooding due to irrigation draw-off or climate change are the main threats to this community. Dieback of trees since 2000 has altered the threat category of this community from Near Threatened to Vulnerable.

Level of Classification: Association. ***Classification Confidence Level:*** Medium.

Formation Group: Eucalyptus Communities of Inland Watercourses and Inner Floodplains.

State Veg Map (Keith 2004): Inland Riverine Forests.

State Landscape (Mitchell 2002): Not Assessed.

NVIS Major Veg Sub-Groups: Eucalyptus forests with a grassy understorey.

Forest Type (RN 17): 199-River Red Gum (P).

Authority(s): (Quantitative Data). Includes a combination of communities 1 and 2 and Table 1.2 in the floristic plot survey of the Murray River by Smith & Smith (1990). Mapped along the Murray river as part of map unit 1 (Red Gum Forest) in Margules & Partners (1990). Probably Red Gum-Quality 1 in forest typing along Murray River by NSW State Forests. The tallest River Red Gum communities (except where logged) in frequently-flooded sites along the length of the Murray River. Note: as of 2005, in NSW, only the Murray River and Great Cumbung Swamp had been adequately plot sampled to detect floristic variation in River Red Gum communities. Future survey and mapping should attempt to map out or model RRG floristic communities.

Interstate Equivalent(s): Victoria: part of EVC 255 Riverine Grassy Woodland/Riverine Sedgy Forest with some similarities to EVC 56 Floodplain Riparian Woodland or EVC292 Red Gum Swamp.

Mapped/Modelled: Current extent and pre-European extent mapped or modelled as part of a broader complex. ***Plot Sampling:*** Adequate.

Mapping Info: It is difficult to map this association solely from aerial photos as it struturally overlaps other types but it could be done with detailed ground checking. Mapped as part of River Red Gum Forest map unit the vegetation map of the Murray River in Margules & Partners (1990).

Climate Zone: Temperate: no dry season (hot summer); Semi-arid: warm (winter rain).

IBRA Bioregion (v6): NSW South-western Slopes (1-30%); Riverina (>70%).

IBRA Sub-Region: Lower Slopes (1-30%); Murray Fans (30-70%); Murray Scroll Belt (1-30%); Murrumbidgee (1-30%); Robinvale Plains (1-30%); Upper Slopes (1-30%); Lachlan (1-30%).

Botanical Division: South Far Western Plains (SFWP) (30-70%); South Western Plains (SWP) (30-70%); South Western Slopes (SWS) (1-30%); South Western Slopes (SWS) (1-30%).

Local Govt. Areas: Albury (1-30%); Corowa (1-30%); Deniliquin (30-70%); Greater Hume (1-30%); Hay (1-30%); Murray (1-30%); Murrumbidgee (1-30%); Wakool (1-30%).

CMAs: Murray (>70%); Murrumbidgee (1-30%); Lachlan (1-30%).

MD Basin: Yes.

Substrate Mass: Alluvium.

Lithology: Alluvial loams and clays; Silt.

Great Soil Group: Black earth; Grey clay; Grey earth.

Soil Texture: Loam; Loamy sand; Sandy clay loam; Silty loam.

Landform Patterns: Covered plain; Flood plain.

Landform Elements: Backplain; Lake; Ox-bow; Stream bed; Stream channel.

Land Use: Grazing; Timber Production.

Impacts of European Settlement: Major alteration of species composition; Younger age class over most of distribution.

Pre-European Extent: 35000 ha ±30%. Expert estimate not based on any mapped vegetation.

Pre-European Extent Comments: Extrapolated from current extent mapping on the Murray river with estimates from other rivers.

Current Extent: 30000 ha ±30% or 86% ± 50% of pre-European extent remaining.

Current Extent Comments: (Estimated from a more broadly classified vegetation map). Estimated that about 20000 ha occurs along the Murray River in NSW. This has been estimated by attributing 5% of section 1, 5% of section 2, 20% of section 3, 20% of section 4, 5% of section 5 and 5% of section 6 of the structural map unit Red Gum Forest as mapped in Margules & Partners (1990) and by correlating the sampling plot frequency along the River of floristic communities 1 and 2 described in Smith & Smith (1990). Additional areas have been added to account for likely occurrences on the Murrumbidgee River and other rivers.

Conservation Reserves: Billabong FR 50 (E3); Moira Lakes FR 40 (E3); Native Dog FR 43 (E3); Pollack FR 100 (E3); Sanddune Pine FR 10 (E3); Snake Island FR 5 (E3); Toupna Creek FR 2 (E3); Yanga NP 3000 (E3); Yanga SCA 30 (E4).

Reserves Total Area: 3280 ha. ***No. Representatives in Reserves:*** 9

Protected Area Explanation: Estimates or measurements of areas in conservation reserves along Murray River have been derived from descriptions in Forestry Commission (1989a) and by overlaying the distribution of the communities defined by Smith & Smith (1990) with the structural mapping by Margules & Partners (1990) and Murray River forests forest typing by State Forests of NSW. These need ground checking to distinguish RRG types. Margules & Partners (1990) Red Gum unit split between ID2 and ID5 for Sanddune Pine Flora Reserve based on forest typing. Pollack Flora Reserve estimate only as several red gum types probably occur there. Yanga NP and SCA estimates from splitting broad RRG mapped in Scott 1992 with notes of four types of RRG in NSWDEC (2005). The 2009/2010 NSW Government decision to protect areas of River Red Gum and associated vegetation types in reserves has not been taken into account in these protected area estimates.

Secure Property Agreements: .

Secure PAs Total Area: 0 ha. ***No. Representatives in Secure Property Agreements:*** 0

Protected Current Extent: 10.93% 3280 ha ± 30%. ***No. Representatives in Protected Areas:*** 9

Protected Pre-European Extent: 9.37% which is inadequately protected across distribution.

Common in 1750: Code 3a: 5-15% of pre-European extent in protected areas (>10,000 ha).

Key Sites for Protection: A number of small patches are protected in reserves along the Murray with one large area protected in Yanga NP in 2005. Patches occur in Barmah, Millewa, other State Forests and private lands along the NSW/Victorian section of the Murray River and probably in the Great Cumbung Swamp on the Murrumbidgee River.

Degree of Fragmentation: Contiguous stands with high connectivity with >60% extent remaining and low edge to area ratio.

Recoverability: Moderate health as structure and/or composition altered. Likely to recover considerably if causal factors and secondary impacts removed.

Variation & Disturbance: This community occurs in low lying areas and its species composition is adapted to frequent flooding. The ecology of regeneration of River Red Gum is discussed on pp33-34 in Forestry Commission of NSW (1985) and Stefano (2002). After seed fall seedlings can establish where sufficient moisture is retained the soil after rain or floods. If flooding is reduced due to river regulation drought-like conditions will prevent tree recruitment. Extended flooding for over four months may kill small seedlings while taller ones may survive. Abundance of associate species varies depending on wetness of the site and the season. Roots of River Red Gum seedlings must penetrate below a poorly aerated gley layer to a aerated clay layer in the soil profile to ensure their successful establishment (Pressey et al. 1984).

Fire Regime: Rarely subject to fire due to flooding and low ground biomass. Crown fires are rare due to the height of the trees and a lack of shrubs. Intense or even medium-intese fires may kill River Red Gum trees by burning to the tree's cambium at the base of the trees. These fires will also kill seedlings. River Red Gum cannot recover by sprouting from lignotubers. Fires in River Red Gum forests of the Murray River region have been recorded in summers after a lack of winter floods. It is possible that Aborigines lightly patch burnt the forest floor prior to European settlement.

Adjoining Communites: Grades into other River Red Gum comunities such as ID5 and into Black Box (ID13) on higher ground and into wetland communities where water ponding persists. Grades into Western Grey Box woodland (ID237) and Yellow Box (ID74) on higher ground or sandy rises along rivers.

Threatening Processes: Although much of this tall forest has been logged and the structure has changed, clearing has been limited due to its occurrence on the innder floodplain near major rivers. The main threats are over-logging, changed flooding regimes due to climate change and/or irrigation, weed invasion and over-grazing. Substantial die back of River Red Gum has been documented from 2000 to 2007 (Cunningham et al. 2007) thus rendering a change in threat code from NT when assessed in 2001 to V in 2009 due to climate change and/or drought.

Threatening Process List: Age class of woody vegetation; Climate Change; Irrigated cropping (incl. horticulture); Firewood collection; Hydrology (disruption of natural flooding regimes); Forestry activities including logging; Nutrient changes through fertilizers or runoff; Salinity; Unsustainable grazing and trampling by stock; Weed (exotic) invasion.

Threat Category: Vulnerable. ***Threat/Protected Area Code:*** V/3a ***Threat Criteria:*** 3; 4; 5.

Planning Controls:

Planning and Management: Murray Valley Regional Environmental Plan requires consent for clearing, however this may be superceded by a new Murray CMA plan. The main issues are provision of adequate flooding regimes under COAG environmental flow agreements and limitations on logging. Many River Red Gum forests are showing signs of die back due to lack of flooding and droughts.

Listed Under Legislation: None.

Recovery Plan: Doesn't exist and not required.

Reference List: (308; 313; 11; 342; 195; 18; 13; 9; 327; 483). Benson, J.S. (1999-2009) Unpublished field note books recording species at various locations in western NSW. (Royal Botanic Gardens and Domain Trust: Sydney); Forestry Commission of NSW (1985) Management Plan for Murray Management Area. (Forestry Commission of NSW: Sydney); Margules & Partners (1990) River Murray Riparian Vegetation Study. (Murray-Darling Basin Commission: Canberra); NSW Department of Environment and Conservation (2005) New Area Investigation Report: Yanga. Unpublished Report (DEC: Dubbo); Pressey, R.L., Bell, F.C., Barker, J., Rundle, A.S. & Belcher, C.A. (1984) Bio-physical features of the Lachlan-Murrumbidgee Confluence, south-western New South Wales. (NSW National Parks and Wildlife Service: Sydney); Roberts, I. & Roberts, J. (2001) Plains Wanderer (Pedionmus torquatus) habitat mapping, including woody vegetation and other landscape features Riverina Plains NSW. Report to NSW National Parks and Wildlife Service (Earth Resources Analysis Pty. Ltd.); Scott, J.A. (1992) The natural vegetation of the Balranald - Swan Hill area. Cunninghamia 2(4): 597-652; Smith, P. & Smith J. Ecological Consultants (1990) Floristic Communities. In River Murray Riparian Vegetation Study. (Murray-Darling Basin Commission: Canberra); Stefano, J. (2002) River Red Gum (Eucalyptus camaldulensis): a review of ecosystem processes, seedling regeneration and silvicultural practice. Australian Forestry 65(1): 14-22; Cunningham, S.C., MacNally, R., White, M., Read, J., Baker, P.J. Thomson, J. & Griffioen, P. (2007) Mapping the current condition of River Red Gum (Eucalyptus camaldulensis Dehnh.) stands along the Victorian Murray River floodplain. Report to northern Vic.

NSW Vegetation Classification - Vegetation ID

Vegetation Community ID 5

Common Name: **River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South West Slopes Bioregion and the eastern Riverina Bioregion**

Scientific Name: *Eucalyptus camaldulensis subsp. camaldulensis / Acacia dealbata / Poa labillardierei var. labillardierei - Carex tereticaulis - Lachnagrostis filiformis-Hemarthria uncinata var. uncinata*

Veg. Comm. ID.: **5** ***Original Entry:*** John Benson 31/12/2005

Photo 1: ID5a_img027pc.jpg Eucalyptus camaldulensis-Poa labillardierei var. labillardierei forest, Millewa State Forest [AGD66 35°49'53.6"S 145°09'07.8"E], 10/4/02, Jaime Plaza.

Photo 2: ID5b_img006pc.jpg Eucalyptus camaldulensis grassy forest, Narrandera Nature Reserve, [AGD66 34°46'35.4"S 146°35'05.4"E], 9/4/02, Jaime Plaza.

Photo 3: ID5c_img305pc.jpg Eucalyptus camaldulensis/Acacia dealbata woodland, Billabong Creek near Walla Walla, [AGD66 35°44'30"S 146°54'38"E], 19/10/02, Jaime Plaza.

Characteristic Vegetation: (Quantitative Data)

Trees: *Eucalyptus camaldulensis subsp. camaldulensis.*

Shrubs/Vines/Epiphytes: *Acacia dealbata; Exocarpos strictus; Amyema miquelii.*

Ground Cover: *Poa labillardierei var. labillardierei; Lachnagrostis filiformis; Hemarthria uncinata var. uncinata; Carex tereticaulis; Juncus amabilis; Junsus falvidus; Cynodon dactylon; Carex appressa; Carex inversa; Eleocharis acuta; Eleocharis pusilla; Persicaria prostrata; Wahlenbergia fluminalis; Centipeda cunninghamii; Pratia concolor; Ranunculus undosus; Juncus subsecundus; Epilobium billardiereanum subsp. cinereum; Oxalis perennans; Verbena hispida; Austrodanthonia racemosa var. racemosa; Chamaecytisus palmensis; Dichondra repens; Elymus scaber var. scaber; Alternanthera denticulata; Pseudoraphis spinescens; Eleocharis acuta; Austrodanthonia caespitosa; Paspalidium jubiflorum; Pseudognaphalium luteo-album; Eclipta platyglossa.*

Weed Species: *Bromus hordeaceus; Cirsium vulgare; Vulpia bromoides; Verbena officinalis; Hypochaeris radicata; Lolium perenne; Lolium rigidum; Cyperus eragrostis; Trifolium subterraneum; Leontodon taraxacoides subsp. taraxacoides; Lythrum hyssopifolia; Carduus tenuiflorus; Chondrilla juncea; Paspalum distichum; Trifolium angustifolium; Trifolium campestre; Trifolium glomeratum; Solanum nigrum; Rumex crispus; Aster subulatus; Bromus diandrus; Vulpia myuros; Sonchus oleraceus; Pentaschistis airoides.*

Weediness: High (15-30%) with >30% cover.

Threatened Plants: Not assessed.

Threatened Fauna: Superb Parrot.

Mean Species Richness: 37±18 of which an average of 17 (47%) are exotic species (community 3 in Smith & Smith 1990 in 20x20 m plots).

Rainforest Structure (Webb): Not applicable.

Structure (WH): Open Forest.

Height Class (WH): Very Tall.

Vegetation Description: Very tall open forest dominated by River Red Gum (Eucalyptus camaldulensis subsp. camaldulensis) with trees averaging about 25 m high and a canopy cover of about 40%. The shrub layer is sparse or absent with Mountain Cedar Wattle (Acacia dealbata) sometimes present. The ground cover may be mid-dense or dense and is dominated by grass species such as snow grass Poa labillardieri, Blown Grass (Lachnagrostis filiformis) and Mat Grass (Hemarthria uncinata var. uncinata) along with sedges such as Carex tereticaulis, Carex inversa and Carex appressa and rushes such as Juncus amablis and Juncus subsecundus. Forb species include Ranunculus spp., Persicaria prostrata, Wahlenbergia fluminalis, Pratia concolor and Centipeda cunninghamii. Weed species may be common and include Bromus hordeaceus, Cirsium vulgare, Vulpia bromoides, Verbena officinalis, Hypochaeris radicata, Lolium perenne, Lolium rigidum and Cyperus eragrostis. Occurs on silty-sandy loam-clay soils on levees or other raised landform elements adjacent to rivers and wetlands. Mainly distributed along the Murray and Murrumbidgee Rivers with small areas on the Lachlan River in the temperate (hot summer) and semi-arid (warm) climate regions of south-western NSWand Victoria. Most common east of Deniliquin and replaced by other River Red Gum floristic types to the west of there. The main threats are dieback from extended drought and lack of flooding regimes due to reduced water flows and flooding, weed invasion and over-logging. Tree dieback from drought has increased since 2000.

Level of Classification: Association. ***Classification Confidence Level:*** Medium.

Formation Group: Eucalyptus Communities of Inland Watercourses and Inner Floodplains.

State Veg Map (Keith 2004): Inland Riverine Forests.

State Landscape (Mitchell 2002): Not Assessed.

NVIS Major Veg Sub-Groups: Eucalyptus forests with a grassy understorey.

Forest Type (RN 17): 199-River Red Gum (P).

Authority(s): (Quantitative Data). Includes communities 3 and 4 with species listed from Table 1.2 in the floristic plot survey along the Murray River by Smith & Smith (1990). Mapped along the Murray River as part of map unit 1 (Red Gum Forest) in Margules & Partners (1990) and possibly site quality 2 in state forest typing of the Murray River Red Gum forests. Note: that forest typing is about stand quality for forestry and does not necessarily strongly correlate particular floristic assemblages. Similar to community C2.1 in Bos & Lockwood (1996). Probably the River Red Gum forest in Wagga Shire in Friday (2004). On higher ground adjacent to river in the eastern sections of the Murray, Murrumbidgee and perhaps Lachlan Rivers. Extra species noted in Benson (1999-2009). Note: as of 2005, in NSW, only the Murray River and the Great Cumbung Swamp had been adequately plot sampled to detect floristic variation in River Red Gum communities. Future survey and mapping should attempt to map out or model RRG floristic communities.

Interstate Equivalent(s): Victoria: part of EVC 255 Riverine Grassy Woodland/Riverine Sedgy Forest but also similar to EVC641 Riparian Woodland in the Wimmera or EVC292 Red Gum Swamp.

Mapped/Modelled: Current extent and pre-European extent mapped or modelled as part of a broader complex. ***Plot Sampling:*** Adequate.

Mapping Info: It is difficult to map this association solely from aerial photos but it could be done with detailed ground checking. Mapped as part of Red Gum Forest unit in vegetation map of Margules & Partners (1990) for the Murray River.

Climate Zone: Temperate: no dry season (hot summer); Semi-arid: warm (winter rain).

IBRA Bioregion (v6): NSW South-western Slopes (30-70%); Riverina (30-70%).

IBRA Sub-Region: Lower Slopes (1-30%); Murray Fans (>70%); Murrumbidgee (1-30%); Lachlan Plains (1-30%); Lachlan (1-30%).

Botanical Division: South Western Plains (SWP) (>70%); South Western Slopes (SWS) (1-30%); Central Western Slopes (CWS) (1-30%).

Local Govt. Areas: Albury (1-30%); Berrigan (1-30%); Corowa (1-30%); Greater Hume (1-30%); Murray (30-70%); Murrumbidgee (1-30%); Narrandera (1-30%); Wagga Wagga (1-30%); Wakool (1-30%); Bland (1-30%); Carrathool (1-30%); Lockhart (1-30%).

CMAs: Murray (>70%); Murrumbidgee (1-30%); Lachlan (1-30%).

MD Basin: Yes.

Substrate Mass: Alluvium.

Lithology: Alluvial loams and clays; Silt.

Great Soil Group: Grey clay; Grey earth; Red-brown earth.

Soil Texture: Clayey sand; Loam; Sandy clay loam; Sandy loam.

Landform Patterns: Covered plain; Flood plain.

Landform Elements: Bank (streambank); Flood-out; Levee.

Land Use: Grazing; Timber Production.

Impacts of European Settlement: Major alteration of species composition; Minor reduction (<30%) in extent and/or range; Younger age class over most of distribution.

Pre-European Extent: 15000 ha ±50%. Expert estimate not based on any mapped vegetation.

Pre-European Extent Comments: Estimated from landscape position in relation to current extent.

Current Extent: 9000 ha ±50% or 60% ± 80% of pre-European extent remaining.

Current Extent Comments: (Estimated from a more broadly classified vegetation map). Estimated that about 7500 ha occurs along the Murray River in NSW. This has been estimated by attributing 50% of section 1, 45% of section 2, 5% of section 3 and 5% of section 4 of the structural map unit Red Gum Forest as mapped in Margules & Partners (1990) and by correlating the sampling plot frequency along the River of floristic communities 3 and 4 described in Smith & Smith (1990). Additional areas for the Murrumbidgee River have been estimated. Miles (2001) estimates that 60% of Riverine vegetation along the Murray River remains. Some areas have been cleared on private land for cropping and grazing. Tree dieback becoming more common due to reduced rainfall and flooding.

Conservation Reserves: Billabong FR 110 (E3); Moira Lakes FR 50 (E3); Narrandera FR 12 (E1); Narrandera NR 50 (E2); Snake Island FR 30 (E3); Toupna Creek FR 10 (E3); Wilbertroy FR 20 (E3).

Reserves Total Area: 282 ha. ***No. Representatives in Reserves:*** 7

Protected Area Explanation: Estimates of areas in conservation reserves along Murray River have been derived from descriptions in Forestry Commission (1989a) and by overlaying the distribution of the communities defined by Smith & Smith (1990) with the structural mapping by Margules & Partners (1990) and Murray River forests forest typing by State Forests of NSW. These need ground checking to distinguish RRG types. Sanddune Pine Flora Reserve from spitting figure in Margules & Partners (1990) with forest typing. Narrandera Nature Reserve estimate from NSW NPWS (1978) and Benson (1999-2009). Wilbertroy Flora Reserve from notes in Forestry Commission (1989a) and forest type map. The 2009/2010 NSW Government decision to protect areas of River Red Gum and associated vegetation types in reserves has not been taken into account in these protected area estimates.

Secure Property Agreements: None.

Secure PAs Total Area: 0 ha. ***No. Representatives in Secure Property Agreements:*** 0

Protected Current Extent: 3.13% 282 ha ± 30%. ***No. Representatives in Protected Areas:*** 7

Protected Pre-European Extent: 1.88% which is inadequately protected across distribution.

Common in 1750: Code 4a: 1-5% of pre-European extent in protected areas (>10,000 ha).

Key Sites for Protection: Sampled in a number of reserves but mostly as small samples. No large areas protected as of 2005. Key areas include Barmah, Millewa and other State Forests and private lands along the eastern section of the Murray River between Albury and Deniliquin. Probably also in Berry Jerry State Forest west of Wagga Wagga on Murrumbidgee River and near Narrandera along that River.

Degree of Fragmentation: Human induced fragmented stands with <60% >30% extent remaining and moderate edge to area ratio.

Recoverability: Poor health as structure and/or composition significantly altered. But sufficient biota remain for natural regeneration if causal factors and their secondary impacts removed and dynamic processes reinstated.

Variation & Disturbance: The ecology of River Red Gum regeneration is discussed on pp33-34 in Forestry Commission of NSW (1985) and Stefana (2002). After seed fall seedlings can establish where sufficient moisture is retained the soil after rain or floods. If flooding is reduced due to river regulation drought-like conditions will prevent tree recruitment. Extended flooding for over four months may kill small seedlings while taller ones may survive. Abundance of associate species varies depending on wetness of the site and the season. This community probably requires less regular flooding than ID2. Roots of River Red Gum seedlings must penetrate below a poorly aerated gley layer to a aerated clay layer in the soil profile to ensure their successful establishment (Pressey et al. 1984).

Fire Regime: Rarely subject to fire due to flooding and low ground biomass. Crown fires are rare due to the height of the trees and a lack of shrubs. Intense or even medium-intese fires may kill River Red Gum trees by burning to the tree's cambium at the base of the trees. These fires will also kill seedlings. River Red Gum cannot recover by sprouting from lignotubers. Fires in River Red Gum forests of the Murray River region have been recorded in summers after a lack of winter floods. It is possible that Aborigines lightly patch burnt the forest floor prior to European settlement.

Adjoining Communites: Grades into taller River Red Gum ID2 in frequently flooded sites, ID79 at higher elevations in the NSW South-western Slopes Bioregion and into Black Box (ID13) on the outer floodplain. Grades into Western Grey Box woodland (ID237) and Yellow Box (ID74) on higher ground along rivers and into (ID76) on adjoining alluvial plains. Grades into ID79 in the upper parts of the NSW South-western Slopes Bioregion.

Threatening Processes: Altered flooding regimes, inapproaprate logging, grazing and weed invasion. Substantial die back of River Red Gum has been documented from 2000 to 2007 (Cunningham et al. 2007) thus rendering a change in threat code from NT when assessed in 2001 to V in 2009 due to climate change and/or drought.

Threatening Process List: Age class of woody vegetation; Clearing for agriculture; Climate Change; Irrigated cropping (incl. horticulture); Firewood collection; Hydrology (disruption of natural flooding regimes); Forestry activities including logging; Nutrient changes through fertilizers or runoff; Salinity; Unsustainable grazing and trampling by stock; Weed (exotic) invasion.

Threat Category: Vulnerable. ***Threat/Protected Area Code:*** V/4a ***Threat Criteria:*** 3; 4; 5.

Planning Controls: Other

Planning and Management: Murray Valley Regional Environmental Plan requires consent for clearing. The main issues are provision of adequate flooding regimes under COAG environmental flow agreements and limitations on logging. Climate change and reduced rainfall and flooding are the long term threats. More representation in protected areas is warranted based on the 2008 protected area status. Weed control may be a priority for some sites. Very vulnerable along the Murrumbidgee River near Wagga Wagga.

Listed Under Legislation: None.

Recovery Plan: Doesn't exist and not required.

Reference List: (308; 177; 313; 24; 11; 246; 35; 18; 316; 9; 327; 483). Benson, J.S. (1999-2009) Unpublished field note books recording species at various locations in western NSW. (Royal Botanic Gardens and Domain Trust: Sydney); Bos, D. & Lockwood, M. (1996) Flora, fauna and other features of the south west slopes biogeographic region, NSW. Report No. 59, Johnson Centre of Parks, Recreation and Heritage. (Charles Sturt University: Albury); Forestry Commission of NSW (1985) Management Plan for Murray Management Area. (Forestry Commission of NSW: Sydney); Forestry Commission of NSW (1989a) Forest preservation in state forests of New South Wales. Research Note No. 47. (Forestry Commission of NSW: Sydney); Margules & Partners (1990) River Murray Riparian Vegetation Study. (Murray-Darling Basin Commission: Canberra); Miles, C. (2001) NSW Murray Catchment: biodiversity action plan. (Nature Conservation Working Group Inc.: Albury); NSW National Parks and Wildlife Service (1978a) Information sheet - Narrandera Nature Reserve. RN 36. John Brickhill. (NSW National Parks and Wildlife Service: Griffith); Pressey, R.L., Bell, F.C., Barker, J., Rundle, A.S. & Belcher, C.A. (1984) Bio-physical features of the Lachlan-Murrumbidgee Confluence, south-western New South Wales. (NSW National Parks and Wildlife Service: Sydney); Priday, S. (2004) The native vegetation and threatened species of the City of Wagga Wagga. Unpublished report. (NSW National Parks and Wildlife Service, Southern Region: Queanbeyan); Smith, P. & Smith J. Ecological Consultants (1990) Floristic Communities. In River Murray Riparian Vegetation Study. (Murray-Darling Basin Commission: Canberra); Stefano, J. (2002) River Red Gum (Eucalyptus camaldulensis): a review of ecosystem processes, seedling regeneration and silvicultural practice. Australian Forestry 65(1): 14-22; Cunningham, S.C., MacNally, R., White, M., Read, J., Baker, P.J. Thomson, J. & Griffioen, P. (2007) Mapping the current condition of River Red Gum (Eucalyptus camaldulensis Dehnh.) stands along the Victorian Murray River floodplain. Report to northern Vic.

NSW Vegetation Classification - Vegetation ID

Vegetation Community ID 7

Common Name: **River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion**

Scientific Name: *Eucalyptus camaldulensis subsp. camaldulensis / Paspalidium jubiflorum - Wahlenbergia fluminalis - Senecio quadridentatus - Carex tereticaulis*

Veg. Comm. ID.: **7** ***Original Entry:*** John Benson 31/12/2005

Photo 1: ID7a_img019pc.jpg Eucalyptus camaldulensis forest, Deniliquin, [AGD66 35°31'48.0"S 144°58'20.0"E], 10/4/02, Jaime Plaza.

Photo 2: ID7b_img020pc.jpg Eucalyptus camaldulensis forest, Deniliquin, [AGD66 35°31'48.0"S 144°58'20.0"E], 10/4/02, Jaime Plaza.

Photo 3: ID7c_Img373ps.jpg Eucalyptus camaldulensis with Carex tereticaulis and grasses as ground cover, Millewa State Forest (east of Mathoura) NSW, Millewa River Road, approx.2.3 km east of junction with Walthours Road, 9/11/1987, Peter Smith.

Characteristic Vegetation: (Quantitative Data)

Trees: *Eucalyptus camaldulensis subsp. camaldulensis.*

Shrubs/Vines/Epiphytes: *Acacia stenophylla; Amyema miquelii.*

Ground Cover: *Paspalidium jubiflorum; Wahlenbergia fluminalis; Senecio quadridentatus; Carex tereticaulis; Ranunculus inundatus; Carex appressa; Elymus scaber var. plurinervis; Lachnagrostis filiformis; Austrodanthonia duttoniana; Austrodanthonia caespitosa; Cynodon dactylon; Eleocharis acuta; Eleocharis pusilla; Carex inversa; Juncus amabilis; Juncus flavidus; Marsilea drummondii; Brachyscome basaltica var. gracilis; Pratia concolor; Picris squarrosa; Centipeda cunninghamii; Alopecurus geniculatus; Calostemma purpureum; Calotis scapigera; Ranunculus pumilio var. pumilio; Asperula conferta; Parietaria debilis; Craspedia variabilis; Haloragis heterophylla; Dichondra repens; Rumex brownii; Alternanthera denticulata; Eclipta platyglossa; Oxalis perennans; Einadia nutans subsp. nutans; Verbena gaudichaudii; Enteropogon acicularis; Senecio cunninghamii var. cunninghamii.*

Weed Species: *Hordeum leporinum; Cirsium vulgare; Bromus diandrus; Echium plantagineum; Centipeda cunninghamii; Hypochaeris glabra; Lolium perenne; Lolium rigidum; Medicago polymorpha; Phyla canescens; Pyla nodiflora; Vulpia muralis; Vulpia myuros; Xanthium occidentale; Sonchus asper subsp. glaucescens; Cyperus eragrostis; Trifolium subterraneum; Bromus hordeaceus; Trifolium glomeratum; Avena barbata; Lactuca serriola; Phyla canescens.*

Weediness: Very high (>30%) with 10-30% cover.

Threatened Plants: Not assessed.

Threatened Fauna: Regent Parrot.

Mean Species Richness: 31±14 of which average 14 (44%) were exotic spp. (community 6 in Smith & Smith 1990 in 20x20 m plots); 20±1 (Horner et al. 2002 in 20x20 m plots during drought).

Rainforest Structure (Webb): Not applicable.

Structure (WH): Open Forest.

Height Class (WH): Tall.

Vegetation Description: Tall open forest averaging dominated by River Red Gum (Eucalyptus camaldulensis subsp. camaldulensis) growing to an average of about 20 m high with a canopy cover of about 40%. Shrubs are generally absent but scattered River Cooba (Acacia stenophylla) may be present. The ground may contain much leaf litter but also a mid-dense herbaceous ground cover dominated by grasses and forbs. Grasses include Warrego Grass (Paspalidium jubiflorum), wheatgrass (Elymus scaber), Blown Grass (Lachnagrostis filiformis) and wallaby grasses (Austrodanthonia spp.). Forbs include Wahlenbergia fluminalis, Senecio quadridentatus, Ranunculus inundatus, Brachyscome basaltica var. gracilis, Pratia concolor, rumex brownii, Picris squarrosa and Centipeda cunninghamii. Sedges include Carex tereticaulis, Carex inversa, Eleocharis acuta and Eleocharis pusilla. Weeds may be common in places and include Hordeum leporinum, Cirsium vulgare, Bromus diandrus, Echium plantagineum, Hypochaeris glabra, Lolium perenne, Lolium rigidum, Medicago polymorpha, Vulpia muralis and Vulpia myuros. The floristic composition varies with changes in flooding. Occurs on alluvial brown or grey cracking clay soils or clay loams on the inner floodplains and lining channels including on levees of major river systems. Distributed from the lower slopes along the lower Lachlan and Murrumbidgee Rivers including in the Great Cumbung Swamp and the mid-west to western section of the Murray River in NSW (generally west of Deniliquin) mainly in the Riverina Bioregion. This is the dominant River Red Gum forest between Deniliquin and Swan Hill. The main threats to this community are altered flooding due to river controls and irrigation, over-logging and weed invasion. Tree dieback from drought has increased since 2000.

Level of Classification: Association. ***Classification Confidence Level:*** Medium.

Formation Group: Eucalyptus Communities of Inland Watercourses and Inner Floodplains.

State Veg Map (Keith 2004): Inland Riverine Forests.

State Landscape (Mitchell 2002): Not Assessed.

NVIS Major Veg Sub-Groups: Eucalyptus forests with a grassy understorey.

Forest Type (RN 17): 199 - River Red Gum (P).

Authority(s): (Quantitative Data). Includes communities 5 and 6 with species listed in Table 1.2 in the floristic plot survey of the Murray River by Smith & Smith (1990). Mapped along the Murray River as part of map unit 1 (Red Gum Forest) in Margules & Partners (1990). Probably typed as Red Gum quality types 2 and 3 in NSW State Forests typing along Murray River. Note: that forest typing is about stand quality for forestry and does not necessarily strongly correlate particular floristic assemblages. Probably map unit 5A in Pressey et al. (1984) in the Great Cumbung Swamp. Probably floristic group 19 being map unit 1 and part of map units 5 and 6 in Horner et al. (2002) for the Hay Plain region. Possibly floristic groups 30 and 31 in Lewer et al. (2003) along mid-Lachlan River. Note: as of 2005 only the Murray River and Great Cumbung Swamp had been adequately plot sampled to detect floristic variation in River Red Gum communities. Probably includes some of Biolandscape SouA75 in Priday (2006). Future survey and mapping should attempt to map out or model RRG floristic communities.

Interstate Equivalent(s): Victoria: part of EVC 106 Riverine Grassy Forest.

Mapped/Modelled: Current extent and pre-European extent mapped or modelled as part of a broader complex. ***Plot Sampling:*** Adequate.

Mapping Info: Difficult to separate out from similar River Red Gum communities without detailed ground checking. Mapped as part of River Red Gum Forest unit in vegetation map of Margules & Partners (1990). Mapped as map unit 5A in Pressey et al. (1994). Mapped as map unit 1 and part of map unit 5 in Horner et al. (2002) on the Hay Plain.

Climate Zone: Semi-arid: warm (winter rain).

IBRA Bioregion (v6): Riverina (>70%).

IBRA Sub-Region: Lachlan (1-30%); Murray Fans (>70%); Murrumbidgee (1-30%).

Botanical Division: South Far Western Plains (SFWP) (1-30%); South Western Plains (SWP) (30-70%).

Local Govt. Areas: Berrigan (1-30%); Hay (1-30%); Murray (30-70%); Murrumbidgee (1-30%); Wakool (30-70%).

CMAs: Lachlan (1-30%); Murray (>70%); Murrumbidgee (1-30%).

MD Basin: Yes.

Substrate Mass: Alluvium.

Lithology: Alluvial loams and clays.

Great Soil Group: Brown clay; Grey clay; Grey earth.

Soil Texture: Heavy clay; Medium heavy clay.

Landform Patterns: Covered plain; Flood plain; Meander plain.

Landform Elements: Bank (streambank); Channel bench; Levee.

Land Use: Grazing; Timber Production.

Impacts of European Settlement: Major alteration of species composition; Minor reduction (<30%) in extent and/or range; Younger age class over most of distribution.

Pre-European Extent: 100000 ha ±30%. Expert estimate not based on any mapped vegetation.

Pre-European Extent Comments: Little of this community has been cleared due to its occurrence on inner floodplains and along channels.

Current Extent: 85000 ha ±30% or 85% ± 50% of pre-European extent remaining.

Current Extent Comments: (Estimated from a more broadly classified vegetation map). Estimated that about 64000 ha occurs along Murray River in NSW. This has been estimated by attributing 5% of section 2, 70% along section 3 and 70% of section 4 of the Red Gum Forest structural map unit in Margules & Partners (1999) and by correlating the sampling plot frequency along the River of floristic communities 5 and 6 based on the distribution of plots in Smith & Smith (1990). About 4000 ha also mapped as map unit 5A by Pressey et al. (1984) in the Great Cumbung Swamp. Horner map about 16000 ha on a section of the Hay Plain including the Great Cumbung Swamp. Estimated other areas occur outside this mapping.

Conservation Reserves: Kalyarr NP 70 (M); Pollack FR 530 (E3); Sanddune Pine FR 20 (E3); Toupna Creek FR 30 (E3); Yanga NP 5000 (E3); Yanga SCA 30 (E4).

Reserves Total Area: 5680 ha. ***No. Representatives in Reserves:*** 6

Protected Area Explanation: Estimates or measurements of areas in conservation reserves along Murray River have been derived from descriptions in Forestry Commission (1989a) and by overlaying the distribution of the communities defined by Smith & Smith (1990) with the structural mapping by Margules & Partners (1990) and Murray River forests forest typing by State Forests of NSW. These need ground checking to distinguish RRG types. Pollack Flora Reserve probably mainly comprises ID7 based on distribution notes in Smith & Smith (1990) but this may be wrong. Kalyarr NP from map unit 1 in Horner et al. (2002). PA DE9906 from overlaying Roberts & Roberts (2001). Yanga NP estimate from splitting broad RRG mapped in Scott 1992 with notes of four types of RRG in NSWDEC (2005). The 2009/2010 NSW Government decision to protect areas of River Red Gum and associated vegetation types in reserves has not been taken into account in these protected area estimates.

Secure Property Agreements: DE9906 PA 25 (M).

Secure PAs Total Area: 25 ha. ***No. Representatives in Secure Property Agreements:*** 1

Protected Current Extent: 6.71% 5705 ha ± 30%. ***No. Representatives in Protected Areas:*** 7

Protected Pre-European Extent: 5.7% which is inadequately protected across distribution.

Common in 1750: Code 3a: 5-15% of pre-European extent in protected areas (>10,000 ha).

Key Sites for Protection: On the Murray River generally west of Deniliquin and in the Great Cumbung Swamp at the confluence of the Lachlan and Murrumbidgee Rivers near Hay. Yanga NP, purchased in 2005, samples a large area of this community.

Degree of Fragmentation: Contiguous stands with high connectivity with >60% extent remaining and low edge to area ratio.

Recoverability: Moderate health as structure and/or composition altered. Likely to recover considerably if causal factors and secondary impacts removed.

Variation & Disturbance: The ecology of River Red Gum regeneration is discussed on pp33-34 in Forestry Commission of NSW (1985) and Stefano (2002). After seed fall seedlings can establish where sufficient moisture is retained the soil after rain or floods. If flooding is reduced due to river regulation drought-like conditions will prevent tree recruitment. Extended flooding for over four months may kill small seedlings while taller ones may survive. Abundance of associate species varies depending on wetness of the site and the season. This community probably requires less regular flooding than ID2. Species composition varies with flooding regimes. The roots of River Red Gum seedlings must penetrate below a poorly aerated gley layer to a aerated clay layer in the soil profile to ensure their successful establishment (Pressey et al. 1984). Some areas devoid of ground cover and covered in leaf litter.

Fire Regime: Rarely subject to fire due to flooding and low ground biomass. Crown fires are rare due to the height of the trees and a lack of shrubs. Intense or even medium-intese fires may kill River Red Gum trees by burning to the tree's cambium at the base of the trees. These fires will also kill seedlings. River Red Gum cannot recover by sprouting from lignotubers. Fires in River Red Gum forests of the Murray River region have been recorded in summers after a lack of winter floods. It is possible that Aborigines lightly patch burnt the forest floor prior to European settlement.

Adjoining Communites: Grades into other types of River Red Gum open forests such as ID2 and ID5, Black Box woodland (ID13 or ID15) or Lignum (ID17).

Threatening Processes: Listed as Near Threatened in 2001 but now as Vulnerable due to irrigation and changed flooding regimes, drought, climate change and evidence of dieback in key tree species (Brett Lane & Associates 2004, Roberts 2007). Other threats include weed invasion and logging of old trees that is changing structure.

Threatening Process List: Climate Change; Hydrology (impoundment); Forestry activities including logging; Salinity; Unsustainable grazing and trampling by stock; Weed (exotic) invasion.

Threat Category: Vulnerable. ***Threat/Protected Area Code:*** V/3a ***Threat Criteria:*** 3; 4; 5.

Planning Controls: Other

Planning and Management: Maintain environmental flows to rivers to provide flooding to forest. Prevent over-cutting of forests. Limit grazing pressure. Localised weed control.

Listed Under Legislation: None.

Recovery Plan: Doesn't exist and not required.

Reference List: (313; 289; 293; 11; 342; 18; 247; 13; 9; 327; 356; 484; 485). Forestry Commission of NSW (1985) Management Plan for Murray Management Area. (Forestry Commission of NSW: Sydney); Horner, G., McNellie, M., Nott, T.A., Vanzella, B., Schliebs, M., Kordas, G.S., Turner, B. & Hudspith, T.J. (2002) Native vegetation map report series: No. 2 Dry Lake, Oxley, Hay, One Tree, Moggumbill & Gunbar 1:100 000 map sheets. (NSW Department of Infrastructure Planning and Natural Resources: Sydney); Lewer, S., Ismay, K., Grounds, S., Gibson, R., Harris, M., Armstrong, R., Deluca, S. & Ryan, C. (2003) Native vegetation map report Bogan Gate, Boona Mount, Condobolin, Dandaloo, Tottenham and Tullamore 1:100 000 map sheets. (NSW Department of Infrastructure, Planning and Natural Resources). Submitted to Cunninghamia; Margules & Partners (1990) River Murray Riparian Vegetation Study. (Murray-Darling Basin Commission: Canberra); NSW Department of Environment and Conservation (2005) New Area Investigation Report: Yanga. Unpublished Report (DEC: Dubbo); Pressey, R.L., Bell, F.C., Barker, J., Rundle, A.S. & Belcher, C.A. (1984) Bio-physical features of the Lachlan-Murrumbidgee Confluence, south-western New South Wales. (NSW National Parks and Wildlife Service: Sydney); Roberts, I. & Roberts, J. (2001) Plains Wanderer (Pedionmus torquatus) habitat mapping, including woody vegetation and other landscape features Riverina Plains NSW. Report to NSW National Parks and Wildlife Service (Earth Resources Analysis Pty. Ltd.); Scott, J.A. (1992) The natural vegetation of the Balranald - Swan Hill area. Cunninghamia 2(4): 597-652; Smith, P. & Smith J. Ecological Consultants (1990) Floristic Communities. In River Murray Riparian Vegetation Study. (Murray-Darling Basin Commission: Canberra); Stefano, J. (2002) River Red Gum (Eucalyptus camaldulensis): a review of ecosystem processes, seedling regeneration and silvicultural practice. Australian Forestry 65(1): 14-22; Priday, S. (in prep. 2006) The native vegetation of the New South Wales South Western Slopes Bioregion (Lachlan, Murrumbidgee and Murray Catchments). Unpublished report to DEC Southern Office Queanbeyan; Brett Lane & Associates Pty Ltd (2005) Survey of River Red Gum and Black Box health along the River Murray in New South Wales, Victoria and South Australia (Murray Darling Basin Commission: Canberra); Roberts, J. (2007) Condition of Murrumbigil Swamp. A report to the NSW Riverbank Program (Report JR 19/2007: Canberra).

NSW Vegetation Classification - Vegetation ID

Vegetation Community ID 9

Common Name: **River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion**

Scientific Name: *Eucalyptus camaldulensis subsp. camaldulensis / Austrodanthonia caespitosa - Juncus flavidus - Carex inversa*

Veg. Comm. ID.: **9** ***Original Entry:*** John Benson 31/12/2005

Photo 1: ID9a_Img375ps.jpg Eucalyptus camaldulensis-Danthonia caespitosa Woodland, Ulupna Island (north of Strathmerton), Victoria; November 1987, Peter Smith.

Characteristic Vegetation: (Quantitative Data)

Trees: *Eucalyptus camaldulensis subsp. camaldulensis.*

Shrubs/Vines/Epiphytes: *Amyema miquelii.*

Ground Cover: *Austrodanthonia caespitosa; Juncus flavidus; Carex inversa; Carex tereticaulis; Austrodanthonia duttoniana; Poa labillardierei var. labillardierei; Lachnagrostis filiformis; Cynodon dactylon; Wahlenbergia fluminalis; Dichondra repens; Rumex brownii; Einadia nutans subsp. nutans; Haloragis aspera; Oxalis perennans; Senecio cunninghamii var. cunninghamii.*

Weed Species: *Cirsium vulgare; Bromus diandrus; Cyperus eragrostis; Lolium perenne; Lolium rigidum; Hypochaeris radicata; Hypochaeris glabra; Trifolium campestre; Trifolium angustifolium; Trifolium glomeratum; Vulpia myuros; Bromus rubens; Sonchus oleraceus; Galium aparine.*

Weediness: Very high (>30%) with >30% cover.

Threatened Plants: Not assessed.

Threatened Fauna: Possibly Hairy Nosed Wombat (Tuppil State Forest 1980s evidence).

Mean Species Richness: 35±10 with average of 17 exotic species (50%) (floristic community 10 in Smith & Smith 1990 in 20x20 plots).

Rainforest Structure (Webb): Not applicable.

Structure (WH): Woodland.

Height Class (WH): Tall.

Vegetation Description: Tall woodland to about 18 m high dominated by River Red Gum (Eucalyptus camaldulensis subsp. camaldulensis) tall woodland. Shrub layer is generally absent. The ground cover may be mid-dense or sparse and is dominated by native grass species especially wallaby grasses such as Austrodanthonia caespitosa. Other grass species include snow grass (Poa labillardierei var. labillardierei), Blown Grass (Lachnagrostis filiformis) and Austrodanthonia duttoniana. The rush Juncus flavidus and sedge Carex inversa are common. Forb species include Wahlenbergia fluminalis, Dichondra repens, Rumex brownii and Oxalis perennans. Exotic weed species are very common include Bromus spp., Vulpia spp., Lolium spp., Trifolium spp., Cirsium vulgare, Hypochaeris radicata, Hypochaeris glabra and Sonchus oleraceous. Occurs on grey and brown clay and loam soils on higher ground on the edge of the River Red Gum zone on floodplains of the Murray, Murrumbidgee and Lachlan Rivers in the lower slopes sub-region of the NSW South Western Slopes but mainly in the Riverina Bioregion extending to Victoria. Large areas have been cleared because this community abuts agricultural areas. Altered flooding regimes, extended drought and dieback threaten the long term survival of some areas of this community. Tree dieback from drought has increased since 2000.

Level of Classification: Association.

Classification Confidence Level: Medium.

Formation Group: Eucalyptus Communities of Inland Watercourses and Inner Floodplains.

State Veg Map (Keith 2004): *Inland Riverine Forests.*

State Landscape (Mitchell 2002): *Not Assessed.*

NVIS Major Veg Sub-Groups: *Eucalyptus woodlands with a grassy understorey.*

Forest Type (RN 17): *199 - River Red Gum (P).*

Authority(s): (Quantitative Data). Includes floristic community 10 and probably some of the highly disturbed floristic community 13 with species listed from Table 1.2 in the floristic plot survey of the Murray River by Smith & Smith (1990). Part of map unit 2 (Red Gum Woodland) in the structural mapping of Margules & Partners (1990). Probably Red Gum quality 3 in forest typing by State forests of NSW of the Murray River Red Gum forest. Note: that forest typing is about stand quality for forestry and does not necessarily strongly correlate particular floristic assemblages. Similar to community C2.2 in Bos & Lockwood (1996). Occurs on the outer edge of the River Red Gum zone on higher ground. Note: as of 2005 only the Murray River and Great Cumbung Swamp had been adequately plot sampled to detect floristic variation in River Red Gum communities. Future survey and mapping should attempt to map out or model the RRG floristic communities.

Interstate Equivalent(s): Victoria: part of EVC 255 Riverine Grassy Woodland/Riverine Sedgy Forest.

Mapped/Modelled: Current extent and pre-European extent mapped or modelled as part of a broader complex. ***Ground Sampling:*** Inadequate.

Mapping Info: Lower canopy height, woodland crown cover and position on the edge of the floorplain makes it possible to map out this type. Mapped as part of Red Gum Woodland map unit in the structrual vegetation map of the Murray River by Margules & Partners (1990).

Climate Zone: Temperate: no dry season (hot summer); Semi-arid: warm (winter rain).

IBRA Bioregion (v6): NSW South-western Slopes (1-30%); Riverina (>70%).

IBRA Sub-Region: Lower Slopes (1-30%); Murray Fans (>70%); Murrumbidgee (1-30%); Lachlan (1-30%); Lachlan Plains (1-30%).

Botanical Division: South Far Western Plains (SFWP) (1-30%); South Western Plains (SWP) (>70%); South Western Slopes (SWS) (1-30%); Central Western Slopes (CWS) (1-30%).

Local Govt. Areas: Berrigan (1-30%); Murray (30-70%); Murrumbidgee (1-30%); Narrandera (1-30%); Wakool (1-30%); Wagga Wagga (1-30%); Lockhart (1-30%); Bland (1-30%); Carrathool (1-30%).

CMAs: Murray (>70%); Murrumbidgee (1-30%); Lachlan (1-30%).

MD Basin: Yes.

Substrate Mass: Alluvium.

Lithology: Alluvial loams and clays; Clay.

Great Soil Group: Brown clay; Grey clay; Grey earth.

Soil Texture: Clay loam; Clay loam, sandy; Heavy clay; Medium clay; Silty clay loam.

Landform Patterns: Covered plain; Flood plain.

Landform Elements: Flood-out; Levee; Plain; Scroll plain.

Land Use: Grazing; Timber Production.

Impacts of European Settlement: Major alteration of species composition; Minor reduction (<30%) in extent and/or range; Younger age class over most of distribution.

Pre-European Extent: 35000 ha ±30%. Expert estimate not based on any mapped vegetation.

Pre-European Extent Comments: Estimated from the vegetation mapping of outer floodplain red gum along the Murray River by Margules & Partners (1990) with estimates for additional areas elsewhere.

Current Extent: 12000 ha ±30% or 34% ± 50% of pre-European extent remaining.

Current Extent Comments: (Estimated from a more broadly classified vegetation map). Estimated that about 10000 ha occurs along Murray River in NSW. This has been estimated by attributing 100% of section 2, 100% of section 3 and 50% of section 4 of the Red Gum Woodland structural map unit in Margules & Partners (1990) based on distribution of community 10 described by Smith & Smith (1990). Also, part of disturbed outer floodplain floristic community 13 described in Smith & Smith (1990) and part of the Red Gum Forest structural map unit in Margules & Partners (1990). Also, occurs along Murrumbidgee and Lachlan Rivers. Large areas have been cleared because this community occurs on the edge of the River Red Gum zone on the floodplain.

Conservation Reserves: Billabong FR 117 (E3); Moira Lakes FR 30 (E3); Yanga NP 2000 (E3); Yanga SCA 30 (E4).

Reserves Total Area: 2177 ha. ***No. Representatives in Reserves:*** 4

Protected Area Explanation: Estimates of areas in conservation reserves along Murray River have been derived from descriptions in Forestry Commission (1989a) and by overlaying the distribution of the communities defined by Smith & Smith (1990) with the structural mapping by Margules & Partners (1990) and Murray River forests forest typing by State Forests of NSW. These need ground checking to distinguish RRG types. Yanga NP estimate from splitting broad RRG mapped in Scott 1992 with notes of four types of RRG in NSWDEC (2005). The 2009/2010 NSW Government decision to protect areas of River Red Gum and associated vegetation types in reserves has not been taken into account in these protected area estimates.

Secure Property Agreements: None.

Secure PAs Total Area: 0 ha. ***No. Representatives in Secure Property Agreements:*** 0

Protected Current Extent: 18.14% 2177 ha ± 30%. ***No. Representatives in Protected Areas:*** 4

Protected Pre-European Extent: 6.22% which is inadequately protected across distribution.

Common in 1750: Code 3a: 5-15% of pre-European extent in protected areas (>10,000 ha).

Key Sites for Protection: Higher floodplains along the Murray and Murrumbidgee Rivers.

Degree of Fragmentation: Human induced fragmented stands with <60% >30% extent remaining and moderate edge to area ratio.

Recoverability: Poor health as structure and/or composition significantly altered. But sufficient biota remain for natural regeneration if causal factors and their secondary impacts removed and dynamic processes reinstated.

Variation & Disturbance: The ecology of River Red Gum regeneration is discussed on pp33-34 in Forestry Commission of NSW (1985) and Stefano (2002). After seed fall seedlings can establish where sufficient moisture is retained the soil after rain or floods. If flooding is reduced due to river regulation drought-like conditions will prevent tree recruitment. Extended flooding for over four months may kill small seedlings while taller ones may survive. This community is less regularly flooded than IDs 2, 5 or 7. Abundance of associate species varies depending on wetness of the site and the season. Roots of River Red Gum seedlings must penetrate below a poorly aerated gley layer to a aerated clay layer in the soil profile to ensure their successful establishment (Pressey et al. 1984).

Fire Regime: Rarely subject to fire due to flooding and low ground biomass. Crown fires are rare due to the height of the trees and a lack of shrubs. Intense or even medium-intese fires may kill River Red Gum trees by burning to the tree's cambium at the base of the trees.

These fires will also kill seedlings. River Red Gum cannot recover by sprouting from lignotubers. Fires in River Red Gum forests of the Murray River region have been recorded in summers after a lack of winter floods. It is possible that Aborigines lightly patch burnt the forest floor prior to European settlement.

Adjoining Communites: Grades into Black Box (ID13, ID15) higher on the floodplain and into various River Red Gum forests (ID2, 5, 7) on lower levels on the inner River Red Gum zone. Grades tinot ID79 in the upper slopes sub-region at higher altitudes to the east.

Threatening Processes: Large areas have been cleared because this community occurs on higher ground more distant from main river channels. Logging has lead to a younger age class. Change flooding regime due to water extraction and weirs that may threatened regeneration of River Red Gums in this outer zone. Ground cover is dominated by herbaceous weeds in many places. Listed as Vulnerable in 2001 but now as Endangered due to irrigation and changed flooding regimes, drought, climate change and evidence of dieback in key tree species (Cunningham et al. 2007, Brett Lane & Associates 2004).

Threatening Process List: Age class of woody vegetation; Clearing for agriculture; Climate Change; Dryland cropping; Irrigated cropping (incl. horticulture); Firewood collection; Hydrology (disruption of natural flooding regimes); Forestry activities including logging; Salinity; Soil erosion, water: sheet erosion; Unsustainable grazing and trampling by stock; Weed (exotic) invasion.

Threat Category: Endangered. ***Threat/Protected Area Code:*** E/3a ***Threat Criteria:*** 3; 4; 5.

Planning Controls: Other

Planning and Management: Requires protection from clearing under Murray and Murrumbidgee catchment plans and better representation in protected areas. Areas under Murray Valley Regional Environmental Plan require consent for clearing. Weeds are a problem in some areas. Fencing off some areas would be benefilial to protect them from stock grazing. Lack of flooding or rainfall is a major long term threat to the trees in this community.

Listed Under Legislation: None.

Recovery Plan: Doesn't exist and not required.

Reference List: (177; 313; 24; 11; 342; 18; 13; 9; 327; 483; 484). Bos, D. & Lockwood, M. (1996) Flora, fauna and other features of the south west slopes biogeographic region, NSW. Report No. 59, Johnson Centre of Parks, Recreation and Heritage. (Charles Sturt University: Albury); Forestry Commission of NSW (1985) Management Plan for Murray Management Area. (Forestry Commission of NSW: Sydney); Forestry Commission of NSW (1989b) Forest preservation in state forests of New South Wales. Research Note No. 47. (Forestry Commission of NSW: Sydney); Margules & Partners (1990) River Murray Riparian Vegetation Study. (Murray-Darling Basin Commission: Canberra); NSW Department of Environment and Conservation (2005) New Area Investigation Report: Yanga. Unpublished Report (DEC: Dubbo); Pressey, R.L., Bell, F.C., Barker, J., Rundle, A.S. & Belcher, C.A. (1984) Bio-physical features of the Lachlan-Murrumbidgee Confluence, south-western New South Wales. (NSW National Parks and Wildlife Service: Sydney); Scott, J.A. (1992) The natural vegetation of the Balranald - Swan Hill area. Cunninghamia 2(4): 597-652; Smith, P. & Smith J. Ecological Consultants (1990) Floristic Communities. In River Murray Riparian Vegetation Study. (Murray-Darling Basin Commission: Canberra); Stefano, J. (2002) River Red Gum (Eucalyptus camaldulensis): a review of ecosystem processes, seedling regeneration and silvicultural practice. Australian Forestry 65(1): 14-22; Cunningham, S.C., MacNally, R., White, M., Read, J., Baker, P.J. Thomson, J. & Griffioen, P. (2007) Mapping the current condition of River Red Gum (Eucalyptus camaldulensis Dehnh.) stands along the Victorian Murray River floodplain. Report to northern Vic; Brett Lane & Associates Pty Ltd (2005) Survey of River Red Gum and Black Box health along the River Murray in New South Wales, Victoria and South Australia (Murray Darling Basin Commission: Canberra).

NSW Vegetation Classification - Vegetation ID

Vegetation Community ID 10

Common Name: **River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina and Murray Darling Depression Bioregions)**

Scientific Name: *Eucalyptus camaldulensis subsp. camaldulensis - Eucalyptus largiflorens / Muehlenbeckia florulenta / Cyperus exaltatus - Paspalidium jubiflorum - Oxalis perennans*

Veg. Comm. ID.: **10** ***Original Entry:*** John Benson 31/12/2005

Photo 1: ID10a_benson.jpg Eucalyptus camaldulensis-Eucalyptus largiflorens-Muehlenbeckia florulenta woodland, near the Wakool River, [AGD66 35°29'53.3"S 144°27'14.0"E], 11/4/02, J.S. Benson.

Characteristic Vegetation: (Combination of Quantitative Data and Qualitative Estimate)

Trees: *Eucalyptus camaldulensis subsp. camaldulensis; Eucalyptus largiflorens.*

Shrubs/Vines/Epiphytes: *Muehlenbeckia florulenta; Chenopodium nitrariaceum; Acacia salicina; Acacia stenophylla; Exocarpos strictus; Rhagodia spinescens; Sclerolaena muricata.*

Ground Cover: *Paspalidium jubiflorum; Einadia nutans subsp. nutans; Cynodon dactylon; Austrodanthonia caespitosa; Wahlenbergia fluminalis; Cyperus exaltatus; Enteropogon acicularis; Chloris truncata; Eclipta platyglossa; Lachnagrostis filiformis; Vittadinia dissecta; Brachyscome basaltica var. gracilis; Sclerolaena brachyptera; Boerhavia dominii; Oxalis perennans; Chamaesyce drummondii; Atriplex spinibractea; Sida corrugata; Sida trichopoda; Austrostipa scabra subsp. scabra; Austrostipa nodosa; Carex inversa.*

Weed Species: *Sonchus oleraceus; Hypochaeris glabra; Bromus rubens; Vulpia myuros; Lolium perenne; Lolium rigidum; Cirsium vulgare; Lactuca serriola; Phyla canescens; Hordeum marinum; Hordeum leporinum; Medicago polymorpha; Lycium ferocissimum.*

Weediness: High (15-30%) with 10-30% cover.

Threatened Plants: Not assessed.

Threatened Fauna: Not assessed.

Mean Species Richness: 25±12 native spp. with an average of 9 exotic spp. (community 11 in Smith & Smith 1990 in 20x20 m plots); 33±6 (floristic group 33 in Lewer et al. 2002 in 20x20 m plots).

Rainforest Structure (Webb): Not appliable.

Structure (WH): Woodland.

Height Class (WH): Mid-High; Tall.

Vegetation Description: Tall to mid-high woodland averaging about 18 m high composed of a mixture of River Red Gum (Eucalyptus camaldulensis) and Black Box (Eucalyptus largiflorens) occurring at the junction of River Red Gum and Black Box zones on the floodplains of major inland rivers. The understorey may contain dense to very sparse stands of Lignum (Muehlenbeckia florulenta) and River Cooba (Acacia stenophylla) with the occasional Exocarpos strictus. The ground layer is sparse and includes grass species such as Paspalidium jubiflorum, Enteropogon acicularis, Cynodon dactylon, Austrodanthonia caespitosa and Austrostipa nodosa; forb species such as Sida corrugata, Oxalis perennans, Wahlenbergia fluminalis and Cyperus exaltatus. Weeds may be common and they include Hordeum spp., Lolium spp. Vulpia spp., Sonchus oleraceus, Medicago polymorpha and Phyla canescens. May form an "ecotonal" community between Black Box and River Red Gum zones. This community occurs on grey to brown loam to medium clays in drainage depressions, swamps and backplains on alluvial plains and floodplains of rivers in the 450-250 mm annual rainfall zone. Occurs west of the western edge of the southern wheatbelt in NSW to the western section of the Riverine Plain Bioregion and in the Murray-Darling Depression Bioregion in south-western NSW extending into Victoria and perhaps South Australia. Significant areas in this community's eastern range have been cleared but some large remnants occur in the more inland, drier regions. Extended drought and dieback is a major threat. Tree dieback from drought has increased since 2000.

Level of Classification: Association.

Classification Confidence Level: Medium.

Formation Group: Eucalyptus Communities of Inland Watercourses and Inner Floodplains.

State Veg Map (Keith 2004): *Inland Riverine Forests.*

State Landscape (Mitchell 2002): *Not Assessed.*

NVIS Major Veg Sub-Groups: *Eucalyptus woodlands with a shrubby understorey.*

Forest Type (RN 17): *200 - River Red Gum-Black Box/Coolabah (P).*

Authority(s): (Combination of Expert Opinion and Quantitative Data). Includes community 11 in the floristic plot survey of the Murray River by Smith & Smith (1990) and most of the structural map unit 3 (Red Gum/Box forest and woodland) in Margules & Partners (1990) along the mid-NSW sections of the Murray River. Probably part of quality 3 River Red Gum type in the forest typing of State Forests of NSW. Probably most of map unit 5 in Horner et al. (2002). Note: that forest typing is about stand quality for forestry and does not necessarily strongly correlate particular floristic assemblages. Mapped as a complex in Porteners (1993) and Scott (1992). Eardley (1999) recognises this community for the Riverina Bioregion. Includes the RRG-BB floristic group 33 being part of map units FLP 1 & 3 in Lewer et al. (2003). Possibly minor part of map unit 3 in Horner et al. (2002). Includes BVT 10 in DEC (2006a). Could be interpreted as being an ecotonal community situated between River Red Gum forest and Black Box woodland. Note: as of 2005 only the Murray River had been properly plot sampled to detect floristic variation in River Red Gum communities. Future survey and mapping should attempt to map out or model RRG floristic communities.

Interstate Equivalent(s): Victoria: part of EVC 255 Riverine Grassy Woodland/Riverine Sedgy Forest and/or EVC 106 Riverine Grassy Forest; or EVC 823 Lignum Swampy Woodland.

Mapped/Modelled: Current extent mapped. ***Plot Sampling:*** Inadequate.

Mapping Info: Mixed tree community but mappable with ground checking. Mapped as mosaics by Scott (1992), Porteners (1993) and Eardley (1999). Described by Smith & Smith (1990). Current extent derived Margules & Partners (1990) map group 3 along Murray with estimates for other places.

Climate Zone: Semi-arid: warm (winter rain).

IBRA Bioregion (v6): Murray-Darling Depression (1-30%); Riverina (>70%).

IBRA Sub-Region: Lachlan (1-30%); Murray Fans (>70%); Murrumbidgee (1-30%).

Botanical Division: South Far Western Plains (SFWP) (1-30%); South Western Plains (SWP) (>70%).

Local Govt. Areas: Balranald (30-70%); Murray (30-70%); Murrumbidgee (1-30%); Wakool (30-70%); Urana (1-30%).

CMAs: Lachlan (1-30%); Murray (30-70%); Murrumbidgee (1-30%).

MD Basin: Yes.

Substrate Mass: Alluvium.

Lithology: Alluvial loams and clays.

Great Soil Group: Alluvial soil; Grey clay; Grey earth.

Soil Texture: Clay loam; Medium clay; Medium heavy clay.

Landform Patterns: Alluvial plain; Flood plain; Meander plain.

Landform Elements: Backplain; Drainage depression; Ox-bow; Swamp.

Land Use: Cropping and Horticulture; Grazing.

Impacts of European Settlement: Dieback due to disease or senescence; Major alteration of species composition; Medium reduction (30-70%) in extent and/or range; Older age class over most of distribution.

Pre-European Extent: 70000 ha ±30%. Expert estimate not based on any mapped vegetation.

Pre-European Extent Comments: Estimate based on Miles (2000) who estimates that about 60% of the broad Riverine vegetation type in the Murray catchment has been cleared.

Current Extent: 40000 ha ±30% or 57% ± 60% of pre-European extent remaining.

Current Extent Comments: (Estimated from mapped extant vegetation: part range). About 15000 ha is estimated to occur along the Murray River floodplain being about 75% of the Red Gum/Box Forest/woodland map unit 3 in Margules & Partners (1990). By dividing the number of floristic groups that are combined into map units FLP1 and FLP3 it is estimated that 11000 ha occurs in the Lachlan River mapped by Lewer et al. (2003). Other areas occur outside mapped areas. This community has been more cleared than the riverine River Red Gum forests on the inner floodplains because it occurs on higher ground on the edge of the floodplain where grazing and cropping are more widespread.

Conservation Reserves: Kalyarr NP 30 (E1); Kemendok NR 64 (M); Peacock Creek FR 30 (E3); Yanga NP 400 (E3); Yanga SCA 300 (E3).

Reserves Total Area: 824 ha. ***No. Representatives in Reserves:*** 5

Protected Area Explanation: Kemendok NR from Margules & Partners (1990). Peacock Creek FR estimated from Smith & Smith (1990). Kalyarr NP estimated from description of map unit 5 in Horner et al. (2002). HA9904 estimated from Scott (1992). Yanga NP and SCA based on RRG-Black Box mosaiic in Scott (1992). The 2009/2010 NSW Government decision to protect areas of River Red Gum and associated vegetation types in reserves has not been taken into account in these protected area estimates.

Secure Property Agreements: HA9904 PA 8 (M).

Secure PAs Total Area: 8 ha. ***No. Representatives in Secure Property Agreements:*** 1

Protected Current Extent: 2.08% 832 ha ± 30%. ***No. Representatives in Protected Areas:*** 6

Protected Pre-European Extent: 1.18% which is inadequately protected across distribution.

Common in 1750: Code 4a: 1-5% of pre-European extent in protected areas (>10,000 ha).

Key Sites for Protection: Requires checking but south-western sections of the Murray, Murrumbidgee and Darling River floodplains.

Degree of Fragmentation: Human induced fragmented stands with <60% >30% extent remaining and moderate edge to area ratio.

Recoverability: Poor health as structure and/or composition significantly altered. But sufficient biota remain for natural regeneration if causal factors and their secondary impacts removed and dynamic processes reinstated.

Variation & Disturbance: The ecology of River Red Gum is discussed on pp33-34 in Forestry Commission of NSW (1985) and Stefano (2002). After seed fall seedlings can establish where sufficient moisture is retained the soil after rain or floods. If flooding is reduced due to river regulation drought-like conditions will prevent tree recruitment. Extended flooding for over four months may kill small seedlings while taller ones may survive. Abundance of associate species varies depending on wetness of the site and the season. This community is ecotonal and can alter in its dominant Eucalyptus species depending on long term flooding regimes.

Fire Regime: Rarely subject to fire due to flooding and low ground biomass. Crown fires are rare due to the height of the trees and a lack of shrubs. Intense or even medium-intese fires may kill River Red Gum trees by burning to the tree's cambium at the base of the trees. These fires will also kill seedlings. River Red Gum cannot recover by sprouting from lignotubers. Fires in River Red Gum forests of the

Murray River region have been recorded in summers after a lack of winter floods. It is possible that Aborigines lightly patch burnt the forest floor prior to European settlement.

Adjoining Communites: Grades into various River Red Gum communities near rivers and on lower parts of the floodplain (IDs 2, 7, 8 and 9) and into Black Box (ID13 or ID15) further out on the floodplain. In some locations may grade into mallee or chenopod shrubland.

Threatening Processes: Lack of regeneration due to altered flooding regimes and overgrazing of seedlings by stock combined with weed invasion and increased clearing for cultivation of crops such as rice. Many areas also susceptible to salinity. Listed as Near Threatened in 2001 but now as Vulnerable due to irrigation and changed flooding regimes, drought, climate change and evidence of dieback in key tree species (Brett Lane & Associates 2004, Cunningham et al. 2007).

Threatening Process List: Age class of woody vegetation; Clearing for agriculture; Dryland cropping; Irrigated cropping (incl. horticulture);Hydrology (drainage); Salinity; Unsustainable grazing and trampling by stock; Weed (exotic) invasion.

Threat Category: Vulnerable. ***Threat/Protected Area Code:*** V/4a ***Threat Criteria:*** 4.

Planning Controls: Other

Planning and Management: Control clearing in various catchment plans including Murray, Lower Murray-Darling and Murrumbidgee. Environmental flows and flooding regimes are vital to the long term survival of this community.

Listed Under Legislation: None.

Recovery Plan: Doesn't exist and not required.

Reference List: (313; 12; 289; 293; 165; 14; 13; 9; 327; 146; 373; 484; 483). Forestry Commission of NSW (1985) Management Plan for Murray Management Area. (Forestry Commission of NSW: Sydney); Fox, M.D. (1991) The natural vegetation of the Ana Branch - Mildura 1:250 000 map sheet (New South Wales). Cunninghamia 2(3): 443-494; Horner, G., McNellie, M., Nott, T.A., Vanzella, B., Schliebs, M., Kordas, G.S., Turner, B. & Hudspith, T.J. (2002) Native vegetation map report series: No. 2 Dry Lake, Oxley, Hay, One Tree, Moggumbill & Gunbar 1:100 000 map sheets. (NSW Department of Infrastructure Planning and Natural Resources: Sydney); Lewer, S., Ismay, K., Grounds, S., Gibson, R., Harris, M., Armstrong, R., Deluca, S. & Ryan, C. (2003) Native vegetation map report Bogan Gate, Boona Mount, Condobolin, Dandaloo, Tottenham and Tullamore 1:100 000 map sheets. (NSW Department of Infrastructure, Planning and Natural Resources). Submitted to Cunninghamia; Miles, C. (2000) Classification and mapping of broad vegetation types (BVTs) for the NSW Murray Catchment. Unpublished. (Murray Catchment Trust: Albury); Porteners, M.F. (1993) The natural vegetation of the Hay Plain: Booligal-Hay and Deniliquin-Bendigo 1:250 000 maps. Cunninghamia 3(1) 1-122; Scott, J.A. (1992) The natural vegetation of the Balranald - Swan Hill area. Cunninghamia 2(4): 597-652; Smith, P. & Smith J. Ecological Consultants (1990) Floristic Communities. In River Murray Riparian Vegetation Study. (Murray-Darling Basin Commission: Canberra); Stefano, J. (2002) River Red Gum (Eucalyptus camaldulensis): a review of ecosystem processes, seedling regeneration and silvicultural practice. Australian Forestry 65(1): 14-22; Western Riverina Regional Vegetation Committee (2001) Draft Western Riverina Regional Vegetation Management Plan. (Western Riverina RVC: Deniliquin); DEC (2006a) Reconstructed and extant distribution of native vegetation in the Lachlan Catchment. Unpublished report (NSW Department of Environment and Conservation: Dubbo); Brett Lane & Associates Pty Ltd (2005) Survey of River Red Gum and Black Box health along the River Murray in New South Wales, Victoria and South Australia (Murray Darling Basin Commission: Canberra); Cunningham, S.C., MacNally, R., White, M., Read, J., Baker, P.J. Thomson, J. & Griffioen, P. (2007) Mapping the current condition of River Red Gum (Eucalyptus camaldulensis Dehnh.) stands along the Victorian Murray River floodplain. Report to northern Vic.

NSW Vegetation Classification - Vegetation ID

Vegetation Community ID 11

Common Name: **River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina and Murray Darling Depression Bioregions)**

Scientific Name: *Eucalyptus camaldulensis subsp. camaldulensis / Acacia stenophylla - Muehlenbeckia florulenta / Paspalidium jubiflorum - Cyperus gymnocaulos - Einadia nutans subsp. nutans*

Veg. Comm. ID.: **11** ***Original Entry:*** John Benson 31/12/2005

Photo 1: ID11a_Img065pc.jpg Eucalyptus camaldulensis-Muehlenbeckia florulenta woodland, Kemendok Nature Reserve, [AGD66 34°31'36.4"S 142°24'08.3"E], 13/4/02, Jaime Plaza.

Photo 2: ID11b_Img176pc.jpg Eucalyptus camaldulensis, Darling River, Wilcannia, [AGD66 31°33'40.8"S 143°23'02.2"E], 25/10/01, Jaime Plaza.

Characteristic Vegetation: (Combination of Quantitative Data and Qualitative Estimate)

Trees: *Eucalyptus camaldulensis subsp. camaldulensis.*

Shrubs/Vines/Epiphytes: *Muehlenbeckia florulenta; Acacia stenophylla; Chenopodium nitrariaceum; Senecio cunninghamii var. cunninghamii; Enchylaena tomentosa.*

Ground Cover: *Paspalidium jubiflorum; Cyperus gymnocaulos; Einadia nutans subsp. nutans; Wahlenbergia fluminalis; Pratia concolor; Alternanthera denticulata; Chenopodium pumilio; Brachyscome basaltica var. gracilis; Eclipta platyglossa; Sonchus hydrophilus; Picris squarrosa; Senecio quadridentatus; Asperula gemella; Euchiton sphaericus; Minuria integerrima; Rorippa laciniata; Centipeda minima var. minima; Marsilea drummondii; Rumex tenax; Damasonium minus; Cyperus bifax; Ranunculus undosus; Glinus lotoides; Ludwigia peploides subsp. montevidensis; Poa fordeana; Euphorbia stevenii; Vittadinia dissecta; Vittadinia cuneata; Senecio pinnatifolius; Austrostipa scabra subsp. falcata.*

Weed Species: *Echium plantagineum; Xanthium occidentale; Lolium perenne; Sisymbrium irio; Malva parviflora; Heliotropium europaeum; Verbena officinalis; Phyla canescens; Pyla nodiflora; Hordeum leporinum; Rapistrum rugosum; Reichardia tingitana; Bromus rubens; Hypochaeris glabra.*

Weediness: High (15-30%) with 10-30% cover.

Threatened Plants: Not assessed.

Threatened Fauna: Regent Parrot.

Mean Species Richness: 27±10 spp. with an average of 10 exotic spp. (Smith & Smith 1990 in 20x20 m plots); 29±2 (floristic group 18 in Horner et al. 2003 in 20x20 m plots).

Rainforest Structure (Webb): Not applicable.

Structure (WH): Open Forest; Woodland.

Height Class (WH): Tall; Very Tall.

Vegetation Description: Tall open forest or woodland with trees to about 20 m high, dominated by River Red Gum (Eucalyptus camaldulensis) to 20 m high with patches of River Cooba (Acacia stenophylla), Lignum (Muehlenbeckia florulenta) and Nitre Goosefoot (Chenopodium nitrariaceum) as a shrub understorey. Black Box (Eucalyptus largiflorens) is sometimes present. Ground cover is usually mid-dense or sparse and is dominated by Warrego Grass (Paspalidium jubiflorum) and forb species such as Pratia concolor, Alternanthera denticulata, Wahlenbergia fluminalis, Chenopodium pumilio, Brachyscome basaltica var. gracilis, Eclipta platyglossa, Senecio quadridentatus, Asperula gemella, Euchiton sphaericus, Minuria integerrima, Rorippa laciniata, Centipeda minima var. minima, Rumex tenax, Damasonium minus and Ranunculus undosus. The sedge Cyperus gymnocaulos is commonly present. Occurs on heavy grey clay soil in drainage depressions and flood-outs of major water courses on the floodplains along western sections of Murray, Murrumbidgee and Lachlan Rivers and extending up the Darling River to Wilcannia. Mainly in the Riverina and Murray-Darling Depression Bioregions of the semi-arid (warm) climate zone. Reasonable stands remain and the greatest threat is over-grazing, changed flooding regimes and extended drought. Tree dieback from drought has increased since 2000.

Level of Classification: Association. ***Classification Confidence Level:*** Medium.

Formation Group: Eucalyptus Communities of Inland Watercourses and Inner Floodplains.

State Veg Map (Keith 2004): Inland Riverine Forests.

State Landscape (Mitchell 2002): Not Assessed.

NVIS Major Veg Sub-Groups: Eucalyptus forests with a shrubby understorey.

Forest Type (RN 17): 199 - River Red Gum (P).

Authority(s): (Quantitative Data). Includes community 12 and Table 1.2 in the floristic plot survey of the Murray River by Smith & Smith (1990). Part of Red Gum Woodland map unit in the structural mapping of Margules & Partners (1990). Probably Red Gum - qualities 2 or 3 in forest typing along Murray River by NSW State Forests. Part of map unit RI (River Red Gum Forest) in Sivertsen & Metcalfe (1995) in the Cargelligo region. Equivalent to floristic group 18 and mapped as map unit 3 and part of map units 5 and 6 (Horner et al. 2002). Probably equivalent to community 5B in the Great Cumbung Swamp mapped by Pressey et al. (1984). Probably includes alliance 20 including community 72 and possibly community 71 in Austin et al. (2000) for the central Lachlan River region. Minor part of Lachlan Red Gum open forest map unit in Dykes (2002). Possibly includes part of Biolandscape SouA75 in Priday (2006). Note: as of 2005 only the Murray River had been properly plot sampled to detect floristic variation in River Red Gum communities. Future survey and mapping should attempt to map out or model RRG floristic communities.

Interstate Equivalent(s): Victoria: probably similar to EVC 823 Lignum Swampy Woodland.

Mapped/Modelled: Current extent and pre-European extent mapped or modelled as part of a broader complex. ***Plot Sampling:*** Inadequate.

Mapping Info: Can be difficult to map from aerial photographs from other RRG communities unless the understorey Lignum is able to be discerned. Mapped as part of River Red Gum Forest unit in vegetation map of Margules & Partners (1990). Mapped as map unit 3 and parts of 5 and 6 in Horner et al. (2002) for part of the Hay Plain. Inadequately plot-sampled along the Darling River and Murrumbidgee Rivers.

Climate Zone: Semi-arid: warm (winter rain).

IBRA Bioregion (v6): Cobar Peneplain (1-30%); Murray-Darling Depression (1-30%); Riverina (>70%); Darling Riverine Plains (1-30%).

IBRA Sub-Region: Murray Fans (30-70%); Murray Scroll Belt (1-30%); Robinvale Plains (30-70%); Great Darling Anabranch (1-30%); Menindee (1-30%).

Botanical Division: South Far Western Plains (SFWP) (>70%); South Western Plains (SWP) (1-30%).

Local Govt. Areas: Balranald (30-70%); Carrathool (1-30%); Griffith (1-30%); Hay (1-30%); Murrumbidgee (1-30%); Wakool (30-70%); Wentworth (1-30%); Central Darling (1-30%).

CMAs: Lachlan (1-30%); Lower Murray-Darling (30-70%); Murray (30-70%); Murrumbidgee (1-30%); Western (1-30%).

MD Basin: Yes.

Substrate Mass: Alluvium.

Lithology: Clay; Silt.

Great Soil Group: Grey clay.

Soil Texture: Heavy clay; Light medium clay; Medium clay; Silty clay loam.

Landform Patterns: Covered plain; Flood plain; Meander plain.

Landform Elements: Backplain; Drainage depression; Flood-out.

Land Use: Cropping and Horticulture; Timber Production.

Impacts of European Settlement: Major alteration of species composition; Minor reduction (<30%) in extent and/or range.

Pre-European Extent: 60000 ha ±30%. Expert estimate not based on any mapped vegetation.

Pre-European Extent Comments: Some clearing has occurred in the east of its range.

Current Extent: 35000 ha ±30% or 58% ± 50% of pre-European extent remaining.

Current Extent Comments: (Estimated from a more broadly classified vegetation map). About 20000 ha mapped for a section of the Hay Plain in Horner et al. (2002). Estimated that about 5600 ha occurs along the western portion of the Murray River in NSW by allocating 50% of river section 5 and 100% of river section 6 of the structural map unit Red Gum/Box Forest and Woodland mapped in Margules & Partners (1990).

Conservation Reserves: Lachlan Valley NR 300 (E1); Kalyarr NP 80 (E1); Kemendok NR 300 (E2); Kinchega NP 814 (M); Yanga NP 4000 (E3).

Reserves Total Area: 5494 ha. ***No. Representatives in Reserves:*** 5

Protected Area Explanation: Mapped in Kinchega National Park by Westbrooke et al. (2001). Kemendok NR estimated from Margules & Partners (1990) and site visit by Benson (1999-2009). Possibly also in some other reserves. Part of Lachlan Valley NR (prev. Goonawarra NR) mapped by Horner et al. (2002) and NPWS (undated) estimate area for total reserve. Kalyarr NP from Horner et al. (2002). Yanga NP estimate from splitting broad RRG mapped in Scott 1992 with notes of four types of RRG in NSWDEC (2005). The 2009/2010 NSW Government decision to protect areas of River Red Gum and associated vegetation types in reserves has not been taken into account in these protected area estimates.

Secure Property Agreements: None.

Secure PAs Total Area: 0 ha. ***No. Representatives in Secure Property Agreements:*** 0

Protected Current Extent: 15.69% 5494 ha ± 30%. ***No. Representatives in Protected Areas:*** 5

Protected Pre-European Extent: 9.15% which is inadequately protected across distribution.

Common in 1750: Code 3a: 5-15% of pre-European extent in protected areas (>10,000 ha).

Key Sites for Protection: Western section of the Murray River, Great Cumbung Swamp on the Lachlan River and the lower Darling River.

Degree of Fragmentation: Contiguous stands with high connectivity with >60% extent remaining and low edge to area ratio.

Recoverability: Moderate health as structure and/or composition altered. Likely to recover considerably if causal factors and secondary impacts removed.

Variation & Disturbance: The ecology of River Red Gum regeneration is discussed on pp33-34 in Forestry Commission of NSW (1985) and Stefano (2002). After seed fall seedlings can establish where sufficient moisture is retained the soil after rain or floods. If flooding is reduced due to river regulation drought-like conditions will prevent tree recruitment. Extended flooding for over four months may kill small seedlings while taller ones may survive. Abundance of associate species varies depending on wetness of the site and the season. Intermittent flooding is also important for recruitment of Lignum and other species such as Acacia stenophylla (River Cooba). Roots of River Red Gum seedlings must penetrate below a poorly aerated gley layer to a aerated clay layer in the soil profile to ensure their successful establishment (Pressey et al. 1984).

Fire Regime: Rarely subject to fire due to flooding and low ground biomass. Crown fires are rare due to the height of the trees and a lack of shrubs. Intense or even medium-intese fires may kill River Red Gum trees by burning to the tree's cambium at the base of the trees. These fires will also kill seedlings. River Red Gum cannot recover by sprouting from lignotubers. Fires in River Red Gum forests of the Murray River region have been recorded in summers after a lack of winter floods. It is possible that Aborigines lightly patch burnt the forest floor prior to European settlement.

Adjoining Communites: Grades into herbaceous River Red Gum communities on river banks or levees, and into Black Box further out on the floodplain. Sometimes may adjoin wetland communities such as IDs 238, 181 and 182. Grades into Lignum shrubland (ID17) on the floodplains where trees are very sparse. Floristically similar to River Red Gum with Lignum in Cowals (ID249) in the NSW South-western Slopes and eastern Riverina Bioregions.

Threatening Processes: Because this community occurs on higher ground near the Black Box zone it is susceptible to clearing for crops or grazing in the Murray River floodplain but less so along the Darling River. Altered flooding regimes are the major long term threat as River Red Gum requires regular inundation for germination of seed and tree survival. Listed as Near Threatened in 2001 but now as Vulnerable due to irrigation and changed flooding regimes, drought, climate change and evidence of dieback in key tree species (Brett Lane & Associates 2004, Cunningham et al. 2007).

Threatening Process List: Clearing for agriculture; Climate Change; Firewood collection; Irrigated cropping (incl. horticulture); Hydrology (disruption of natural flooding regimes); Forestry activities including logging; Salinity; Soil erosion, water: gully, tunnel, landslips; Unsustainable grazing and trampling by stock; Unsustainable grazing by introduced animals; Weed (exotic) invasion.

Threat Category: Vulnerable. ***Threat/Protected Area Code:*** V/3a ***Threat Criteria:*** 3; 4; 5.

Planning Controls:

Planning and Management: Protection from overlogging of River Red Gum and maintenance of environmental flooding regimes for regeneration.

Listed Under Legislation: None.

Recovery Plan: Doesn't exist and not required.

Reference List: (308; 282; 313; 289; 155; 11; 246; 342; 18; 13; 34; 9; 327; 23; 484; 483). Benson, J.S. (1999-2009) Unpublished field note books recording species at various locations in western NSW. (Royal Botanic Gardens and Domain Trust: Sydney); Dykes, P. (2002) Vegetation communities of the Cobar Shire. Unpublished report. (Department of Land and Water Conservation, Far West Region: Dubbo); Forestry Commission of NSW (1985) Management Plan for Murray Management Area. (Forestry Commission of NSW: Sydney); Horner, G., McNellie, M., Nott, T.A., Vanzella, B., Schliebs, M., Kordas, G.S., Turner, B. & Hudspith, T.J. (2002) Native vegetation map report series: No. 2 Dry Lake, Oxley, Hay, One Tree, Moggumbill & Gunbar 1:100 000 map sheets. (NSW Department of Infrastructure Planning and Natural Resources: Sydney); Johnson, J. (undated) Goonawarra Nature Reserve inspection report. File note RN 31. (NSW National Parks and Wildlife Service: Griffith); Margules & Partners (1990) River Murray Riparian Vegetation Study. (Murray-Darling Basin Commission: Canberra); Miles, C. (2001) NSW Murray Catchment: biodiversity action plan. (Nature Conservation Working Group Inc.: Albury); NSW Department of Environment and Conservation (2005) New Area Investigation Report: Yanga. Unpublished Report (DEC: Dubbo); Pressey, R.L., Bell, F.C., Barker, J., Rundle, A.S. & Belcher, C.A. (1984) Bio-physical features of the Lachlan-Murrumbidgee Confluence, south-western New South Wales. (NSW National Parks and Wildlife Service: Sydney); Scott, J.A. (1992) The natural vegetation of the Balranald - Swan Hill area. Cunninghamia 2(4): 597-652; Sivertsen, D. & Metcalfe, L. (1995) Natural vegetation of the southern wheat-belt (Forbes and Cargelligo 1:250 000 map sheets). Cunninghamia 4(1): 103-128; Smith, P. & Smith J. Ecological Consultants (1990) Floristic Communities. In River Murray Riparian Vegetation Study. (Murray-Darling Basin Commission: Canberra); Stefano, J. (2002) River Red Gum (Eucalyptus camaldulensis): a review of ecosystem processes, seedling regeneration and silvicultural practice. Australian Forestry 65(1): 14-22; Westbrooke, M.E., Kerr, M.K.C. & Leversha, J. (2001) The vegetation of Kinchega National Park, western New South Wales. Cunninghamia 7(1): 1-25; Brett Lane & Associates Pty Ltd (2005) Survey of River Red Gum and Black Box health along the River Murray in New South Wales, Victoria and South Australia (Murray Darling Basin Commission: Canberra); Cunningham, S.C., MacNally, R., White, M., Read, J., Baker, P.J. Thomson, J. & Griffioen, P. (2007) Mapping the current condition of River Red Gum (Eucalyptus camaldulensis Dehnh.) stands along the Victorian Murray River floodplain. Report to northern Vic.

NSW Vegetation Classification - Vegetation ID

Vegetation Community ID 79

Common Name: **River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes bioregion and western South East Highlands Bioregion**

Scientific Name: *Eucalyptus camaldulensis - Eucalyptus blakelyi / Callistemon sieberi - Acacia implexa - Acacia dealbata - Bursaria spinosa / Carex appressa - Microlaena stipoides var. stipoides - Rumex brownii - Dichondra repens*

Veg. Comm. ID.: **79** ***Original Entry:*** John Benson 10/01/2006

Photo 1: ID79a_Img296pc.jpg Eucalyptus camaldulensis woodland with shrubs of Callistemon sieberi, Koorawatha Nature Reserve, [AGD66 34°03'20"S 148°35'01"E], 12/10/02, Jaime Plaza.

Photo 2: ID79b_PC172-14.jpg Eucalyptus camaldulensis riparian woodland with grassy ground cover, Canowindra-Goologong Rd, south-western slopes, [AGD66 33°34'27"S 148°29'58"E], 11/10/02, Jaime Plaza.

Photo 3: ID79c_PC245-2.jpg Eucalyptus camaldulensis riparian woodland along Manildra creek, West Manildra, [AGD66 33°11'32.3"S 148°39'1.7"E], 03/05/2005, Jaime Plaza.

Characteristic Vegetation: (Quantitative Data)

Trees: *Eucalyptus camaldulensis; Casuarina cunninghamiana; Eucalyptus blakelyi; Eucalyptus melliodora.*

Shrubs/Vines/Epiphytes: *Callistemon sieberi; Acacia dealbata; Acacia implexa; Bursaria spinosa subsp. lasiophylla; Acacia vestita; Acacia melanoxylon; Acacia buxifolia subsp. buxifolia; Leptospermum continentale; Leptospermum obovatum; Leptospermum brevipes; Kunzea ericoides; Typha domingensis; Melicytus dentatus; Lomatia myricoides; Dodonaea viscosa subsp. spatulata; Exocarpos cupressiformis; Acacia verniciflua; Chondrilla juncea; Pomaderris phylicifolia subsp. Phylicifolia.*

Ground Cover: *Carex appressa; Microlaena stipoides var. stipoides; Rumex brownii; Dichondra repens; Poa labillardierei var. labillardierei; Austrodanthonia auriculata; Austrodanthonia racemosa; Austrodanthonia fulva; Lythrum hyssopifolia; Eleocharis acuta; Eleocharis pusilla; Carex inversa; Cyperus eragrostis; Pratia pedunculata; Gratiola peruviana; Arthropodium minus; Hypericum gramineum; Wahlenbergia stricta subsp. stricta; Acaena echinata; Euchiton involucratus; Scutellaria humilis; Senecio bathurstianus; Persicaria hydropiper; Einadia nutans subsp. nutans; Haloragis heterophylla; Opercularia aspera; Themeda australis; Bothriochloa macra; Cynodon dactylon; Lachnagrostis filiformis; Echinopogon ovatus; Dichelachne crinita; Austrostipa blackii; Austrostipa bigeniculata; Aristida ramosa; Austrostipa scabra subsp. scabra; Eragrostis lacunaria; Panicum simile; Juncus usitatus; Juncus amabilis; Juncus aridicola; Juncus psammophilus; Juncus psammophilus; Desmodium varians.*

Weed Species: *Rubus fruiticosus; Verbena bonariensis; Anagallis arvensis; Trifolium arvense; Trifolium glomeratum; Petrorhagia nanteuilii; Echium plantagineum; Hordeum marinum; Phalaris aquatica; Salix alba var. alba; Avena barbata; Trifolium campestre; Silene gallica var. gallica; Solanum nigrum; Schinus areira; Hypochaeris radicata; Hypochaeris glabra; Lolium perenne; Briza maxima; Bromus hordeaceus; Bromus molliformis; Bromus sterilis; Conyza albida; Holcus lanatus; Avena barbata.*

Weediness: Very high (>30%) with >30% cover.

Threatened Plants: Not assessed.

Threatened Fauna: Not assessed.

Mean Species Richness: Not assessed.

Rainforest Structure (Webb): Not applicable.

Structure (WH): Woodland.

Height Class (WH): Very Tall; Tall.

Vegetation Description: Very tall or tall riparian woodland dominated by River Red Gum (Eucalyptus camaldulensis) sometimes with River Oak Casuarina cunninghamiana. The River Red Gum may grade into or cross with Blakely's Red Gum (Eucalyptus blakeli) in smaller watercourses at higher altitudes. The shrub layer is generally sparse but in some rocky zones it may be mid-dense and is dominated by tea tree (Leptopsermum spp.) and bottlebrush (Callistemon seiberi) along with Mountain Silver-Wattle (Acacia dealbata) and other species of Acacia. The ground cover is usually dense and includes grass species such as Poa labillardierei var. labillardierei, Microlaena stipoides var. stipoides, Lachnagrostis filiformis, Echinopogon ovatus, Dichelachne crinita, Austrodanthonia spp., Themeda australis, Cynodon dactylon, Austrostipa verticillata and Aristida spp. Small low lying water-holding depressions contain sedges such as Carex spp. Eleocharis spp. and Cyperus spp. along with rushes such as Juncus aridicola and Juncus amabilis. Forbs include Dichondra repens, Wahlenbergia stricta subsp. stricta, Euchiton involucratus, Scutellaria humilis, Senecio bathurstianus, Rumex brownii, Gratiola peruviana, Arthropodium minus, Hypericum gramineum and Persicaria hydropiper. Occurs on alluvial loam soils on river banks and adjoining river flats along major watercourses in the upper slopes sub-region of the NSW South-western Slopes Bioregion extending into the South Eastern Highlands Bioregion. Associate species vary considerably over the range and due to inundation levels across flats. Shrubs may be absent in heavily grazed and eroded areas. This community grades into into other River Red Gum and Black Box communities on the south-western plains and into Blakely's Red Gum - Yellow Box woodland (ID277) on adjoining hillslopes or flats on higher ground. It also grades into River Oak-dominated open forest (ID85) at mid-altitudes and in various locations along rivers and into a separately classified River Red Gum community occupying cowals (lakes) on the lower slopes and western plains (ID249). This community is mainly cleared. Many remnants are infested with annual or perennial exotic grasses and forbs along with woody weeds such as Blackberry and Willow. Due to the degree of clearing and weed infestation this community is considered to be threatened.

Level of Classification: Association. ***Classification Confidence Level:*** Medium.

Formation Group: Eucalyptus Communities of Inland Watercourses and Inner Floodplains.

State Veg Map (Keith 2004): Inland Riverine Forests.

State Landscape (Mitchell 2002): Not Assessed.

NVIS Major Veg Sub-Groups: Eucalyptus woodlands with a grassy understorey.

Forest Type (RN 17): 199 - River Red Gum (P).

Authority(s): (Combination of Expert Opinion and Quantitative Data). Incorporates most of Vegetation Group 43 (Thomas et al. 2000 and Gellie 2005). Includes most of Biolandscape SouA75 in Priday (2006). Noted in the Mid-Lachlan Regional Vegetation Committee (1999). Part of "riverine forest/woodland" broad community in Murray Catchment (Miles 2000) and profiled for a number of sub-catchments in the south western slopes in Stelling (1998). Noted as Broad Veg. Type 9 (Riparian Communities) by Riverina Highlands Regional Vegetation Committee (2001). Possibly part of community 72 in Austin et al. (2000) for the slopes section of the central Lachlan region. Community E - River Red Gum forest in Seddon et al. (2002) for Little River Catchment. Checked by Benson (1999-2009). RRG community for Boorowa Shire in NPWS (2002a). Part of BVT30 in DEC (2006, 2006a). Note: as of 2007 only the Murray River had been properly plot sampled to detect floristic variation in River Red Gum communities. Future data analysis could split this community.

Interstate Equivalent(s): Victoria: similar to EVC68 Creekline Grassy Woodland.

Mapped/Modelled: Current extent partly mapped or modelled. ***Plot Sampling:*** Inadequate.

Mapping Info: Gellie (2005) maps 1300 ha over part of its range. Mapped as part of broader community by Murray Catchment Trust (2001). Mapped in other aras such as Little River catchment. Plot sample across range remains inadequate as of 2007.

Climate Zone: Temperate: no dry season (hot summer).

IBRA Bioregion (v6): NSW South-western Slopes (>70%); South Eastern Highlands (1-30%).

IBRA Sub-Region: Lower Slopes (1-30%); Upper Slopes (30-70%); Bondo (1-30%); Crookwell (1-30%); Murrumbateman (1-30%); Hill End (1-30%); Orange (1-30%).

Botanical Division: Central Western Slopes (CWS) (30-70%); South Western Slopes (SWS) (30-70%); Central Tablelands (CT) (1-30%); Southern Tablelands (ST) (1-30%).

Local Govt. Areas: Cabonne (1-30%); Coolamon (1-30%); Cootamundra (1-30%); Cowra (1-30%); Forbes (1-30%); Greater Hume (1-30%); Gundagai (1-30%); Harden (1-30%); Junee (1-30%); Lachlan (1-30%); Parkes (1-30%); Temora (1-30%); Wagga Wagga (1-30%); Weddin (1-30%); Young (1-30%);Australian Capital Territory (1-30%).

CMAs: Lachlan (1-30%); Murray (30-70%); Murrumbidgee (30-70%).

MD Basin: Yes.

Substrate Mass: Alluvium.

Lithology: Alluvial loams and clays; Alluvial sand; Gravel; Silt.

Great Soil Group: Alluvial soil.

Soil Texture: Clay loam; Sandy clay loam; Silty clay loam; Silty loam.

Landform Patterns: Flood plain; Hills; Low hills.

Landform Elements: Bank (streambank); Bar (streambar); Levee.

Land Use: Cropping and Horticulture; Grazing.

Impacts of European Settlement: Dieback due to disease or senescence; Major alteration of species composition; Major reduction (>70%) in extent and/or range.

Pre-European Extent: 35000 ha ±50%. Estimated from pre-European map: part range.

Pre-European Extent Comments: 20915 ha mapped as pre-European extent for southern CRA covering about half of its range (Thomas et al. 2000). Would have occupied most major watercourses on the south western slopes.

Current Extent: 12000 ha ±50% or 34% ± 80% of pre-European extent remaining.

Current Extent Comments: (Estimated from mapped extant vegetation: part range). About 1300 ha is mapped in the Southern Forests CRA area (Vegetation group 43 in Gellie (2005) but this does not cover the full range. Seddon et al. (2002) estimate that 15% (609 of 4048 ha) remains in the Little River Catchment. 1666 ha (49%) estimating remaining of an original 3251 ha in Boorowa Shire (NPWS 2002a).

Conservation Reserves: Hattons Corner NR 1 (E1); Koorawatha NR 5 (E1); Flagstaff Memorial NR 2 (E2).

Reserves Total Area: 8 ha. ***No. Representatives in Reserves:*** 3

Protected Area Explanation: Hatton Corner Nature Reserve from a NPWS information sheet. Koorawatha NR from observation by J Benson (1999-2009) and Porteners (2007). GE9907 estimated from secure areas for each PA in DIPNR PA database. Flagstaff Memorial NR from NSWNPWS file notes. VCA008 and VCA084 estimates from DECC file notes on VCA.

Secure Property Agreements: GE9907 PA 10 (E1); VCA008 VCA 7 (E4); VCA084 VCA 10 (E2).

Secure PAs Total Area: 27 ha. ***No. Representatives in Secure Property Agreements:*** 3

Protected Current Extent: 0.29% 35 ha ± 30%. ***No. Representatives in Protected Areas:*** 6

Protected Pre-European Extent: 0.1% which is inadequately protected across distribution.

Common in 1750: Code 5a: <1% of pre-European extent in protected areas (>10,000 ha).

Key Sites for Protection: Requires targeted survey along rivers to select sites in good condition for property agreements or reserves. Large remnants on flats should be protected.

Degree of Fragmentation: Human induced highly fragmented small stands with <30% extent remaining and high edge to area ratio.

Recoverability: Poor health as structure and/or composition significantly altered. But sufficient biota remain for natural regeneration if causal factors and their secondary impacts removed and dynamic processes reinstated.

Variation & Disturbance: A broadly typed plant community so there is significant variation in species composition across its range. Some areas contain a grassy ground cover others have a high density of shrubs. Flooding and soil variation affect local species composition. Water retention patterns and land use alters the understorey component. Over-grazed areas have lost their shrub layer and are erosion prone. Trampling of river banks may threaten soil erosion in some places.

Fire Regime: Fire is rare due to fragmentation of natural habitats and lack of ground cover.

Adjoining Communites: Grades into River Red Gum communities ID2, 5 and 9 and the cowal River Red Gum community ID249 downstream to the west on larger floodplains. Grades into Eucalyptus blakelyi - Eucalyptus melliodora (ID277) or White Box (ID266) dominated vegetation on adjoining hills. Grades into River Oak forest (ID85) in various locations along rivers. Grades into various wetlands dominated by sedges, rushes or reeds on adjoining floodplains.

Threatening Processes: A threatened community although large riparian areas remain hence recorded as Vulnerable at this stage. A high proportion has been cleared and it is now highly fragmented along watercourses. Lack of flooding and prolonged drought is killing River Red Gums in some places. Dams on rivers may have affected flooding regimes and weeds are a problem at many locations. Streambank erosion due to trampling by stock is a common form of degradation.

Threatening Process List: Age class of woody vegetation; Clearing for agriculture; Dryland cropping; Irrigated cropping (incl. horticulture); Hydrology (disruption of natural flooding regimes); Salinity; Soil erosion, water: sheet erosion; Unsustainable grazing and trampling by stock; Weed (exotic) invasion.

Threat Category: Vulnerable. ***Threat/Protected Area Code:*** V/5a ***Threat Criteria:*** 4; 3.

Planning Controls:

Planning and Management: Murray, Murrumbidgee and Lachlan Catchment Management Plans should fence off and protect riparian vegetation and floodplain remnants from overgrazing, trampling by stock, clearing and encourage restoration and regrowth. Some areas require weed control.

Listed Under Legislation: None.

Recovery Plan: Doesn't exist, but required.

Reference List: (183; 308; 67; 165; 164; 163; 276; 336; 341; 353; 356; 372; 373; 379). Austin, M.P., Cawsey, E.M., Baker, B.L., Yialeloglou, M.M., Grice, D.J. & Briggs, S.V. (2000) Predicted vegetation cover in the central Lachlan region. National Heritage Trust Project AA 1368.97. (CSIRO Division of Wildlife and Ecology: Canberra); Benson, J.S. (1999-2009) Unpublished field note books recording species at various locations in western NSW. (Royal Botanic Gardens and Domain Trust: Sydney); Mid-Lachlan Regional Vegetation Committee (1999) Plan Draft Mid-Lachlan Regional Vegetation Management Plan for Public Exhibition. (Mid-Lachlan RVC: Forbes); Miles, C. (2000) Classification and mapping of broad vegetation types (BVTs) for the NSW Murray Catchment. Unpublished. (Murray Catchment Trust: Albury); Riverina Highlands Regional Vegetation Committee (2001) Draft Riverina Highlands Regional Vegetation Management Plan. (RHVC: Albury); Thomas, V., Gellie, N. & Harrison, T. (2000) Forest ecosystem classification and mapping for the southern CRA region. Volume 2 Appendices. (Department of Urban Affairs and Planning: Sydney); Seddon, J., Briggs, S. & Doyle, S. (2002) Little River Catchment biodiversity assessment. Report. (NSW National Parks and Wildlife Service c/- CSIRO Sustainable Ecosystems: Canberra); NSW National Parks and Wildlife Service (2002a) The native vegetation of Boorowa Shire (NSW National Parks and Wildlife Service: Hurstville); Stelling, F. (Ed.) (1998) South West Slopes Revegetation Guide (Murray Catchment Management Committee and Department of Land & Water Conservation: Albury); Gellie, N.J.H. (2005) Native vegetation of the Southern Forests: South-east Highlands, Australian Alps, South-west Slopes and SE Corner bioregions. Cunninghamia 9(2): 219-254; Priday, S. (in prep. 2006) The native vegetation of the New South Wales South Western Slopes Bioregion (Lachlan, Murrumbidgee and Murray Catchments). Unpublished report to DEC Southern Office Queanbeyan; DEC (2006) Reconstructed and extant distribution of native vegetation in the Central West Catchment. Unpublished report (NSW Department of Environment and Conservation: Dubbo); DEC (2006a) Reconstructed and extant distribution of native vegetation in the Lachlan Catchment. Unpublished report (NSW Department of Environment and Conservation: Dubbo); Porteners, M.F. (2007) Vegetation survey and mapping of Koorawatha, Dananbilla, Gungewalla and Illunie Nature

Reserves. Report to Department of Environment and Climate Change NSW.

NSW Vegetation Classification - Vegetation ID

Vegetation Community ID 249

Common Name: **River Red Gum swampy woodland wetland on cowals (lakes) and associated flood channels in central NSW**

Scientific Name: *Eucalyptus camaldulensis subsp. camaldulensis / Muehlenbeckia florulenta - Teucrium racemosum - Eutaxia microphylla - Sclerolaena muricata / Alternanthera denticulata - Juncus aridicola - Marsilea drummondii - Lachnagrostis filiformis*

Veg. Comm. ID.: **249** ***Original Entry:*** John Benson 31/12/2005

Photo 1: ID249a_PC204-11.jpg Eucalyptus camaldulensis woodland, Gum Swamp near Walla Walla, [AGD66 35°49'25"S 147°04'30"E], 19/10/02, Jaime Plaza.

Photo 2: ID249b_SWS0507381.jpg A band of River Red Gum (Eucalyptus camaldulensis) open woodland on the western edge of Lake Cowal in central western NSW, [AGD66 33°37.166"S 147°23.389"E], 31/5/2007, Jaime Plaza.

Photo 3: ID249c_BBSMAY09_2178.jpg River Red Gum (Eucalyptus camaldulensis) woodland with a sedge rush ground cover on the edge of Old Harbour Lagoon near Gilgandra [AGD66 31°55'47"S 148°46'1.6"E], 14/5/09, Jaime Plaza.

Characteristic Vegetation: (Quantitative Data)

Trees: *Eucalyptus camaldulensis subsp. camaldulensis; Casuarina cristata.*

Shrubs/Vines/Epiphytes: *Muehlenbeckia florulenta; Teucrium racemosum; Sclerolaena muricata; Acacia hakeoides; Eutaxia microphylla; Glycyrrhiza acanthocarpa.*

Ground Cover: *Alternanthera denticulata; Juncus flavidus; Juncus aridicola; Marsilea drummondii; Lachnagrostis filiformis; Amphibromus nervosus; Mentha satureioides; Eleocharis plana; Pratia concolor; Rumex tenax; Monachather paradoxus; Cynodon dactylon; Centipeda cunninghamii; Paspalum distichum; Chamaesyce drummondii; Chloris truncata; Marsilea costulifera; Persicaria decipiens; Amphibromus fluitans; Austrostipa bigeniculata; Carex inversa; Myriophyllum verrucosum; Wahlenbergia communis.*

Weed Species: *Sonchus oleraceus; Cirsium vulgare; Trifolium angustifolium; Echium plantagineum; Lactuca serriola; Sonchus asper subsp. glaucescens; Aster subulatus; Hypochaeris glabra; Lolium rigidum.*

Weediness: Very high (>30%) with 10-30% cover.

Threatened Plants: None recorded.

Threatened Fauna: Not assessed.

Mean Species Richness: 33±4 (floristic group 18 in Lewer et al. 2003 in 20x20 m plots).

Rainforest Structure (Webb): Not applicable.

Structure (WH): Woodland.

Height Class (WH): Tall.

Vegetation Description: Tall woodland with trees averaging about 20 m high dominated by River Red Gum (Eucalyptus camaldulensis subsp. camaldulensis). Shrubs are absent or rare, the most common being Lignum (Muehlenbeckia florulenta) and occasionally Teucrium racemosum, Eutaxia microphylla, Glycyrrhiza acanthocarpa or Acacia spp. The ground cover is dense and often contains a number of grasses such as Veined Swamp Wallaby Grass (Amphibromus nervosus), wallaby grass (Monachather paradoxus), Blown Grass (Lachnagrostis filiformis), Austrostipa bigeniculata and Couch Grass (Cynodon dactylon). Forb species include Alternanthera denticulata, Mentha satureioides, Pratia concolor, Rumex tenax, and Centipeda cunninghamii. Nardoo (Marsilea drummondii) may be common along with the rushes (Juncus flavidus, Juncus aridicola) and sedges such as Eleocharis plana, Cyperus spp. and Carex appressa. Occurs on grey sandy clay to heavy crakcin clay soils on the edges of or across the bed of lakes (cowals) and assocated flood channels on floodplains and alluvial plains in central west NSW from just north of Dubbo extending to Victoria. This community is restricted in extent and is poorly presented in reserves as of 2007. Mainly cleared and susceptable to weed invasion, burning or pig damage.

Level of Classification: Association. ***Classification Confidence Level:*** Medium.

Formation Group: Eucalyptus Communities of Inland Watercourses and Inner Floodplains.

State Veg Map (Keith 2004): Inland Riverine Forests.

State Landscape (Mitchell 2002): Not Assessed.

NVIS Major Veg Sub-Groups: Eucalyptus woodlands with a grassy understorey.

Forest Type (RN 17): 199 - River Red Gum (P).

Authority(s): (Quantitative Data). Floristic Group 18 being part of map unit FLP1 in Lewer et al. (2003). A restricted community partly based on geomorphological features that has not been mapped over its range as it would require finer scale mapping than exists in 2009.

Interstate Equivalent(s): Victoria: EVC292 Red Gum Swamp.

Mapped/Modelled: Current extent and pre-European extent mapped or modelled as part of a broader complex. ***Plot Sampling:*** Inadequate.

Mapping Info: Sampled in Lewer et al. (2003) for part of range but not mapped or surveyed over range.

Climate Zone: Temperate: no dry season (hot summer).

IBRA Bioregion (v6): Darling Riverine Plains (1-30%); NSW South-western Slopes (30-70%); Riverina (1-30%); Brigalow Belt South (1-30%).

IBRA Sub-Region: Bogan-Macquarie (1-30%); Lachlan Plains (1-30%); Lower Slopes (30-70%); Murrumbidgee (1-30%); Pilliga sub (1-30%).

Botanical Division: Central Western Slopes (CWS) (1-30%); North Western Plains (NWP) (1-30%); South Western Plains (SWP) (30-70%); South Western Slopes (SWS) (1-30%).

Local Govt. Areas: Bogan (1-30%); Coonamble (1-30%); Lachlan (1-30%); Murrumbidgee (1-30%); Narromine (1-30%); Warren (1-30%); Greater Hume (1-30%); Urana (1-30%); Lockhart (1-30%).

CMAs: Central West (30-70%); Lachlan (1-30%); Murrumbidgee (1-30%); Murray (1-30%).

MD Basin: Yes.

Substrate Mass: Alluvium.

Lithology: Alluvial loams and clays.

Great Soil Group: Brown clay; Grey clay.

Soil Texture: Medium clay; Heavy clay.

Landform Patterns: Alluvial plain; Flood plain; Lacustrine plain.

Landform Elements: Drainage depression; Flood-out; Lake.

Land Use: Grazing.

Impacts of European Settlement: Major alteration of species composition; Medium reduction (30-70%) in extent and/or range.

Pre-European Extent: 7000 ha ±50%. Expert estimate not based on any mapped vegetation.

Pre-European Extent Comments: A restricted community due to landform element in which it occurs.

Current Extent: 3500 ha ±50% or 50% ± 80% of pre-European extent remaining.

Current Extent Comments: (Expert estimate). Estimated to be a small part of the 32077 ha River Red Gum mapped by Lewer in central NSW. Kerr et al. (2003) estimated that about 40% of River Red Gum remains in the Dubbo Region. Some cowals have been cleared for crops others degraded by grazing.

Conservation Reserves: Lake Urana NR 9 (M); Wiesners Swamp NR 70 (E1).

Reserves Total Area: 79 ha. ***No. Representatives in Reserves:*** 2

Protected Area Explanation: Lake Urana NR from Roberts & Roberts (2001) and described in NPWS management plan. Wiesners Swamp estimate from NSW NPWS (2001c).

Secure Property Agreements: None.

Secure PAs Total Area: 0 ha. ***No. Representatives in Secure Property Agreements:*** 0

Protected Current Extent: 2.25% 79 ha ± 30%. ***No. Representatives in Protected Areas:*** 2

Protected Pre-European Extent: 1.12% which is inadequately protected across distribution.

Restricted in 1750: Code 5b:<5% of pre-European extent in protected areas (1,000<area<10,000 ha).

Key Sites for Protection: Trangie Cowal, Lake Cowal and cowals from the Bogan River to the Murray floodplain including Gum Cowal near Walla Walla. An excellent northern-most occurrence occurs in Old Harbour Lagoon south of Gilgandra in the BBS Bioregion.

Degree of Fragmentation: Naturally fragmented stands of variable patch sizes with >50% extent remaining.

Recoverability: Poor health as structure and/or composition significantly altered. But sufficient biota remain for natural regeneration if causal factors and their secondary impacts removed and dynamic processes reinstated.

Variation & Disturbance: The dominance of ground cover species alter with soil wetness and flooding regimes and from north to south.

Fire Regime: Rarely burns.

Adjoining Communites: Grades into other River Red Gum communities along rivers or Black Box on the floodplain. Grades into White Cypress Pine on adjoining sandy lunettes.

Threatening Processes: Clearing, altered river flows and reduced flooding are the main threats. Feral animals such as pigs. Weed invasion is a problem in some sites. Illegal burning of River Red Gums could lead to tree-death.

Threatening Process List: Cropping; Chemical pollution (incl. herbicides, pesticides); Hydrology (disruption of natural flooding regimes); Salinity; Soil erosion, water: gully, tunnel, landslips; Unsustainable grazing and trampling by stock; Weed (exotic) invasion.

Threat Category: Vulnerable. ***Threat/Protected Area Code:*** V/5b ***Threat Criteria:*** 1; 4.

Planning Controls:

Planning and Management: Samples should be protected in reserves or under property agreements. Over-stocking should be prevented through fencing off the woodland from the surrounding plain. Burning of trees and Lignum should be prohibited unless there are demonstrable ecological reasons to do so.

Listed Under Legislation: None.

Recovery Plan: Doesn't exist and not required.

Reference List: (318; 293; 247; 323). Kerr, M., Jowett, A. & Robson, D. (2003) Reconstructed distribution and extent of native vegetation within the lower Macquarie-Castlereagh Region. Unpublished Report. (NSW National Parks and Wildlife Service, Western Directorate: Dubbo); Lewer, S., Ismay, K., Grounds, S., Gibson, R., Harris, M., Armstrong, R., Deluca, S. & Ryan, C. (2003) Native vegetation map report Bogan Gate, Boona Mount, Condobolin, Dandaloo, Tottenham and Tullamore 1:100 000 map sheets. (NSW Department of Infrastructure, Planning and Natural Resources). Submitted to Cunninghamia; Roberts, I. & Roberts, J. (2001) Plains Wanderer (Pedionmus torquatus) habitat mapping, including woody vegetation and other landscape features Riverina Plains NSW. Report to NSW National Parks and Wildlife Service (Earth Resources Analysis Pty. Ltd.); NSW National Parks and Wildlife Service (2001c) Wiesners Swamp Nature Reserve. Draft Plan of Management. (NSW National Parks and Wildlife Service: Hurstville).